



Black-tailed Prairie Dog Monitoring at Scotts Bluff National Monument

2010-2013 Multiyear Report

Natural Resource Data Series NPS/NGPN/NRDS—2013/584



ON THE COVER

Black-tailed prairie dog colony at Scotts Bluff National Monument in 2013.
Photograph by the Northern Great Plains Network, National Park Service

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November 2013

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

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Please cite this publication as:

Wilson, S. K., M. H. Wilson, and A. R. Jarding. 2013. Black-tailed prairie dog monitoring at Scotts Bluff National Monument: 2010-2013 multiyear report. Natural Resource Data Series NPS/NGPN/NRDS—2013/584. National Park Service, Fort Collins, Colorado.

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Abstract

The Scotts Bluff National Monument black-tailed prairie dog colony was delineated and mapped by the Northern Great Plains Inventory and Monitoring Network from 2010-2013. Field methodologies were consistent with the efforts of the Heartland Inventory and Monitoring Network, which monitored the same prairie dog colony from 1995-2009. Colony area in 2010 (19.4 ha) and 2011 (17.4 ha) was similar to what was reported in 2009 (18.3 ha). In 2012 and 2013, the colony area was almost twice as large as in 2010 and 2011. However, this marked increase in colony size is still slightly less than the maximum colony size in 2004.

Acknowledgments

We would like to thank J. Wrede and K. Sternhagen, both former employees of the Northern Great Plains Inventory and Monitoring Network, for their prairie dog monitoring efforts in 2010 and 2011. Thank you to the staff at Scotts Bluff National Monument, particularly R. Manasek for providing logistical support and P. Bean for providing field support in 2012 and 2013. D. Uresk with the U.S. Forest Service provided a thorough review of the report. We thank the Heartland Inventory and Monitoring Network for providing fourteen years of legacy data. Finally, we appreciate the Northern Great Plains Fire Ecology Programs' willingness to share legacy photos of their vegetation monitoring plots in and around the prairie dog community.

Introduction

Black-tailed prairie dogs (*Cynomys ludovicianus*) (hereinafter referred to as prairie dogs) are an ecologically dominant species that strongly influence grassland biodiversity, vegetative composition and structure, forage availability, and nutrient cycling (Hoogland 2006; Desmond et al. 2000; Miller et al. 2000). Prairie dog colonies provide food and habitat for many invertebrate and vertebrate species, including the federally endangered black-footed ferret (*Mustela nigripes*). This ability to affect ecosystem structure, function and composition has resulted in prairie dogs being described as a keystone species (Kotliar et al. 2006; Miller et al. 2000).

In the last century, prairie dog habitat and abundance have declined as much as 98% throughout North America due to changing land use and land cover, disease, shooting, and poisoning (Hoogland 2006; U.S. Fish and Wildlife Service 2000; Miller et al. 1994). Today, remnant populations of prairie dogs are scattered throughout much of the range it once occupied (U.S. Fish and Wildlife Service 2000). The prairie dog population at Scotts Bluff National Monument (SCBL) in western Nebraska is one of these remnant populations.

The prairie dog population at SCBL was exterminated in 1944, naturally recolonized in the northwest corner in 1981, and controlled until 1988 (Morrison et al. 2010). Limited and varied monitoring of the population occurred from 1983 to 1993 by SCBL personnel and various investigators (Franklin 1983, 1984; Cox and Franklin 1989). The National Park Service's Prairie Cluster Prototype Long-Term Ecological Monitoring Program (Prairie Cluster Prototype LTEM) and United States Geological Survey collaborated from 1995 to 1999 to develop a monitoring protocol (Plumb et al. 2001). The protocol estimated 1) prairie dog density and population size using visual counts, 2) colony size using global positioning system (GPS) and geographic information system (GIS) technologies, and 3) surveillance of sylvatic plague. The protocol was then implemented by the National Park Service's Heartland Inventory and Monitoring Network (HTLN) from 2000-2009 (Morrison et al. 2010).

