Description and history of the Meeteetse black-footed ferret environment

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DESCRIPTION AND HISTORY OF THE MEETEETSE
BLACK-FOOTED FERRET ENVIRONMENT

Tim W. Clark1, Steven C. Forrest2, Louise Richardson2, Denise E. Casey2, and Thomas M. Campbell III2

ABSTRACT.—The black-footed ferret (Mustela nigripes) occupied area lies in the western Big Horn Basin, Park County, Wyoming. Cody, a nearby town, shows a record high temperature of 40.5 °C and a low of -43.3 °C, with 173 days each year below 0 °C. Area geology is dominated by Absaroka volcanics. Soils are shallow (0.5 m) and underlain by unconsolidated gravels; well-drained, medium-textured clay-loams (ca. 1 m in depth); or clays derived from shale parent materials. Vegetation is characterized by a wheatgrass-needlegrass shrubsteppe type (Agropyron/Stipa/Artemisia). Prior to white settlement, the area hosted a diverse large mammal community. First white settlement began 1878–1885, with establishment of several area ranches. Predator and prairie dog (Cynomys leucurus) poisoning began about 1884. Heavy livestock grazing of public ranges followed the demise of bison (Bison bison) by 1890, which likely was conducive to a continuation of an ungulate-range relationship favoring prairie dog habitat. Ferret specimens from Crow Indian inhabitants of the region date to 1850s and two specimens from Park County date from the 1920s–1930s. Today ferrets are found on white-tailed prairie dog colonies (a “complex”) totaling ca. 2,995 ha. The areas occupied by these colonies are equally owned by private, state, and federal interests. Evidence shows many abandoned prairie dog colonies which, along with the current ones, total about 8,400 ha. Many of them may have been active simultaneously prior to poisoning in the 1930s.

This paper summarizes some physical and biological characteristics of the Meeteetse, Wyoming, black-footed ferret (BFF) environment, serves as a general description of the region, and provides a partial description of BFF habitat. It focuses on land uses, past and present, including prairie dog poisoning programs.

METHODS

A general description of the western half of Wyoming’s Big Horn Basin (the general BFF study area) was obtained from numerous site visits between October 1981 and March 1985. Extensive conversations with ranchers, historians, anthropologists, state and federal wildlife managers, and literature reviews provided further understanding of the area. Prairie dog colonies in the general study area, which potentially serve as BFF habitat (Linder et al. 1972, Hubbard and Schmidt 1984, Anderson et al. 1985, Forrest et al. 1985), were located by air and ground surveys and interviews with landowners. Summer spotlighting surveys and winter snow-tracking surveys determined the distribution of BFF-occupied prairie dog colonies. An intensive study area was delineated within the larger study area from these data. All prairie dog colonies were mapped on 1:62500 USGS topographic quads. BFF-occupied colonies were mapped on 1:4800 base maps we prepared to detail site features. Historical information was obtained from the literature and interviews with area ranchers and participants in prairie dog poisoning programs. “Dead” prairie dog colonies were identified by the presence of unused, revegetated prairie dog mounds as described by Clark (1970).

THE ENVIRONMENT

The Meeteetse study area is named after a small community in the Big Horn Basin of northwestern Wyoming (Fig. 1). The larger extensive study area includes most of the western half of the Basin (8,000 sq km) including parts of Park, Hot Springs, Big Horn, and Washakie counties. The Basin is enclosed by mountains on the west, south, and east and is open to the north. The Shoshone, Greybull, and Bighorn rivers drain the Basin. The smaller intensive study area containing the BFFs is also shown in Figure 1. Portions of the larger study area have been described by the

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U.S. Forest Service (1982) and the U.S. Bureau of Land Management (1982). The intensive study area and ferret use of that area were described by Forrest et al. (1985) and modeled by Houston et al. (1986).

Climate

Climatographs for Cody, Wyoming, located north of the intensive study area, and Thermopolis, Wyoming, at the south end, are shown in Figure 2. The record high temperature for Cody is 40.5 C and the record low is -43.3 C, with 173 days each year below 0 C based on 1960 U.S. Department of Commerce records. The Thermopolis record high is 41.1 C and the low is -41.1 C with 194 days below 0 C. Winds are estimated to average 13-16 kmph at Cody, with lower velocity winds at Thermopolis. The Meeteetse area is generally snow-free, because of wind action. Occasional accumulations, generally 10 cm or less, may occur for several days at a time.
Prevailing winter winds are westerly. Mean annual isohyets for the Big Horn Basin are shown in Figure 3.

