Demographic Consequences of Habitat Use for Burrowing Owls in Northeastern Wyoming

Annual Report for 2002

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by

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Introduction

Burrowing Owls (*Athene cunicularia*) in North America have suffered dramatic population declines and significant range contraction (Dechant et al. 1999). Burrowing Owls are considered threatened or endangered in Minnesota, Iowa, and Canada, and populations have declined significantly in British Columbia, Alberta, Arizona, Colorado, Kansas, Nebraska, New Mexico, Utah, and Washington (James and Espie 1997). Many state wildlife agencies are becoming increasingly concerned about declining Burrowing Owl populations. The Burrowing Owl is classified as a Species of Special Concern, Category 4, by the Wyoming Game and Fish Department (SSC4; Oakleaf et al. 1996).

Despite the widespread declines and increased concern for Burrowing Owls throughout North America, few conservation efforts exist to reverse population declines. Because Burrowing Owls are still present in many areas in the west (Dechant et al. 1999), we need to implement effective on the ground conservation efforts quickly to reverse declining population trends. Quick action will prevent further declines and avoid future listing under the federal Endangered Species Act.

Prior to developing and implementing recovery efforts, we need to understand the ultimate cause of population declines and the proximate factors influencing local distribution, reproductive success, and annual survival of Burrowing Owls. Burrowing Owls require short grass habitats and prefer open areas within deserts, grasslands, and shrub-steppe (Haug et al.1993). Lack of suitable nesting burrows due to the eradication of colonial burrowing mammals may also limit Burrowing Owl populations (Desmond and Savidge 1996). Indeed, Burrowing Owls primarily nest in black-tailed prairie dog (*Cymomys ludovicianus*) burrows in Wyoming and the distribution of black-tailed prairie dogs in the U.S. has declined by 98% since the early 1900s (Summers and Linder 1978).

The goals of our project are to 1) conduct standardized population surveys for nesting Burrowing Owls in Wyoming to determine local population status and estimate population trends, 2) locate, confirm, and monitor active nesting burrows weekly, 3) estimate annual fecundity, natal recruitment, and adult survival of Burrowing Owls in Wyoming for comparison with populations in other portions of their breeding range, and 4) determine habitat and landscape features that influence nesting burrow selection, reproductive success, natal recruitment, and annual burrow fidelity. The study area

encompasses 4000 km^2 in Campbell, Weston, and Converse counties, including Thunder Basin National Grasslands and surrounding public and private lands.

Standardized surveys

Surveys for Burrowing Owls were conducted from 24 April to 22 July 2002, on the Thunder Basin National Grasslands in northeastern Wyoming. In 2001 we developed standardized methods for locating Burrowing Owls on black-tailed prairie dog colonies, and the same methods were repeated in 2002 (Conway and Simon 2001, Conway and Hughes 2001). Burrowing Owls in Wyoming are quite secretive and often flush in response to human presence. Hence, surveys were conducted from a vehicle to maximize the area surveyed and prevent owls from flushing before being detected. All surveys were conducted with 2 observers. We conducted standardized point-count surveys at 0.32-km intervals (0.2-mi intervals) along all roads and two-tracks in and around each prairie dog colony (Appendix 1). A survey began at the edge of the colony where burrows were first observed. Observers drove slowly (approximately 24 km/hr) between survey points and stopped the vehicle (but never exited the vehicle) to verify identification of any birds/objects detected while driving. Nesting burrow locations were confirmed on subsequent visits to the areas where owls were detected. The driver-side and passenger-side windows were rolled down, and the windshield and rear windows were kept clean for all surveys. Point-count surveys consisted of a 1-minute passive period followed by a 3-minute call-broadcast period. After the initial one-minute passive period, we placed a speaker on the car roof while listening and looking for owls. The 3-minute call-broadcast segment consisted of 30 seconds of calls followed by 30 seconds of silence, with this pattern repeated 3 times. The first two 30-second call periods consisted of the primary male song (*coo-coooo*; Haug et al. 1993) of Burrowing Owls, and the final 30-second call period consisted of an alarm call (*quick-quick-quick*). Observers scanned the landscape using binoculars in a 360° arc around the survey station during the entire 4-minute survey.

While searching for owls, observers counted the number of prairie dogs detected to determine the activity level within the prairie dog colony. If the colony was very active (many prairie dogs) the survey would take longer so that all prairie dogs could be counted. For each owl detected, observers recorded all survey segments during which

each bird was heard and/or seen: before call broadcast, during call broadcast, after the 4-minute survey. Owls detected "before" the survey began included owls seen before the call broadcast began and those detected while driving between points. Owls detected "during" the survey were detected during the call broadcast and while counting prairie dogs. Owls detected "after" included owls seen after completing the survey, but before driving to the next point.

