

PREDATOR SURVEYS IN BADLANDS NATIONAL PARK, SOUTH DAKOTA
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This study surveyed for locations and activities of coyotes (*Canis latrans*) and badgers (*Taxidea taxus*) in the area of a proposed black-footed ferret (*Mustela nigripes*) reintroduction in 1996. The study area is located within Burns Basin, Badlands National Park, South Dakota and includes three black-tailed prairie dog (*Cynomys ludovicianus*) colonies, totalling 290.5 ha (717.4 ac), and the surrounding area (Figure 1.).

METHODS

Den surveys. Daytime reconnaissance of the prairie dog colonies and surrounding areas was used to detect possible dens of badgers and coyotes, who frequently use badger dens (Bekoff 1982). Edges of sod tables and washes were thoroughly investigated. The criteria used to determine a possible den site were: 1) entrance $\geq 25\text{cm}$ (10 in.) in general diameter, 2) uneroded by water from the inside (erosion is sometimes indicative of a water drainage hole), 3) tunnel $> 1\text{m}$ (3 ft.) in length, 4) animal sign such as tracks, hair, disturbance. After possible dens were identified, a fine soil track bed was laid in front of the entrance(s) to determine if the den was active and by which species. Surveys were conducted for two days.

Visual surveys. Coyotes tend to be crepuscular, more active during sunrise and sunset (Bekoff 1982). To monitor coyotes and badgers active during this time, a 15x45-60 spotting scope with a tripod was used to count individuals and observe behavior from a selected high point on the basin edge (Figure 2.). Surveys were conducted from $\frac{1}{2}$ hour before sunrise to 2 hours after sunrise and $1\frac{1}{2}$ hours before sunset to $\frac{1}{2}$ hour after sunset for five mornings and five evenings.

Vocal/spotlight surveys. High-powered spotlights were used to detect the pale green eyeshine and movement of coyotes and badgers, similar to the methods used to detect black-footed ferrets (McDonald et al. 1996). Time, location, and direction of movement were noted to reduce the chance of counting the same coyote more than once. Voigt and Berg (1987) mentioned that vocalizations may provide reliable coyote data in small study areas such as this. When a spotlihter reached a howling station (Figure 2.) the spotlight was turned off and the spotlihter remained still and quiet for five minutes. The howl of a coyote was then played on a Johnny Stewart Game Caller with a coyote tape for one minute and three minutes allowed for vocal response. A conservative estimate of the minimum number of coyotes howling and their general direction was recorded. After three minutes, the spotlight was used to scan the area for non-vocally responding coyotes approaching the area, before resuming spotlighting. Surveys were conducted from sunset to sunrise for five nights.

Scent-station surveys. Sensus Roughton and Sweeny (1979 and 1982), scent-stations were located 0.5 km (0.3 mi) apart on a rectangular line transect passing through the prairie dog colonies (Figure 2.). At each scent-station, a fine soil track bed 1m (3 ft) in diameter was laid using a hand trowel and soil sifter. A wafer of synthetic fatty acid scent (U.S. Dept. of Agriculture, Pocatello Supply Depot, Pocatello, ID) was placed in the center of the track bed. Stations were checked once per day for tracks and swept clean. Scent wafers were replaced as needed. Each species found at a station was recorded once, regardless of the number of tracks. Surveys were conducted for four consecutive days during each of two weeks, for a total of eight survey nights.

RESULTS AND DISCUSSION

A total of 960 minutes were spent surveying the area for possible dens on and near the prairie dog colonies. Eleven possible den sites were identified (Figure 2.) for an average of one den found per 87.3 minutes surveyed (Table 1). None of the dens were determined to be active, although den #11 had a high probability of being active. Den #11 is within 20m of several coyote locations, has two entrances, and freshly disturbed soil. Inclement weather prevented verification of activity.

