



The Effects of Coyote Removal in Texas: A Case Study in Conservation Biology

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Part I - Introduction

The Plains of West Texas are part of a semi-arid ecosystem dominated by a mixture of shortgrass prairies and chaparral. The primary producers in the prairies include various species of grasses and other herbaceous flowering plants (forbs). The chaparral is dominated by a variety of shrubs including mesquite and yucca intermixed with grasses and forbs. The low-level predators, scavengers, and herbivores in this system include jackrabbits, cottontails, ground squirrels, and rodents (three species of rats, and seven species of mice). The mammalian mesopredators in this system are badgers, bobcats, skunks, and grey fox. The top-level predator is the coyote.

Humans often eliminate coyotes and other top predators from natural communities. Removal is generally aimed at increasing game populations, and protecting livestock, pets, and small children. Previous studies indicate that the effect of removing coyotes varies depending on the type of community from which they have been removed.

You have received a request for proposals from The Nature Conservancy. The Conservancy wants to determine the effects of coyote removal in West Texas.

Questions

1. What specific question do you intend to answer?
2. What type of experimental treatment and control will you use?
3. What variables do you intend to monitor?

Part II - Experimental Design

Congratulations! Your proposal has been funded. Your final experimental design includes four 5,000-hectare (ha) sites — two control and two treatment (Figure 1). The communities in the control sites are similar to those in the treatment sites. All coyotes will be removed from the treatment sites and from a 5-kilometer (km) border around the sites. There will be no experimental manipulation in the control sites. You will monitor the animal community on all sites for one year prior to treatment and two years following coyote removal.

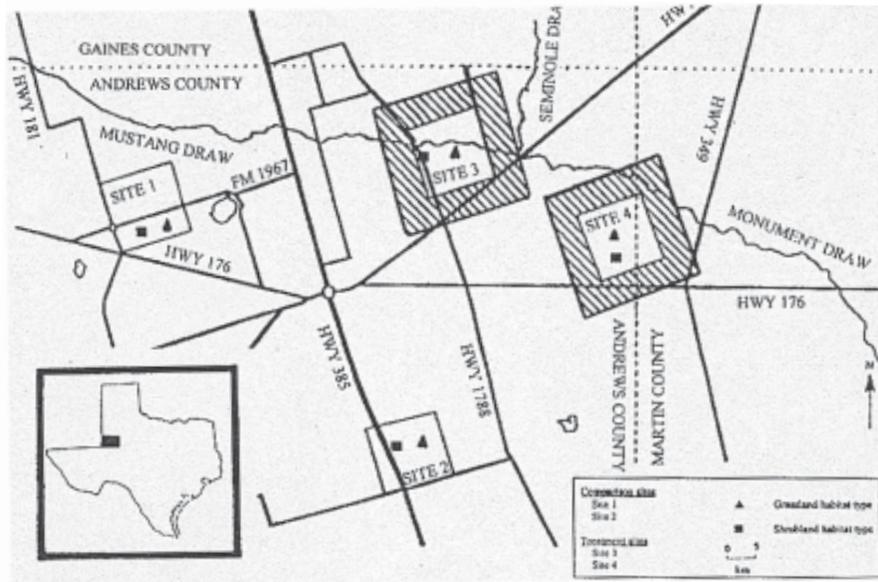


Figure 1. Location of experimental sites in West Texas. Sites 1 and 2 were the control sites. Coyotes were removed from sites 3 and 4 and from a 5-km border (figure from Henke and Bryant 1999, used with permission).

Question

4. Make two predictions concerning the effects of coyote removal on the fauna of West Texas.

Part III - Mesopredators

After monitoring the mesopredator populations for three years, you plotted the total abundance of badgers, bobcats, skunk, and fox on treatment and control sites each year (Figure 2). Use these data to interpret the impact of coyote removal on the community of small mammalian predators.

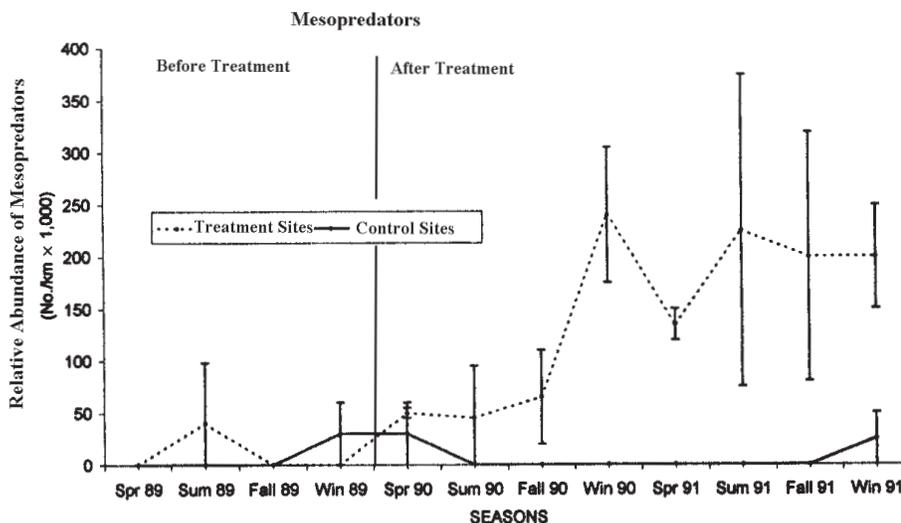


Figure 2. Relative abundance of mammalian mesopredators in the experimental sites before and after treatment. Error Bars represent one standard error (figure modified from Henke and Bryant 1999, used with permission).