As part of a reorganization effort to conserve financial resources and group Parks with similar ecological characteristics, the monitoring of prairie dogs at SCBL was transferred to the Northern Great Plains Inventory and Monitoring Network (NGPN) in 2010. Leading up to that transition, NGPN and HTLN discussed potential improvements to the HTLN protocol based on research suggesting that visual counts are frequently unreliable for population estimates (Magle et al. 2007). Goldberg (2012) evaluated the use of four methods (i.e., minimum known number alive, visual counts (Plumb et al. 2001), mark-resight, and mark-recapture) to estimate prairie dog abundance at SCBL and reported that the mark-resight method produced the most precise estimates, while the visual count method of Plumb et al. 2001 was highly variable and imprecise.

Based on the recent literature and a discussion between NGPN and SCBL staff (R. Manasek) about their prairie dog management objectives, it was agreed that future monitoring efforts would focus on spatial dynamics of the colony (i.e., colony shape and size) and eliminate any estimate of prairie dog

abundance. This decision was based on the uncertainty of past abundance estimates and the expense associated with the recommended mark-resight method.

This report expands on the existing long-term spatial dataset collected by the Prairie Cluster Prototype LTEM and HTLN personnel by including the most recent spatial dynamics (i.e., colony location and size) of the prairie dog population collected by NGPN staff. Also, presented in this report is a refinement to the approach for delineating the prairie dog colony perimeter to provide more reliable and consistent area occupied estimates among observers, but still allow for comparisons with previously collected data.

Study Area and Methods

Scotts Bluff National Monument (designated in 1919) in western Nebraska encompasses approximately 1,240 ha and is located in the Western High Plains Level III ecoregion and Scotts Bluff and Wildcat Hills Level IV ecoregion (Chapman et al. 2001). Vegetation at SCBL is predominantly mixed-grass prairie and sparsely vegetated communities, with woody and wetland herbaceous vegetation communities being less common (The Nature Conservancy 1998).

Prairie Dog Colony Delineation and Mapping

The perimeter of the prairie dog colony at SCBL was delineated by NPS personnel on July 30, 2010, July 11, 2011, June 27, 2012 and July 9-10, 2013 largely following the field methodology described in the Plumb et al. (2001) protocol for monitoring prairie dogs at SCBL, but refined to provide more reliable and consistent area occupied estimates among observers.

In 2010 and 2011, one NGPN observer delineated the prairie dog colony boundary. In 2012 and 2013, there were three to four observers working together to delineate the boundary (Figure 1). For all years, the prairie dog colony boundary was identified as

the maximum combined extent of vegetative clip lines, when discernible, or by mapping within 5 m of active burrows. Burrows were considered active if the opening was at least 7 cm diameter with fresh scat within 0.5 m of the opening (Biggens et al. 1993). The presence of soil disturbance, tracks, and vegetative clippings were also used to evaluate if the burrow was active. A maximum distance of 20 m between active burrows was used to exclude satellite burrows and prevent the inclusion of large grassland islands. A minimum mapping unit of 0.25 ha was used to exclude satellite colonies.

Once the colony boundary was located, colored pin flags were placed approximately 10 m apart to mark the boundary perimeter. After the colony edge was marked with pin flags, a line feature was recorded using a Hemisphere GPS XF101 receiver (real-time Differential GPS positions using Wide Area Augmentation System corrections) with an Archer Field PC running ESRI ArcPad (Version 7 in 2010 and 2011; Version 10 in 2012 and 2013). Positions were streamed every second to construct a line. Position Dilution of Precision (PDOP) limits were restricted to less than six.



Figure 1. Field crew searching for active prairie dog burrows or vegetative clip lines during the 2013 monitoring period.

Colony area was calculated by implementing line topology rules in an ESRI ArcGIS 10 file geodatabase, correcting any errors (e.g., dangles, self-intersection), and converting the line to a polygon feature.

Repeat Photography

Repeat photography was collected at five locations within the current prairie dog colony (Figure 2). Two locations utilized current vegetation monitoring transects established by the NGPN plant community monitoring crew and the Northern Great Plains Fire Ecology Program. Photo capture for existing vegetation monitoring transects followed the approach described in the NGPN plant community composition and structure monitoring standard operating procedures (Symstad et al. 2012).

Three new photo point sites were established to monitor the core and the edge-line vegetation of the prairie dog colony. A waypoint was taken at each point, and the landscape was photographically captured in each cardinal direction using a compass. A whiteboard was used to capture the name, date, and cardinal direction each picture represented. Using a Nikon D3100 camera (auto mode and 18mm), the photographer captured the scene by stepping approximately 2 m from the whiteboard, 0.8 m above the ground, and used the cardinal direction as the center of the frame.