Geology

Area geology is dominated by Absaroka volcanics that compose most of the Absaroka Range and Carter Mountains immediately west of the study area. Surface geology is described by Pierce (1978) and shown in Figure 4. Most prairie dogs are associated with Cody shales or unconsolidated sediment. Prairie dog association with shale-derived soils has been identified in other studies (Stromberg 1975, Knowles 1982). Shale parent materials may provide clayey soils that are structurally more stable for burrow construction.

Known geological structures for oil and gas in the region are shown in Figure 5. Oil and gas potential for much of the intensive study area is rated high (U.S. Forest Service 1982). Following discovery of the BFFs, 41 mineral leaseholders were notified in March 1982 of possible changes in lease status by the U.S. Bureau of Land Management. The affected area included about a 1 km buffer zone around the intensive study area.

Soils

Soils are shallow (0.5 m and underlain by unconsolidated gravels); well drained, with medium-textured clay-loams (ca 1 m in depth); or clays derived from shale parent materials. Additional soil descriptions are given by Collins and Lichvar (1986).

Vegetation

Vegetation is characterized by Kuchler’s (1964) description of wheatgrass-needlegrass shrubsteppe type (Agropyron/Stipa/Artemisia). Vegetation of the intensive study area is dominated by Koeleria cristata, Agropyron spicatum, A. smithii, and mixed shrub (largely Artemisia tridentata) as described by Collins and Lichvar (1986). Vegetation has been heavily grazed by cattle, horses, and sheep for about 100 years.

Prairie Dogs

Current prairie dog distribution within the intensive study area is shown in Figure 6. The 37 colonies shown total 2,995 ha and contain about 125,000 prairie dog burrow entrances. BFF occupancy has been noted in 23 of these colonies. Prairie dog burrow openings average 41.7 per ha, and prairie dog densities reach 9 per ha (Clark et al. 1985). BFF use of these colonies is described by Forrest et al. (1985).

Surface and subsurface ownership is presented in Table 1. Surface ownership is about equally divided among state (31.0%), federal (33.4%), and private (35.6%) entities. Subsurface ownership is 57% federal, 31% state, and
12% private. Seven ranches contain BFFs, with about two-thirds of the total prairie dog colony area on one ranch. The other six ranches each have 1%-9% of the total BFF area.

Comparisons of the Meeteetse area with eight other prairie dog study areas are shown in Table 2. Ten variables are contrasted among these areas. The Meeteetse BFF/prairie dog site falls within ranges for these variables, except that it shows a greater mean burrow opening density and lower inter-colony distance than the other areas. Unfortunately, data are not complete in all cases for comparative purposes.

Land Use History

The Big Horn Basin was opened to white settlement in the mid-1870s. Previously the area was used as hunting and wintering ground by Mountain Crow Indians, whose major impact was likely restricted to occa-
Fig. 4. Geological map of the intensive black-footed ferret study area showing prairie dog colonies in relation to underlying geology.


Q_p — Pediment deposits — Thin veneer of poorly rounded to subangular surficial material deposited on smooth, gently sloping erosion surfaces cut in bedrock.

Q_t — Terrace gravel — Unconsolidated deposits of gravel, sand, cobbles, and silt.

K_m — Mesaverde Formation (Upper Cretaceous) — Interbedded light gray sandstone and gray shale in upper part; lower part massive light buff, ledge-forming sandstone containing thin, lenticular coal beds.

K_f — Frontier Formation (Upper Cretaceous) — Thick lenticular gray sandstone, gray shale, brown carbonaceous shale and bentonite. Torchlight sandstone.

K_a — Meeteetse Formation.

Q_a — Alluvium — Unconsolidated deposits of silt, sand, gravel, and cobbles along stream valley and at or near present stream level. Includes alluvial fans and glacial outwash.

Q_c — Colluvium — Heterogeneous deposits of rock detritus.

Q_l — Landslide deposits — Heterogeneous deposits of rock debris emplaced by mass movement.

T_w — Wapiti Formation (Eocene) — Dark-brown andesitic breccia, tuff, volcanic sandstone, siltstone, and conglomerate; lava flows and flow breccias; dark to medium-brown pyrozene andesite; sparse hornblende. Includes predominantly volcanic sandstone and siltstone of the Pitchfork formation of the Sunlight Group of the Absaroka Volcanic Supergroup in upper Greybull River area. Thickness 1000–1500 m.

During 1878–1885 several area ranches were established, most notably the Pitchfork Ranch founded by Otto Franc. The Pitchfork Ranch grazed about 15,000 head of cattle on various ranges throughout the Basin by 1884, encompassing virtually all the lands in the intensive BFF study area (Edgar and Turnell 1978). The Pitchfork Ranch incorporated surrounding ranch properties in the period 1903–1922, encompassing 100,000 ha, and grazed 12,000–20,000 head of cattle and 60,000 head of sheep.