Questions

5. What effect does coyote removal have on the mesopredator populations?
6. Predict what might have happened to the rodent populations as a result of changes in the mesopredator populations.

Part IV - Rodent Population Size

You decide to analyze the data on rodent population size next. As a measure of population size, you compare the rodent biomass in grams per hectare in the treatment and control areas over the three years of the study (Figure 3).

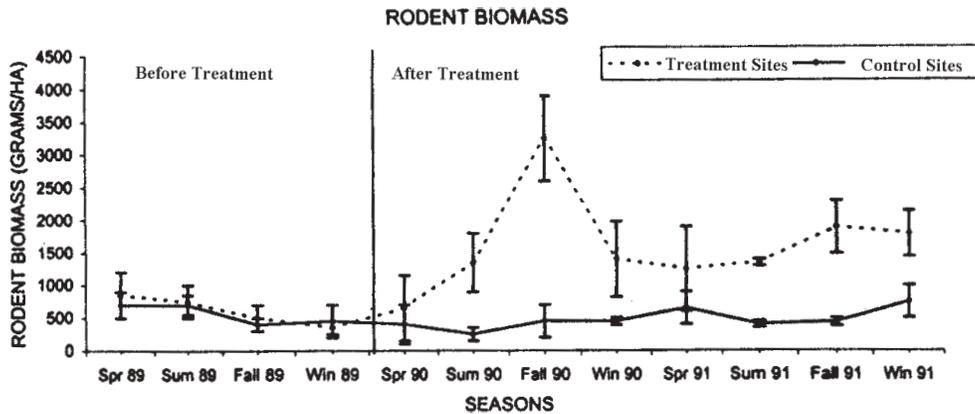


Figure 3. Biomass of rodents in the experimental sites before and after coyotes were removed from the treatment sites. Error Bars represent one standard error (figure modified from Henke and Bryant 1999, used with permission).

Questions

7. What do you think is the primary factor controlling rodent population growth?
8. Given the changes in population size, what other changes might you expect in the rodent community?

Part V - Rodent Diversity

When you look at the population size of individual rodent species, you realize that the Ord's kangaroo rat seems to be doing particularly well in treatment areas. Examine the data comparing the rodent diversity in the control and treatment areas before and after coyote removal (Figure 4).

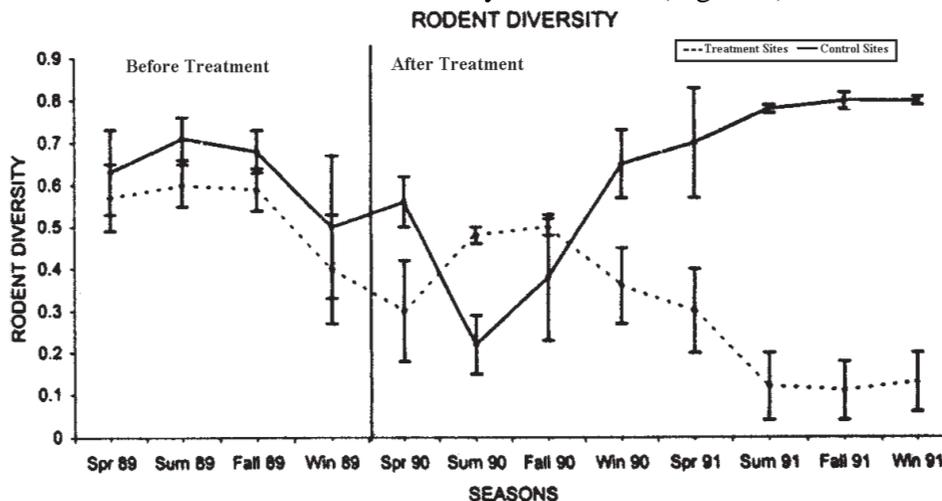


Figure 4. Diversity of rodents in the experimental sites before and after coyotes were removed from the treatment sites. Rodent diversity was estimated using Simpson's Index. Error Bars represent one standard error (figure modified from Henke and Bryant 1999, used with permission).

Questions

In one sentence summarize the meaning of the graph shown in Figure 4.

9. How does the competitive success of Ord's kangaroo rat change in the absence of coyotes?
10. What term could be used to describe the role of the coyote in this community?
11. Propose one possible cause for the decline in rodent diversity in the control areas after treatment begins.
12. In your report to The Nature Conservancy, how will you summarize the impact of coyote removal in this community?

Image Credit: Photograph provided courtesy of the *Clay Hill Memorial Forest* web site:
<http://cygnus.campbellsvil.edu/~chmf/>.

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