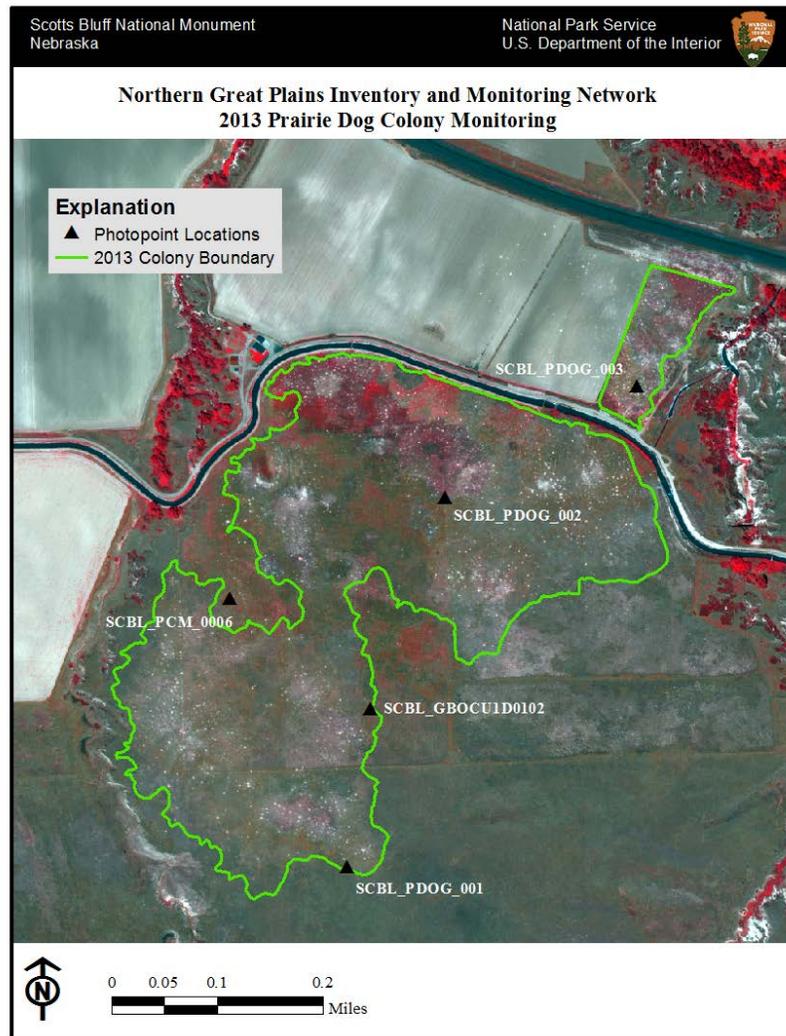


Figure 2. Photopoint locations in relationship to 2013 prairie dog colony boundary at Scotts Bluff National Monument.

Results

Prairie Dog Colony Delineation and Mapping

From 2010-2012, the colony boundary was primarily delineated by mapping within 5 m of active burrows because the clip line was not discernible. In 2013, a clip line was present in the northwest corner of the colony but again, the colony was primarily delineated by mapping within 5 m of active burrows (Figure 3). This is consistent with earlier findings that report a clip line was not visible at SCBL during HTLN monitoring efforts (Peitz and Cribbs 2007; Cribbs 2005).



Figure 3. Example clip line found during the 2013 prairie dog monitoring at Scotts Bluff National Monument.

Consistent with all years since 2008, prairie dogs were located only in the northwest corner of the monument. Morrison et al. (2010) referred to a large colony south of the irrigation canal in the northwest corner of SCBL as the “main colony”, a smaller area north of the irrigation canal as the “north colony”, and a “Saddle Rock colony along the eastern border of SCBL. Our mapping efforts resulted in two polygons separated by the irrigation canal and road. We separate these for consistent

mapping purposes with previous HTLN monitoring, but fully recognize that the irrigation canal is not a barrier creating two distinct prairie dog populations. The “main colony” and “north colony” area were combined for annual comparison.

