



# History of Occurrence and Present Home Territory Sizes for Black-Tailed Prairie Dogs on the Standing Rock Sioux Reservation

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## On the Ground

- Past management and historic occupation by black-tailed prairie dogs will affect the vegetation responses to changes in management.
- Ecological sites have different production potential and may influence colonization by black-tailed prairie dogs.
- Thin Claypan ecological sites had the largest coterie home territory size at 1.8 ha but also had coterie among the smallest at 0.5 ha.

**Keywords:** black-tailed prairie dogs, coterie: home territory size, ecological sites.

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Black-tailed prairie dogs (*Cynomys ludovicianus*) are burrowing mammals that can be present throughout much of the mixed and short-grass prairie of western North America. Prairie dogs are often cited as “ecosystem engineers” or “keystone species” within the grasslands and prairies of North America because their activities influence the organization of ecological communities.<sup>1</sup> However, it is these same activities that can generate conflict with ranchers. Prairie dogs live in family groups known as *coterie*s, which, when combined with additional coterie home territories, create prairie dog towns. Each family group defends a specific home territory, which consists of an elaborate set of burrows and tunnels, from its neighbors. The number of tunnels within a coterie differs and may be a function of coterie age and population density.<sup>2</sup> The holes or tunnel entrances and exits are the cause of some

concern to ranchers, who fear injury to their animals. However, it is the foraging and survival strategies of prairie dogs that draw the most criticism. Like cattle, prairie dogs prefer graminoids over forbs and are perceived as competitors for forage that would otherwise be available for livestock.<sup>3</sup> Furthermore, prairie dogs depend on family, neighbors, their hearing and vision to stay safe. Prairie dogs expend great energy during the growing season clipping vegetation in an effort to facilitate greater detection of predators.<sup>2</sup> The combination of foraging and clipping by prairie dogs typically reduces the quantity of biomass available for livestock and can reduce livestock weight gains.<sup>3,4</sup> This competition has led to a large-scale eradication effort to remove prairie dogs from rangelands. However, the benefits they provide to other wildlife species and reduction in overall numbers warrant consideration during the development of alternative management options.

Many Native American Reservations are located in the mixed and short-grass prairie and provide habitat to prairie dogs. The Standing Rock Sioux Reservation is located in south central North Dakota and north central South Dakota. The reservation is approximately 1,011,700 ha, of which roughly 607,028 ha are considered grasslands. Lands within the reservation are primarily under tribal or private ownership. Ranching provides valuable jobs to a region with an extremely high unemployment rate and is considered a way of life by many on the reservation. In addition to providing forage for livestock, grasslands and rangelands are critical habitat for wildlife. Many species of wildlife are important components of the Native American culture; therefore, Native Americans may be more open to ranching with prairie dogs. Nonetheless, rangelands across the Reservation have become degraded from the prolonged presence of prairie dogs and overgrazing. Although ranching is an important economic engine in the region, its full potential may not be reached unless management actions are taken to improve rangeland conditions.

New management options can be more effective if past land use is considered. Past disturbances by prairie dogs can impact a site's response to different management practices. The number of years an area has been colonized can influence prairie dog populations and vegetation characteristics.<sup>5,6</sup> For example, prairie dogs in South Dakota, in a colony that was first colonized over 40 years ago, had smaller litters and lower survival rates compared with a population in an area more recently colonized (approximately 4 years ago).<sup>6</sup> Archer et al.<sup>5</sup> reported that 69% of differences in vegetation that occurred in a prairie dog town in South Dakota were related to the time since colonization.

Past land use and occupancy by prairie dogs may have an effect on current coterie home territory size and prairie dog population levels. The ecological site concept has grown in popularity in recent years and is recognized as a potential management tool in the Northern Great Plains.<sup>7</sup> Ecological sites are defined on the basis of their soil, landform, climate, and landscape position. These characteristics result in the occurrence of a distinct plant community being attributed with a specific ecological site, with the production potential differing among ecological sites. Many different ecological sites can be found in the Northern Great Plains, and some may be more susceptible to foraging by prairie dogs than others. Previous studies have evaluated the sizes of coterie home territories across the Northern Great Plains, but none to our knowledge has considered ecological sites.<sup>2</sup> Our purpose in this paper is to introduce the reader of this special issue of *Rangelands* to the historic and present populations of prairie dogs at the Standing Rock Sioux Reservation research site and to describe the present coterie home territory sizes among a few different ecological sites.