Observers recorded UTM coordinates (using a GPS receiver) of each survey point, legal description, date, time, observer, wind speed, cloud cover, when owls were detected and in what direction, number of prairie dogs detected, habitat type and percent habitat visible, as well as any comments about the point, including any species of concern observed (Mountain Plover, Sage Grouse, etc.). Scanning for owls continued during the 0.32-km drive to the next point. All survey routes were marked on a USFS map. We did not conduct standardized surveys if the wind speed was >20 km (> 12mph), or if it was raining or snowing.

We conducted surveys at all times of day; start times ranged from 0600 to 2230 hr. Burrowing Owl calls were broadcast at 80 dB (measured at 1m from the speaker) using a portable compact disc player and a mini-amplified speaker (Radio Shack Cat. No. 32-2040).

We surveyed 475 points along 122.3 km of secondary roads within 73 prairie dog colonies of varying sizes and levels of prairie dog activity (Appendix 1). All surveys conducted in 2001 were repeated in 2002, and additional surveys were conducted in 2002. The prairie dog colonies we surveyed ranged in size from 0.2 to >200 hectares. The range of activity levels among colonies varied from inactive (0 prairie dogs observed) to very active (>200 prairie dogs). We located and monitored 78 Burrowing Owl actual or potential nest burrows in 2002. Of those 78 burrows, 58 were actively used by Burrowing Owls (Table 1, Appendix 1). We located 31 of the 58 active burrows using our standardized survey methods. Fourteen of the 58 active burrows were used as nests in previous years (located in 2000 and 2001) and 13 active burrows were found incidentally or by word of mouth.

Burrow monitoring

We monitored 78 Burrowing Owl burrows throughout the breeding season of 2002. One or more owls were seen at 58 different burrows. If 1+ owls were observed on at least 1 visit, the burrow was considered active. Of the 58 active burrows, 51 were used for nesting (Table 1). We defined a nest as any burrow attended by both a male and female Burrowing Owl on at least 2 visits. This excluded burrows where only single males were observed (7). Thirty burrows were located on USFS lands, while 48 were found on private land. At 7 burrows we observed an unpaired male early in the season (one of these unpaired males returned near the end of the field season).

To document occupancy and reproductive success, we visited all active burrows on a weekly basis from 14 April to 20 September 2002. Using binoculars and spotting scopes, we first surveyed the area for owl activity from >100m before approaching the burrow on foot to look for signs of use (pellets, feathers, prey remains, and presence of cobwebs at the burrow entrance). We recorded presence/absence of owls and/or sign on each visit and used behavioral cues to determine nest status, nest success, and the number of young fledged. On every other nest visit, we used an infrared video probe to examine nest status and brood size at each of our nests. Forty-nine of the 51 nest burrows monitored produced between 1 and 7 young (mean = 3.6). Three nests failed early in the season; while adults remained at those sites after nest failure, no second attempts were observed. Forty-eight nests were successful in producing at least one juvenile to the age of 32 days post-hatch. Forty-one nests were successful in fledging ≥ 1 juvenile (fledge=40 days), and the average number of young fledged per nest was 2.8 (Table 1).

Survival and annual burrow fidelity

Trapping attempts were made at 57 burrows located on public and private land with landowner's consent. Trapped birds were banded with uniquely-numbered ACRAFT© color bands and USFWS aluminum bands. Using spring traps and 2-way traps, we captured and banded 131 Burrowing Owls: 56 adults (31 females, 25 males) and 75 juveniles (Table 2).

Out of 32 adults banded in the 2001 season, 8 (25%) were re-sighted or recaptured in 2002 (3 females, 5 males) (Table 1). None of the 73 juveniles banded in 2001 were relocated in 2002. Of the 31 burrows monitored in 2001, 14 were reoccupied

in 2002 (Table 3). Of the 14 reoccupied burrows in 2002, 12 were re-used as nests, and we were only able to confirm 2 nests that were reoccupied by ≥1 of the same breeding adults in both 2001 and 2002. Of the 17 burrows from 2001 that were not used in 2002, 13 were still intact. Three were occupied by black-tailed prairie dogs and 1 appeared to have been purposefully buried.