As D. Healy (in Killough 1977) points out, estimates of range use during the open range period are difficult to assess, and little experience concerning the productivity of fenced allotments was available prior to the passage of the Taylor Grazing Act in 1934. Carrying capacity estimates were likely too optimistic, resulting in heavy overuse of public range. Killough (1977) states that this probably occurred throughout the Bighorn Basin. By the 1930s the Pitchfork was grazing about 20,000 sheep and 5,000 cattle on 28,000 ha of deeded land, 44,000 ha of leased land, and 24,000 ha
Fig. 5. Map of oil and gas fields and mining regions for the western Big Horn Basin in relation to the intensive black-footed ferret study area.

Oil activities, beginning in the 1950s, included seismic testing for underlying geological structures and a concomitant increase in primitive roads to maintain wells, pipelines, and support facilities. In recent years seismic activity has increased within the intensive

of permitted land (Turnell 1982, personal communication). The LU Ranch on Grass Creek, south of Meeteetse, which had poorer range conditions, controlled a comparable 100,000 ha and grazed 1,500 cattle and 15,000 sheep (Killough 1977).
Fig. 6. Prairie dog colonies in the Meeteetse intensive black-footed ferret study area.

study area. In 1981 prior to discovery of the BFF population, four wells were drilled on the Rose Creek Field directly on the largest BFF concentration (Fig. 5). In addition, two subsurface pipelines and one pumping station are located in BFF-occupied prairie dog colonies.

**Fauna**

Prior to white settlement, the area probably hosted a diverse faunal assemblage dominated by grazing ungulates and their various predators. Killough (1977) found bison skulls exposed as deep as 3.6 m in gullies in the Big Horn Basin, showing long-term use of the area by bison and suggesting that periods of overgrazing and erosion followed by range restoration (gully healing) may have been common within recent history. White trappers recorded large bison herds in the upper Greybull drainage as late as 1878. James White, who worked in the Greybull River country, secured 2,000 hides in 1880 alone (Edgar and Turnell 1978). The last locally known native bison was killed along Meeteetse Rim in 1892 (Edgar and Turnell 1978). Although bison skeletal remains were intensively scavenged for fertilizer markets throughout the West, numerous bones and horn sheaths can still be found in this area today.

Otto Franc recorded the presence of literally thousands of bighorn sheep (*Ovis canadensis*) wintering along the Greybull in 1880, and Archibald Rogers noted on a hunting trip to the -TL Ranch (later Pitchfork) in 1893 a band of 250 bull elk (*Cervus elaphus*) (cited in Edgar and Turnell 1978). By 1890 Franc noted a drastic decline in big game numbers from a decade of unchecked exploitation by sport, skin, and market hunters. Big game numbers continued to decline in the area through the early 1900s, although pronghorn (*Antilocapra americana*) were protected on Pitchfork Ranch lands and occasionally transplanted elsewhere. Big game numbers have experienced an apparent recovery and have continued to increase since a low during the 1940s (J. Lawrence and J. Turnell, personal communication). Grizzly bears (*Ursus arctos*) were apparently quite common, as records of bear encounters abound (e.g., Seton 1899). By 1894, gray wolves (*Canis lupus*) began depredations on live-
Table 1. Size, surface, and subsurface ownership patterns of prairie dog colonies in the intensive black-footed study area.

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stock, possibly as a result of decimated large mammal populations. Wolf predation concerned Franc until his death in 1902 (Edgar and Turnell 1978), and Mrs. H. C. Larsen of Wood River also noted that wolves were numerous from the late 1800s until the 1920s (Diem 1973).

The historic relationship between prairie dogs and bison can only be surmised, although the role of bison in grassland ecosystems has been debated for some time (Larson 1940). Nevertheless, there is little doubt that there was a reciprocal ecological relationship between bison and prairie dogs, each tending to maintain the shortgrasses interspersed with patches of forbs, ideal habitat for each other (Koford 1958). Osborn and Allen (1949) and King (1955) also noted that bison tended to concentrate on prairie dog colonies, their activities apparently creating an environment that favored prairie dogs. These bison activities included "over grazing," trampling soil, wallowing, and defecating and urinating. In the late 1850s, Mead (1859) noted that prairie dogs disappeared from parts of Kansas shortly after the bison and concluded that bison were
necessary for prairie dog existence because they compacted soils and created communities of forbs.

Clark (1973) presented a model hypothesizing the interrelationship of bison and prairie dogs, in which both animals functioned in a reciprocal manner ecologically to increase grassland productivity beyond what each species could contribute individually. More recently Bonhan and Lerwick (1976), O’Mellica et al. (1980), Uresk and Bjungstad (1980), and Coppock et al. (1983) have studied prairie dog ecology and, in some instances, prairie dog-bison relationships. Their results support the earlier observations and models described above. When large numbers of domestic livestock replaced the bison at the turn of the century, they may have continued to provide an environment conducive to prairie dog occupancy of the Meeteetse area.