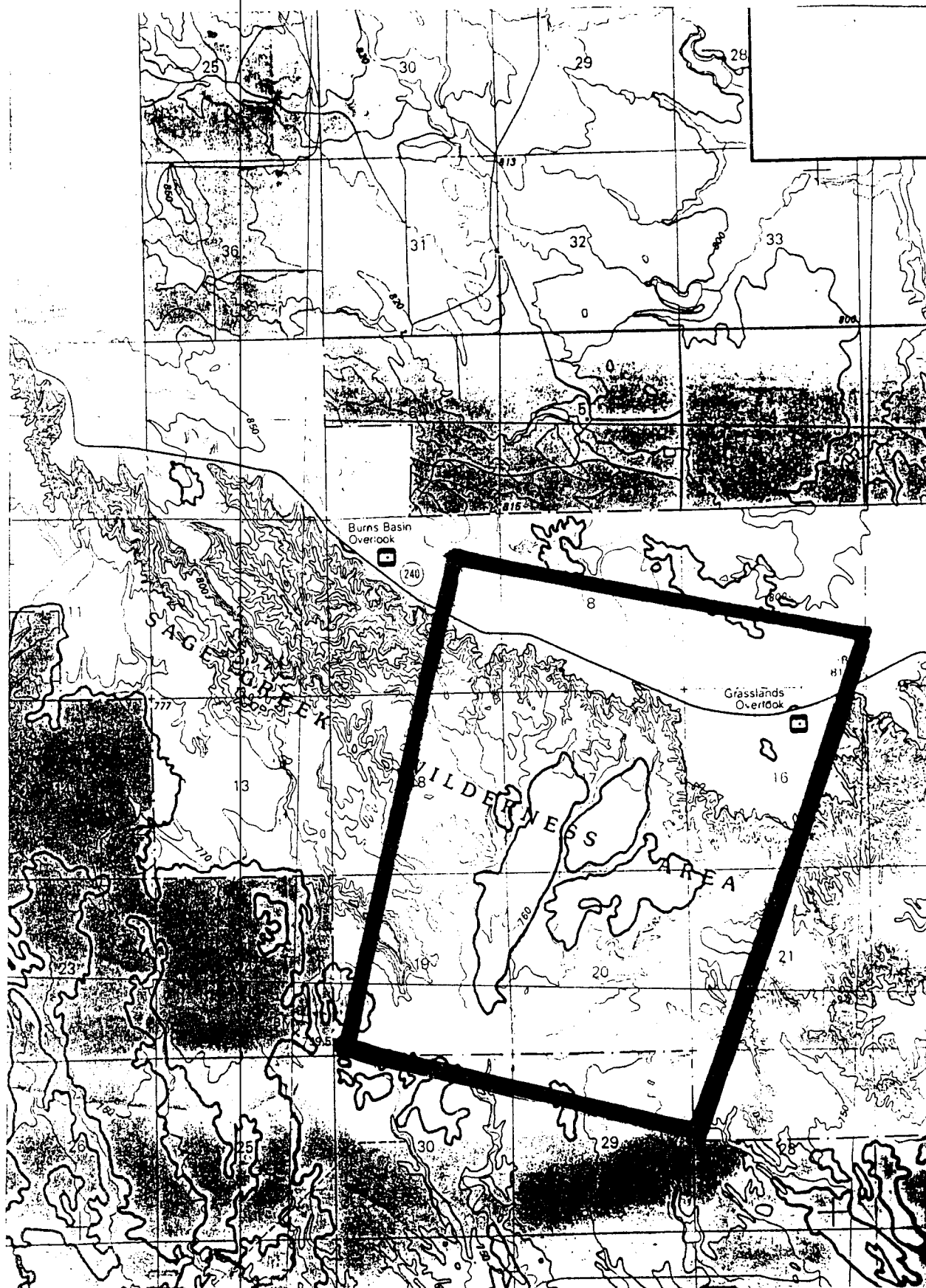


FIGURE 1. PREDATOR SURVEY STUDY AREA IN BADLANDS NATIONAL PARK, SOUTH DAKOTA.