## Data Collection

Our research site was located on privately owned land in Corson County, South Dakota, within the Standing Rock Sioux Reservation. The site was native grasslands with some encroachment by introduced species and lies in a landscape dominated by grass and crop lands. Common graminoids at the site included western wheatgrass [*Pascopyrum smithii* (Rydb.) A. Löve], needle and thread [*Hesperostipa comata* (Trin. & Rupr.) Barkworth], and green needlegrass [*Nassella viridula* (Trin.) Barkworth], whereas purple coneflower (*Echinacea angustifolia* DC.), and scarlet globemallow [*Sphaeralcea coccinea* (Nutt.) Rydb.] are common forbs. The area receives approximately 44 cm per year of precipitation and has an average summer temperature of 20°C (South Dakota Weather and Climate, 2015). The dominant soil types on the study site include Cabba-Reeder loams (6%–25% slopes), Reeder-Cabba loams (6%–9% slopes), and Wayden-Cabba complexes (9%–40% slopes).<sup>6</sup>

The site was divided into four pastures of roughly equal size (203 ha) with varying degrees of prairie dog presence. Pasture 1 was 18% occupied by prairie dogs, and pastures 2, 3, and 4 had 40%, 75%, and 0% prairie dog presence, respectively.

Each pasture was stocked from early June to early October with yearling steers to achieve 50% elimination of vegetation.

We used photographs from 1938, 1984, and 2010 to estimate the area at the site occupied by prairie dogs over time. Photos were digitized into ArcMap 10 and minimum convex polygons were used to determine area occupied by prairie dogs for the years for which photographs were available. We considered areas that showed signs of severe erosion likely caused by prolonged prairie dog presence and evidence of prairie dog excavations as areas occupied by prairie dogs.

Death of all individuals in a neighboring coterie, landscape positioning, years since colonized, population history, and climate can all impact coterie home territory size. As the density of prairie dogs increases, the demand placed on the vegetation becomes greater, forcing prairie dogs to expand their territory if an adjacent habitat is available.<sup>7</sup> Coterie home territory size was estimated as part of a mark-recapture study. Coterie home territory size was estimated at eight sites currently being used as part of a study evaluating the effects of herbivory (cattle and prairie dogs) on plant community composition (see Field et al. in this issue).<sup>8</sup> Sites were originally selected on the basis of ecological site, landscape position, and aspect. Ecological sites included Thin Claypan (toe-slope), Loamy (mid-slope), and Shallow Loamy (shoulder). Each site consisted of a plot used to exclude cattle (exclosure) and a paired plot where herbivory by cattle was allowed. Data collection was limited to the non-exclosed areas for the purpose of our study. Coterie home territory sizes were estimated at three Thin Claypan, four Loamy, and one Shallow Loamy sites. Prairie dogs were captured by using walk-in traps baited with oats. Areas to be trapped were prebaited with oats, beginning approximately 1 to 2 months prior to trapping. Prior to the onset of trapping, traps were placed on location, and doors wired open to allow animals an opportunity to acclimate to traps. Traps were placed at each location near active burrows. During the trapping events, traps were checked at hourly intervals. Captured animals were ear tagged, sexed, weighed, and given an identifiable mark by using a dye solution consisting of water, peroxide, and Nyanzonal-D.<sup>2</sup> The marked animals were observed from a distance with spotting scopes and binoculars. Known locations were marked on handheld GPS units and transferred to ArcMap 10 and used to create minimum convex polygons for each coterie.

## Results

Because of the limited availability of historic photographs, our estimate of area occupied by prairie dogs was restricted to what is now defined as pasture 1 and portions of pasture 2. In 1938, prairie dogs were present in pastures 1 and 2 and occupied approximately 24.2 ha. Prairie dog presence was primarily restricted to the areas now defined as a Thin Claypan ecological site (Fig. 1). Images from 1984 indicated that the town had expanded to more than 38.0 ha moving up slope into Loamy ecological sites. By 2010, prairie dogs occupied roughly 79.0 ha in pastures 1 and 2 and were present

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