**Historic Ferret Habitat**

Because BFF’s require prairie dogs as part of their habitat, a review of historic prairie dog status and poisoning programs in the region provides data on historic BFF habitat. BFF’s have most likely occupied the Meeteetse area and Big Horn Basin since pristine times. Crow Indians of the region collected BFF’s as medicine objects in the mid- to late 1880s (Clark 1975). Clark (1977) listed 20 BFF reports from the Big Horn Basin from 1889 to 1977. Two of these reports originated in Park County, in the vicinity of the intensive study area. Ed Larson and Frank Smith, oldtime residents of Meeteetse, report trapping or knowing of trapped BFF’s in the 1920s-1930s from the Meeteetse Creek area. Cal Todd, former manager of the Pitchfork Ranch, and his wife, Margo, reported that their dog killed a BFF in 1962 on the headquarters grounds. The corpse was described to George Reesy, Wyoming Game and Fish Department, who did not investigate it. The skin was retained for about 6 yrs and later lost. In September 1981 a male BFF was killed by a dog on the John Hogg Ranch (Clark and Campbell 1981). Subsequently, a nearby BFF population was located by Doug Brown, a cowboy, which lead to the present study.
Fig. 7. Location of currently active and historic “dead” prairie dog colonies, near Meeteetse, Wyoming, 1984.
Prairie dog control programs within the intensive study area began in the 1880s (Edgar and Turnell 1978) and continued sporadically until the mid-1930s. From 1923 to 1928 rodent control expenditures for Park County totalled $7,476, the third highest county expenditure in the state. During the same period more than 500,000 ha of prairie dogs were eradicated in Niobrara, Weston, and Campbell counties (Day and Nelson 1929), so considerable control activity was occurring. Over a five-year period during the mid- to late 1930s, large and well-organized poisoning programs were conducted throughout most, if not all, of the intensive and general study areas (B. Sells, E. Larson, F. Smith, personal communication). All of Meeteetse, Rush, Rawhide, and Spring creeks, and parts of the Greybull and Wood River drainages were poisoned, as well as much of the area north of Meeteetse Creek up to Cody. These federal programs poisoned only a portion of the total area during any one year, and, even though “kill rates” are undocumented, 50%-100% kills of prairie dogs were often obtained elsewhere (e.g., Tietjen 1976).

The entire prairie dog complex was apparently never all poisoned in a single year. Beginning in the 1940s and continuing through the 1960s, limited poisoning was carried out on specific colonies or areas (B. Rosan, J. Winninger, D. Winninger, J. Turnell, J. Hogg, personal communication). This suggests that the 1930s campaigns were effective in eliminating prairie dogs, leaving few to be poisoned later (M. Todd, personal communication). This pattern has been seen in other areas where adequate data exist, such as Phillips County, Montana (Bureau of Land Management 1982) and in eastern Wyoming (Clark 1973, Campbell and Clark 1981). Since 1970 only a few small areas have been poisoned (J. Hogg, J. Winninger, J. Turnell, A. Thomas, B. Gould, personal communication).

Since “dead” prairie dog colonies may retain their identity for 60+ years (Clark and Campbell, unpublished data), we used areas formerly occupied to get a maximum upper size (after Clark 1970) of the prepoisoning colony complex. We assumed that all the “dead” prairie dog colonies seen today were simultaneously active prior to the large 1930s poisoning campaigns, plus those colonies currently active. The estimated total of 8,400 ha of colonies may have been present prior to the 1930s (Fig. 7). If one assumes that these 8,400 ha of prairie dog colonies could support one BFF for each 50 ha (Forrest et al. 1985), then a maximum estimate of the pre-1930s BFF population in the pre-1930s can be obtained. Assuming all else is equal between today’s observed BFF population size, density, and reproductive rate, the pre-1930 BFF habitat could have supported as many as 168 adult BFFs.

**Discussion**

The overall climate, geology, soils, vegetation, and land use history of the Meeteetse area, which today contains the world’s only known BFF population, is similar to much of Wyoming and other areas throughout the West where prairie dogs are found. BFF’s probably always inhabited the Meeteetse region. Their persistence there today is probably due to: (1) a historical abundance of prairie dog habitat, (2) prairie dog control programs that left active colonies or parts of colonies unpoisoned during any one year, and (3) absence of catastrophic diseases (sylvatic plague, distemper). Prairie dogs were apparently kept at low levels after the 1930s, and this “bottleneck” for BFFs persisted for some years, perhaps having genetic consequences for the BFFs of today (Pettus 1985, Kilpatrick et al. 1986).

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**Literature Cited**