Given the secretive nature of Burrowing Owls within our study area, normal re-sighting with high-powered telescopes and binoculars was very difficult. In an effort to remedy this problem we experimented with pit-tag (passive integrated transponder) marking techniques to identify previously-banded individuals. We attached 12mm pit-tags to ACRAFT© color bands using super glue and epoxy, and marked 38 of the 56 adults with pit-tags. As each pit-tag has its own radio-frequency ID, a small portable reading system was used to identify individual owls. We tested this technique at a subset of burrows (*n*=5). Pit-tag readers were placed at nest burrow entrances, covered in burlap, and left unattended for 2 hours. The range of the readers required owls to pass within 12 inches to enter or exit nest burrows. Adults were identified by the pit-tag reader at all 5 test burrows. Additionally, 6 marked adults (2 male, 4 female) that were recaptured late in the season still had pit-tag attachments intact.

Mortalities

We found and collected 6 dead adult Burrowing Owls (1 male and 5 of unknown sex), 3 dead juveniles greater than 32 days post-hatch, and 1 dead juvenile owl of unknown age in 2002. The cause of death for the adult male appeared to be avian predation. None of the dead birds found were banded. Interestingly, the adult male carcass was located in the burrow entrance of a nest where both adults were still present. Of the remaining adult mortalities: 3 appeared to have been depredated by raptors (plucked feathers found in pile), and 2 died of unknown causes (legs or single wing only). Of the 4 juvenile mortalities, 2 appeared to have been depredated by ground predators (partial carcasses found on ground near burrow entrance), 1 appeared to have been depredated by a raptor (plucked feathers), and 2 died of unknown causes.

Migratory Habit

We visited 25 nests on January 23-26, 2003 to document winter occupancy of Burrowing Owl nest sites. Twenty-six nests (of the 51 total active burrows during the

2002 breeding season) were inaccessible due to snow conditions. Observations at all 25 nests followed our standard nest monitoring protocol (see Burrow Monitoring section above). No owls were observed at all 25 nest burrows, and no sign was present at any burrows within the natal areas. Anecdotally, we questioned several local landowners about the presence of Burrowing Owls on their land in the winter, and no one could recall having seen any owls after October.

Habitat features

Methods

We measured habitat and landscape features at 43 nest burrows in 2002. We were unable to obtain permission from the landowner to access 5 burrows. In three cases, owls were located late in the season and the location of actual nest burrows were not known. Due to time constraints, we did not conduct vegetation surveys at the 7 sites where single adults were observed. In addition to the measurements taken at the 43 nest burrows, we measured the same features at 43 paired, randomly-chosen burrows. The random burrows were 'paired' with the nest burrows in that for each nest burrow, another burrow was randomly chosen within the same prairie dog colony. We will use these random burrows in future analyses to compare use with availability. All habitat features measured at the nests were standardized for comparison with other study sites.

The orientation (azimuth) of the burrow from the point of view of an owl exiting the burrow was obtained using a compass. We measured minimum and maximum diameters of the burrow opening, and minimum and maximum diameter inside the burrow passage (16-23cm or in as far as we could reach). Number of branches and tunnel length was measured using an infrared burrow videoscope. The height of the mound, the minimum and maximum diameter of the mound, and the slope of the landscape within 1 meter, 30 meters, and 200 meters were recorded. We also collected soil samples from the soil surface within one meter of the burrow. We recorded land use, distance to the nearest perch, height and type of perches, distance to the nearest road, distance to temporary and permanent water holes and types of water holes, distance to nearest available shade, and the presence/absence of a fence or utility line within 30 meters of the burrow. Additionally, we determined the visibility of an owl at the burrow

entrance from a distance of 10 and 30 meters, at the height of one meter, in the 8 cardinal directions (north, northeast, east, etc.).

Observers recorded the number of burrows available to a Burrowing Owl within 30 meters of the nest burrow, and how many of these were occupied by either conspecifics or prairie dogs. Each burrow was examined closely. If fresh diggings and scat were apparent, the burrow was considered occupied by a prairie dog. Burrows were not considered occupied by owls or prairie dogs if cobwebs blocked the burrow entrance. We obtained indices of prairie dog abundance using 2 200-meter transects bisecting the nest burrow in randomly-chosen directions. We recorded number of available burrows along transects (within a 4-meter band), as well as number of burrows occupied by prairie dogs.

Vegetation surveys were conducted within a 30-meter radius of the burrow. We estimated percent ground covered by shrubs, grasses, sedges, and forbs, litter, bare ground, rocks, and "other" (e.g., roads). We identified all plants within this area to species and categorized each species as native or non-native (Appendix 2). Those species listed as 'unknown' have been labeled and preserved (identification of those species is underway and will be included in subsequent reports).