Colony size was 19.4 ha and 17.4 ha in 2010 and 2011, respectively (Figure 4). These area estimates are similar to what HTLN reported for the main colony from 2005 to 2009 (range 15.9 ha to 22.7 ha; Morrison et al. 2010). Whereas, the area delineated in 2012 (37.1 ha) and 2013 (35.1 ha) was just below the maximum colony size of 38.8 ha reported by HTLN in 2004 (Morrison et al. 2010). It is possible that the increase in occupied area in 2012 and 2013 is related to lower annual precipitation. Future regression analysis will explore the relationship of precipitation and area occupied by prairie dogs at SCBL.

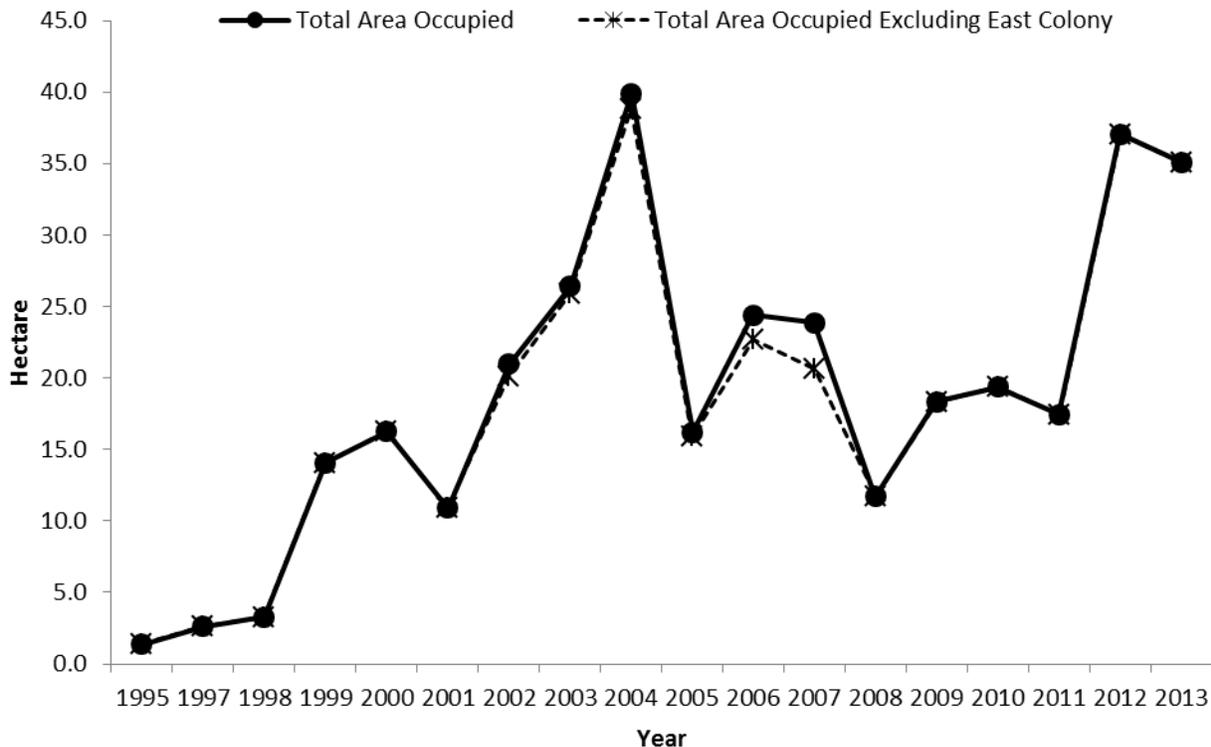


Figure 4. Total area occupied by prairie dogs at Scotts Bluff National Monument from 1995 to 2013. Hashed line (---*---) represents the total area occupied excluding the Saddle Rock (East) colony which was active from 2002 to 2008.

The spatial arrangement of the colony delineated from 2010 to 2013 remained similar to previous years. Even though the occupied area more than doubled in size from 2011 to 2012, the area occupied in 2012 was almost entirely within the area occupied in 2004 (Figure 5 and 6). In general, the colony boundary shifts on an annual basis but it does not appear that the prairie dogs are expanding into areas previously unoccupied since 2004.