FIGURE 2. LOCATION OF PREDATOR SURVEY STATIONS IN BADLANDS NATIONAL PARK, SOUTH DAKOTA. B# - Visual, H# - Howling, S# - Scent, D# - Den

Visual surveys were conducted on three mornings and three evenings for a total of 810 minutes. Rain and windy conditions hampered the surveys. Coyotes were seen 9 times, for an average of one coyote seen per 90.0 minutes surveyed, and then observed for a total of 390 minutes (43.3 minutes/observation, Table 1). On two occasions, two coyotes (for a total of four observations) were seen together as a pair, once hunting together and making a failed attempt at a rabbit. The other five observations are believed to be one of the pair due to repeated observations at proximal locations and may be inhabiting den #11. Time allowing, future visual surveys may verify this and possibly determine if the pair are rearing pups. Six coyotes were detected howling during visual surveys, of which four were seen. No badgers were seen and one ferruginous hawk (*Buteo regalis*) was seen. Inclement weather such as rain and windy conditions hampered the surveys. Winds above 10mph made steadying the spotting scope difficult on the open point.

Four nights were spent conducting vocal/spotlight surveys for a total of 615 minutes. A fifth night was cancelled several times due to poor weather conditions. The Johnny Stewart Game Caller provoked coyotes to howl a minimum of 13 times at 16 artificial howls (0.81 coyote howls per artificial howl). An additional nine coyote howls unprovoked by an artificial howl were detected. A minimum of four coyotes howling at the same time was recorded twice. While surveying on the night of 5/13, a total of six coyotes howled within two minutes, two to the west in unison, one to the north (across Hwy. 240), two to the northeast in unison, and one to the south. When winds were > 5mph coyotes seemed less apt to vocally respond to a howl, but rather investigate the source of the artificial howl, which occurred five times. On the night of 5/16, the survey was cancelled due to storms approaching, but a bobcat was observed briefly. No badgers were detected.

Twelve scent-stations were laid out in a rectangular pattern on and around the three prairie dog colonies. Stations were sometimes located on and abandoned prairie dog mound, which provided soft, siftable soil. Surveys were conducted for two days and were cancelled thereafter due to several inches of rainfall through the next week. In two survey days, two stations were visited by coyotes. Urination was present at both visited stations and scat at one. Other animals visiting the stations were birds, prairie dogs, and mice. No badgers were detected and none of the scent wafers needed replacement.

Through a combination of visual survey and vocal/spotlight survey data, I believe there are a minimum of seven coyotes using the area. Six coyotes were heard howling within two minutes in several distinct directions, two to the west, two to the northeast, one to the south (probably one of the observed pair), and one to the north across the road. The seventh coyote is the second of the observed pair. It is known that coyotes are coming from the north, across the road, down into the basin. Tracks have been found leading on a trail from the top to the bottom of the basin, and the first black-footed ferret mortality detected in the June 1995 Burns Basin release of 14 animals was found north of the basin, across the road and was confirmed as a coyote mortality by Dr. Elizabeth Williams (Badlands National Park, unpublished data). Badgers were not detected during the surveys but are most likely present in unknown numbers.

In my estimation, the visual surveys combined with vocal/spotlight surveys was most effective in gathering data. Visual surveys are able to monitor behavior, movement, directly count numbers, find possible dens, and crude territorial boundaries. Vocal/spotlight surveys were effective in directly counting numbers and general distribution. My scent-station surveys collected too small a sample to determine whether the method is effective or efficient, but those surveys could not provide the same type of data the other surveys do. Scent-station surveys may be useful in long-term monitoring of an area. Den surveys were easily conducted along with a general reconnaissance of the area and provided baseline knowledge of possible activity. Weather was a significant factor hindering surveys. Rainfall makes travel into the basin near impossible and dangerous. The latter part of April had winds gusting up to 72mph and May had 7.03 inches of rainfall, well above the average of approximately 3 inches (Pinnacles weather station, Badlands National Park). Future surveys should take place during June and July when weather conditions tend to be more favorable and coyote pups are present aboveground.