Results

Results from habitat features measured at Burrowing Owl nests in 2002 can be found in Table 4. Mean vegetation cover within 30m of nest burrows was 71.9%, shrubs comprising 6.1% of vegetal cover. Percent bare ground was 17.4% (mean) within 30m of nest burrows. The mean number of usable burrows within 30m of nests was 29. Prairie dog activity was documented at 49 out of 51 nest sites. Distance to perches, water sources, and roads were highly variable among nest sites (Table 4). The data summarized in Table 4, combined with those from 2001, will allow us to determine correlations between habitat features, burrow fidelity, and nesting success.

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Table 1. Occupancy and success of Burrowing Owl nesting burrows in 2002 at Thunder Basin National Grasslands and surrounding private lands, northeastern Wyoming.

Description	Number	Range
Owl sightings (single and pairs)	58	--
Total adult owls found	106	--
Active burrows monitored	58	--
Total burrows monitored (active + 2001 inactive)	78	--
Burrows with owl sign	58	--
Burrows with owl observed	58	--
Burrows with only "resident" male detected	6	--
Burrows with only "resident" female detected	1	--
Pairs observed	51	--
Pairs observed at burrows	51	--
Burrows used as nest	51	--
Second attempts	0	--
Clutch size (mean ± SE)	5.17 ± 0.2	4 to 7
Burrows that produced young – observed by video scope or at burrow entrance	49	--
Nesting Success (percentage of nests producing ≥1 juvenile to 32 days post-hatch)	48 (94%)	--
Young produced / nest (mean ± SE)	3.9 ± 0.21	0 to 7
Nests that fledged ≥1 young	41 (80%)	--
Young fledged / nest (mean ± SE)	2.8 ± 0.27	0 to 7
Young fledged / successful nest (mean ± SE)	3.2 ± 0.25	1 to 7
Nest burrows not found*	3	--
Proportion of nest burrows from 2001 re-used in 2002	14 (45%)	--
Proportion of nest burrows from 2001 unusable in 2002**	4 (13%)	--
Adult males resighted from 2001 (of 17 banded)	5 (29%)	--
Adult females resighted from 2001 (of 15 banded)	3 (20%)	--
Juveniles resighted from 2001 (of 73 banded)	0	--
Proportion of birds overwintering	0	--

* Adults and juveniles found in an area post-fledge, actual location of nest burrows not found
** 3 occupied by black-tailed prairie dogs, 1 buried

Table 2. Burrowing Owl monitoring effort on black-tailed prairie dog colonies in northeastern Wyoming in 2002

Description	Number
Prairie dog colonies surveyed	73
with protocol	68
without protocol*	5
Miles surveyed with protocol	76 (122.3km)
Point-count surveys conducted with protocol	475
Vegetation surveys completed	86
nest plots	43
paired non-nest plots	43
Owls banded (with ACRAFT and USFWS)	131
females	31
males	25
juveniles	75
People hours spent trapping	1358
Total trap hours	724
Trap hours using 2-way traps	454.5
Trap hours using spring traps	458.3
Owls caught in 2-way traps	97 (+15 recaps)
females	20
males	5
juveniles	72
recaptures	15
Owls caught in spring traps	38 (0 recaps)
females	15
males	22
juveniles	1
recaptures	0
Owls caught by hand (juveniles)	2

* Scanned colonies for owls, did not use call-broadcast due to wind.

Table 3. Burrow occupancy by nesting Burrowing Owls on black-tailed prairie dog colonies in northeastern Wyoming, 2001 and 2002.

Description	2001	2002
Total burrows monitored (active + inactive)	38	78
Total active burrows monitored	31	59
Burrows used as nest	31	51
Burrows reoccupied from previous year	--	14
Burrows reoccupied by ≥ 1 same adult as previous year	--	2

Table 4. Habitat features at Burrowing Owl nest sites on black-tailed prairie dog colonies in northeastern Wyoming, 2002.

Description	Mean ± SE
Slope at 1m; 30m; 200m	0.6 ± 0.23; 2.6 ± 0.49; 3.5 ± 0.52
Min./Max. diameter of nest burrow opening	17.8cm ± 0.84 / 28.2cm ± 1.53
Min./Max. diameter of nest burrow passage	9.8cm ± 0.33 / 12.6cm ± 0.45
Min./Max. diameter of nest burrow mound	137.6cm ± 9.19 / 172.1 ± 10.37
Height of nest burrow mound	7.7cm ± 0.82
Distance to perch	134.1m ± 18.26
Distance to paved road	5824m ± 1038.00
Distance to gravel road	1859.8m ± 325.17
Distance to water source	547.8m ± 50.71
% of nests with fence within 30m	4.65% (absolute value)
% of nests with utility line within 30m	4.65% (absolute value)
Number of usable burrows within 30m	29.9 ± 1.84
% Sagebrush cover within 30m	6.05% ± 1.2
% Non-native vegetation cover within 30m	7.88% ± 2.04
% Native vegetation cover within 30m	65.41% ± 3.27
% Vegetation cover within 30m (native and non-native)	71.93% ± 2.76
% Bare ground within 30m	17.44%; 1.84

Appendix 2. Plant Species Found at Burrowing Owl Nest Sites in 2002 in Thunder Basin National Grasslands and surrounding private lands.