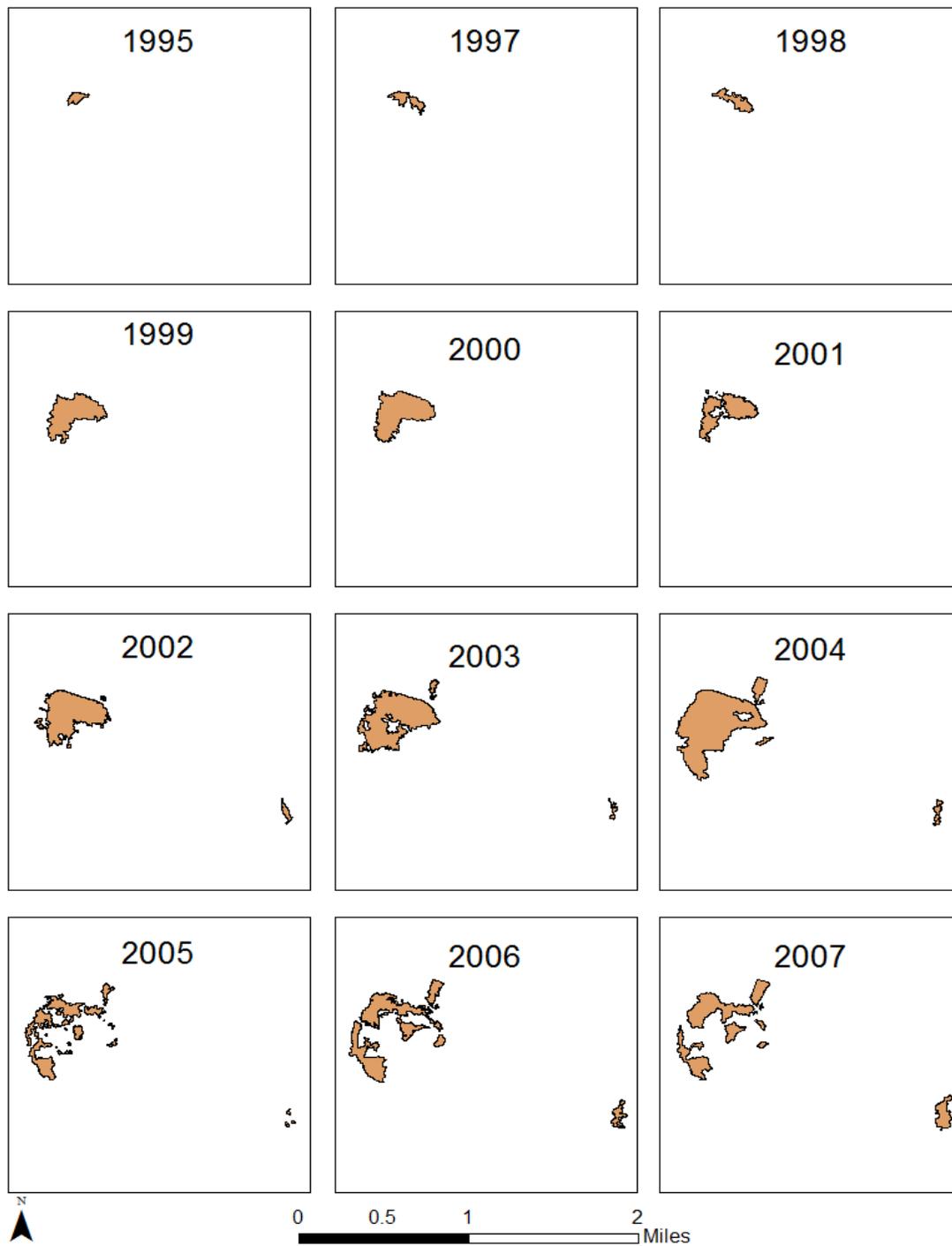


Figure 5. Prairie dog colony shape and distribution at Scotts Bluff National Monument from 1995-2007. Data courtesy of Heartland Inventory and Monitoring Network.