RECOMMENDATIONS

There are several coyotes using the Burns Basin area. Past black-footed ferret releases in the area have shown that coyote predation is certainly a factor that must be taken into consideration for future releases, particularly in Burns Basin. I recommend that electronet fencing be utilized in the fall 1996 black-footed ferret release to exclude coyotes. Further, I recommend an experimental design be formulated to study the effects of the electronet fencing on the coyote activities and ferret mortality. Coyotes should be trapped with leg-hold traps, anaesthetized, and fitted with a radio collar. The movement of these coyotes should be monitored during four successive time periods: 1) before electronet fence erection, 2) after electronet fence erection but before release of the ferrets, 3) after release of the ferrets inside the electronet fence, and 4) after removal of the electronet fencing. Monitoring after electronet fence removal may determine if short-term ferret survivorship is increased or mortality is simply delayed. Radio telemetry may identify specific problem coyotes, aid in removal of these animals, and provide more insight into the coyote-ferret interaction.

LITERATURE CITED

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APPENDIX 1. DATA COLLECTED FROM PREDATOR SURVEYS

<u>DATE</u>	<u>SURVEY TYPE</u>	<u>#MINUTES</u>	<u>ANIMAL DETECTED/MINUTES</u>	<u>STATION</u>	<u>COMMENTS</u>
4/22-23	den	960	11 possible dens	mobile	coyote tracks in N-S wash between towns
4/26am	visual	195	1 coyote / 7 minutes 1 coyote / 18 minutes, howled	B1 B1	on SE town south of W town. howled, bounding and pouncing
4/26pm	visual	65	1 ferruginous hawk / 85 minutes 2 coyotes / 12 minutes	B1 B1	on edge of SE town, perched on small hill on SE town, hunting together, unsuccessful attempt at a rabbit
4/27pm	visual	130	1 coyote / 32 minutes, howled 2 coyotes howling	B1 B1 B1	on SE town, howled at sunset not seen
4/28am	visual	110	none	B1	winds 15+mph
4/29am	visual	200	1 coyote / 114 minutes, howled	B1	on SE town edge, howled, pair with next coyote seen
4/29pm	visual	110	1 coyote / 12 minutes, howled 1 coyote / 96 minutes 1 coyote / 87 minutes	B1 B1 B1	south of SE town, howled, pair with above coyote sitting on small hill, pair with next coyote sitting on table near den 11, pair with above coyote
5/1pm	vocal/spottlight #1	144	3 coyotes howling of which 1 seen	H1	3 howling coyotes to the south, one seen howling came from south and circled west, urinated
5/5pm	howl #2 howl #3 vocal/spottlight #1	260	4 coyotes howling no response no response 3 coyotes howling	H1 H7 H1 mobile	4 howling coyotes to the south/southwest 3 howling coyotes to the south, not in response to my howling
5/13pm	howl #2 howl #3 howl #4 howl #5 howl #6 vocal/spottlight #1	181	no response 1 coyote seen 1 coyote seen no response 1 coyote seen no response no response no response 1 coyote seen no response	H2 H3 H4 H5 mobile H6 H1 H1 H1 H1 H1	in response to my howling, moved west in response to my howling, moved west on north edge of NE town, moved west in response to my howling, on W town

APPENDIX 1. DATA COLLECTED FROM PREDATOR SURVEYS (continued)

<u>DATE</u>	<u>SURVEY TYPE</u>	<u>#MINUTES</u>	<u>ANIMAL DETECTED/MINUTES</u>	<u>STATION</u>	<u>COMMENTS</u>
5/13 (cont)			3 coyotes howling	mobile	2 coyotes howling to the west, one coyote howling to the north across the road, not in response to my howling
			4 coyotes howling	mobile	2 coyotes howling to the northeast, one to the south, one to the west, not in response to my howling
	howl #5		3 coyotes howling	H8	2 coyotes howling to the northeast, one to the north across the road
	howl #6		no response 2 coyotes howling	H8 mobile	2 coyotes howling to the northeast, not in response to my howling
5/16	vocal/spotlight	30	1 bobcat / 1 minute	B1	survey cancelled due to winds
5/21	scent station		coyote tracks	S5	coyote urination and defecation
5/22	scent station		coyote tracks	S9	coyote urination