Grasses

Natives

Western Wheatgrass	*Agropyron smithii*	
Crested Wheatgrass	*Agropyron cristatum*	
Red Threeawn	*Aristida longiseta*	
Purple Threeawn	*Aristida purpurea*	
Blue Grama	*Bouteloua gracilis*	
Sandberg Bluegrass	*Poa secunda*	
Prairie June Grass	*Koeleria macrantha*	
Sand Dropseed	*Sprorobolus cryptandrus*	
Inland Saltgrass	*Distichlis stricta*	
Buffalo Grass	*Buchloe dactyloides*	
Poverty Oatgrass	*Danthonia spicata*	
Needle and Thread grass	*Stipa comata*	
Squirrel's Tail	*Elymus elymoides*	
Six-weeks Fescue	*Vulpia octoflora*	
Giant Rye?	*Elymus sp.?*	May be non-native

Non-natives

Cheatgrass	*Bromus tectorum*
Japanese Brome	*Bromus japonicus*
Tufted Wheatgrass	

Unknowns - listed as below on data sheets and samples **

Frog2 unk1, 2, 3
4W-1 unk1
Bruce2 unk7

Sedges

Carex sp.
Eleocharis sp.

Forbs

Natives

Scarlet Globemallow	*Sphaeralcea coccinea*
Plantain	*Plantago patagonica*
Prairie Coneflower	*Ratibida columnifera*
Rocky Mountain Bee Plant	*Cleome serrulata*

Cocklebur	*Xanthium strumarium*
Prairie Sunflower	*Helianthus petiolaris*
White Clover?	*Trifolium sp*.
Curlycup Gumweed	*Grindelia squarrosa*
Hairy Goldenaster	*Chrysopsis villosa*
Bitterweed	*Hymenoxys odorata*
Lupine	*Lupinus sp*.
Broom Snakeweed	*Gutierrezia sarothae*
	Mirabilis linearis
	Lygodesmia juncea
	Verbena bractaea
	Asclepia speciosa
	Solanum triflorum
	Happlopappus spinulosa

<u>Non-Natives</u>

Russian Thistle	*Salsola iberica*
Prostrate Vervain	*Verbena bracteata*
Common Dandelion	*Taraxacum officianale*
Yellow Sweetclover	*Melilotus officinalis*?
Pepperweed?	*Lepidium sp*.
Wooly heads	*Psilocarpus brevissimus*
Erect Knotweed	*Polypogon erectum*
Prostrate Knotweed?	*Polypogon aviculare*
Alfalfa	
Mustard	*Lepidium densiflorum*

<u>Unknowns - listed as below on data sheets and samples</u> **

Bruce2 unk2, 5, 9
Dull2 unk1, 2
Elliot2 unk1
yellow composite
viney thing
Hay1 unk1
Irene1 unk1
Klodt1 unk1, 2
small mustard
Klodt3, unk3
Mush1, unk1
Piney2 unk1, 2, 3
Piney5 unk1, 2, 3
Sec1-2 unk1, 2, 3
Sewell5 unk1
Wildcat7 unk1

Shrubs

Natives

Fringed Sagewort	*Artemisia frigida*	"fringe" in notes
Big Sagebrush	*Artemisia tridentata*	
Saltbush	*Atriplex gardineri?*	
Silver Sagebrush	*Artemisia trifoliata*	
Black Sage	*Artemisia nova*	
Greasewood	*Sarcobatus vermiculatus*	
Winterfat	*Eurotia lanata*	

Succulents

Plains pricklypear	*Opuntia polyacantha*
Pincushion	*Coryphantha spp.*

** *We are actively identifying unknown species and results will be included in subsequent reports.*

Appendix 1. Locations of standardized roadside surveys conducted in 2002 and location of Burrowing Owl nests detected and monitored, Thunder Basin National Grasslands and surrounding lands, northeastern Wyoming.

Note: prairie dog colony data was supplied by C. Lockman, U.S. Forest Service, Douglas Ranger District.