A Comparison of Species Diversity of Vegetation Within Prairie Dog Towns and Non-Inhabited Areas

ABSTRACT:

A comparative study of species richness and species diversity was performed. Samples were taken from four different sites in the grassland areas just east of the Rocky Mountains near Boulder, Colorado. Two of the sites were located in active prairie dog towns and the other two sites were areas that were undisturbed and uninhabited by prairie dogs. The purpose of this study was to determine what effect, if any, prairie dogs have on the species richness and diversity of plants located in these grasslands. To determine the species richness and diversity, we sampled the plants in both areas by using a point frame. To keep our samples random, we performed a 50 meter transect in each area, followed by randomly choosing three 30 meter transects, perpendicular to the 50 meter transect. Finally, we randomly chose three points along each 30 meter transect to place the point frame. The point frame was then used to assess the ground cover in each area. To analyze our data we used a variety of tools which included the Shannon-Weiner species diversity index, which was used to measure species diversity, a percent similarity test to see how similar the two habitats were as far as plant species are concerned, and a Chi-Square test to determine if the populations are the same. We found the percent similarity to be only 68.2% similar. This suggests that the communities are different. The species diversity test showed the non-inhabited sites to be H= .435 while the uninhabited was H= .717. This shows that the diversity of the inhabited was much higher than that of the non-inhabited. The results of the Chi-Square test was very definitive. The critical value was 16.9, but our results were 172.1, which says that the grass communities were not the same. It is known that prairie dogs alter species composition and biomass of the plants, litter, and bare ground of the towns, making the site more diverse (Munn et al. 1993).

INTRODUCTION:

Prairie dog populations have decreased by about 98% in North America since the turn of the century, due to extensive eradication programs (Miller & Ceballos, 1994). Some of these programs include poisoning and annual events such as the Nucla prairie dog shoot. It has been proven that prairie dogs are in fact keystone species that play a significant role the preservation of the western grasslands that extend from southern Canada to northern Mexico (Miller & Ceballos, 1994). The effects that prairie dogs have on the environment or more specifically, the soil, has not been documented at this time. But it is known that prairie dogs alter species composition and biomass of the plants, litter, and bare ground in their towns (Munn et al. 1993). They do this by moving greater amounts of soil material and living in large densely populated communities. Extensive grazing causes the canopy microclimate to be a little warmer with a higher evaporation rate (Hoffman et al., 1995). Although this can be deleterious to the well being of the

plants, it may be compensated for by the increase in soil moisture (Hoffman et al., 1995). Studies show that a higher amount of soil moisture may be the result of smaller transpiring leaf mass, and also from improved infiltration caused by the burrowing of the prairie dogs (Hoffman et al., 1995). Their way of life permanently effects the properties of the soil, by causing the rate of soil mixing to be increased. Due to changes in the soil, the area often becomes patchy or more diverse (Munn et al., 1993). The effects of prairie dog towns on their surrounding environment is not limited to plant life. It was found that both avian and mammal species were increased within the prairie dog town when compared to sites without prairie dogs present (Reading et al., 1993).

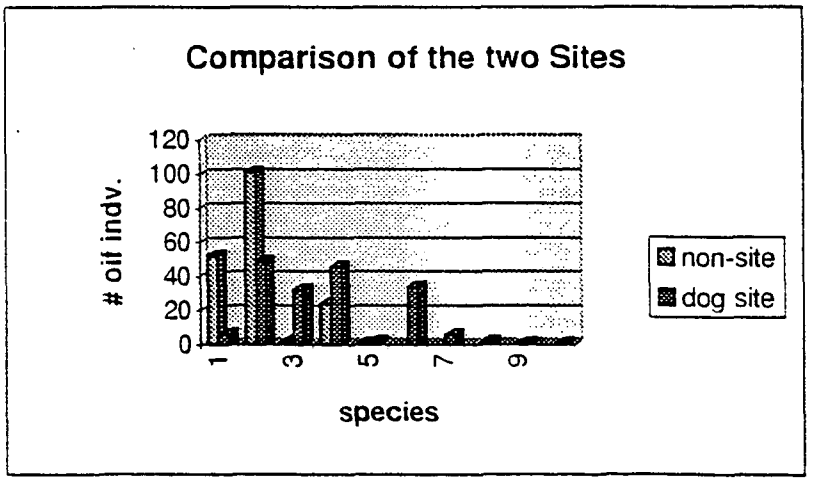
METHODS:

Our study involved a total of four sites. All of them located in the grassland communities of Boulder County. Two of the sites were used as control sites in east Boulder Open Space. These sites were labeled non-1 and non-2. They were uninhabited by prairie dogs and only slightly grazed. The other two sites were labeled yes-1 and yes-2. These sites were inhabited with active prairie dogs. At each individual site we used a 50 m transect line across the area of interest. Then randomly selected three places along the main line to extend 30 m transect lines running perpendicular to the main transect line. Along these shorter transect lines we randomly selected three spots to use a point frame. The point frame enabled us to assess the ground cover. We categorized them as either: litter, bare ground, forbe, grass species A, grass species B, grass species C, weed, flower, rose, clover, or potential flower. We used the point frame a total of nine times at each site. After identifying the species we were able to distinguish between the vegetation types at a

uninhabited and an inhabited site. We utilized a chi square test, the Shannon-Weiner species diversity test, and a percent similarity test to analyze our data.

RESULTS:

The results of the study were that the control sites and the prairie dog sites were significantly different from one another. By using a chi-square test, percent similarity test, and a species diversity test, we were able to draw the conclusion that prairie dog towns added to the species richness of the grassland ecosystem. The chi-square test, with degrees of freedom of 9, gives us a critical value of 16.9. Since 179.12 > 16.9, the two sites are definitely significantly different. The percent similarity test was conducted to compare the two types of sites. This test showed that the two sites are only 68.2% similar. To elaborate on this point even further, the species diversity test was conducted. The results of this test are that for the control site H= .435 while for the prairie dog site H= .717.



DISCUSSION:

The chi-square test shows us that prairie dog sites differ significantly from our control sites; the presence of prairie dogs adds to the species richness of the grassland ecosystem. This supports our hypothesis that the prairie dog affects vegetation. It grazes on vegetation in and around the town, increasing species diversity by not letting one species dominate, as does species A in the control sites. Our hypothesis is further supported by the results of the percent similarity and species diversity tests.

One problem with our results is that we did not sample areas that had been previously inhabited by prairie dogs. We could possibly have determined with that data whether or not the species diversity and species richness is a result of the prairie dogs or if they move to occupy those specific areas because of the plant-life that is there. The control site species diversity test result is misleading because many of the number of individual samples that were recorded as different from species A were only litter created by species A. This caused the H value to be higher than it should be, meaning that the control site has very few species other than species A. On the other hand, the prairie dog town site was very diverse with multi-species, the total number of the combined sites being 10 separate species. The percent similarity of the two sites is also slightly off because of the litter being at both sites, which in turn seem to be equal, but are not because the control site had only one type of litter while the prairie dog site had several types of litter--due to its many more types of species. Another source of error is that we don't know what native species existed at our sites and perhaps vegetation has been introduced into the prairie dog towns.

If prairie dogs are indeed a keystone species, they are an important part to the grassland ecosystem. It is possible that prairie dogs also increase the number of raptors and mammals in these systems (Reading et al., 1993). In order to maintain species diversity within the ecosystem itself, prairie dogs must not be eradicated, but left to maintain a balance within the grassland system. With the large decline in the number of species around the world, protecting the ecosystem of the prairie dog will help in the battle to stop species loss. Further studies would need to be conducted to fully understand the large role that prairie dogs fill within the grassland community and to see if they are indeed a *keystone* species.

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