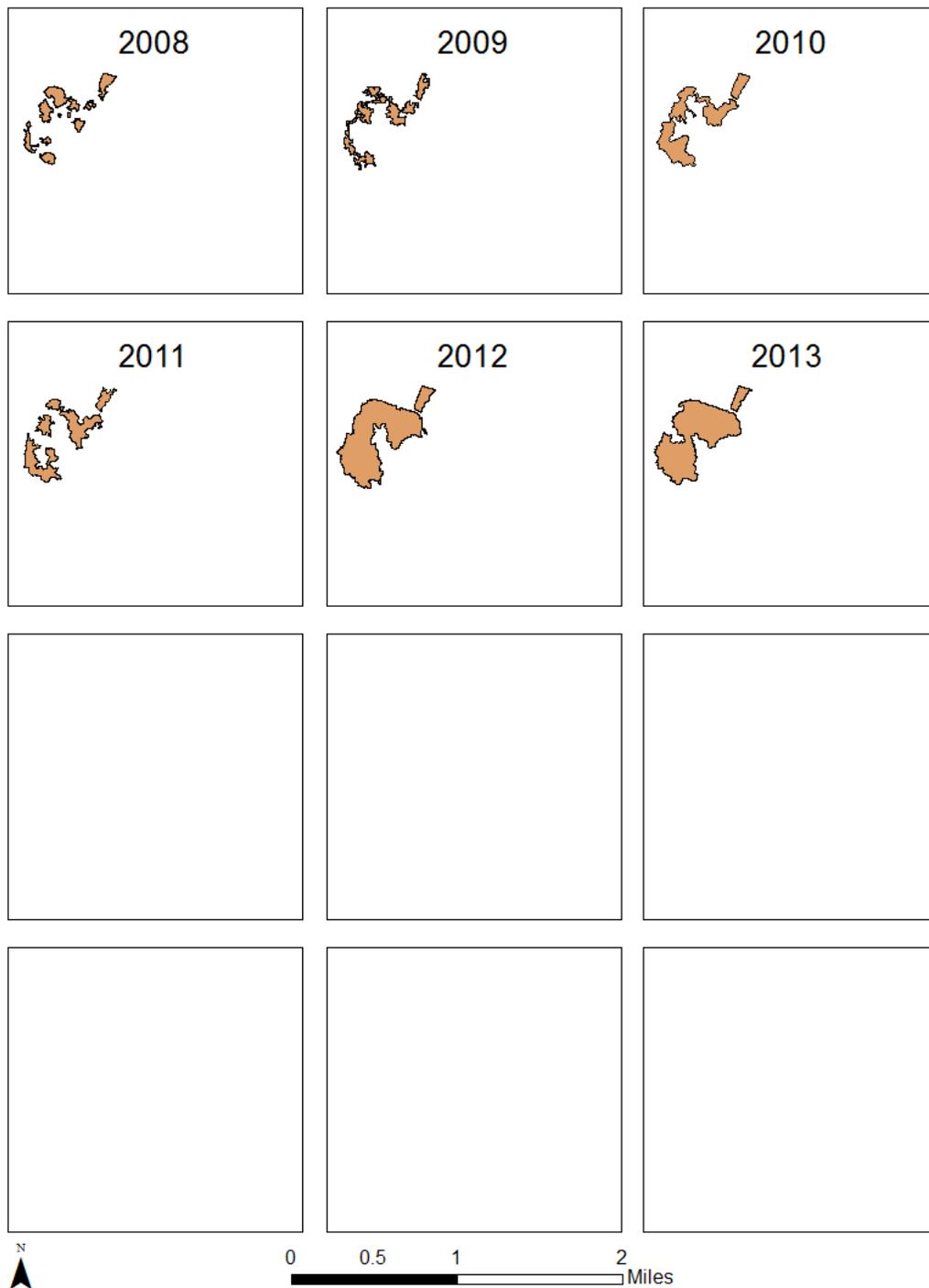


Figure 6. Prairie dog colony shape and distribution at Scotts Bluff National Monument from 2008-2013. Colony information for 2008 and 2009 courtesy of Heartland Inventory and Monitoring Network.

Repeat Photography

All photopoint locations were visited on July 10, 2013. This was the first year establishing photopoint locations, as well as repeating photographs at existing vegetation monitoring plots during the actual prairie dog monitoring effort. The photographs visualize the plant community characteristics at the time of the survey and may be useful in interpreting colony changes influenced by cumulative precipitation.

Of particular interest, is the Northern Great Plains Fire Ecology Program (NGP-FireEP) plot (SCBL_GBOCU1D0102) that was originally established in 1998. The plant community has clearly shifted from one dominated by native mixed grass prairie to one infested with *Bromus* spp (Figure 7). This shift is one example of what we hope to document through the use of repeat photography. Additionally, we will be able to utilize the quantitative, long term vegetation monitoring data collected by NGPN at site SCBL_PCM_0006 and NGP-FireEP at site SCBL_GBOCU1D0102.

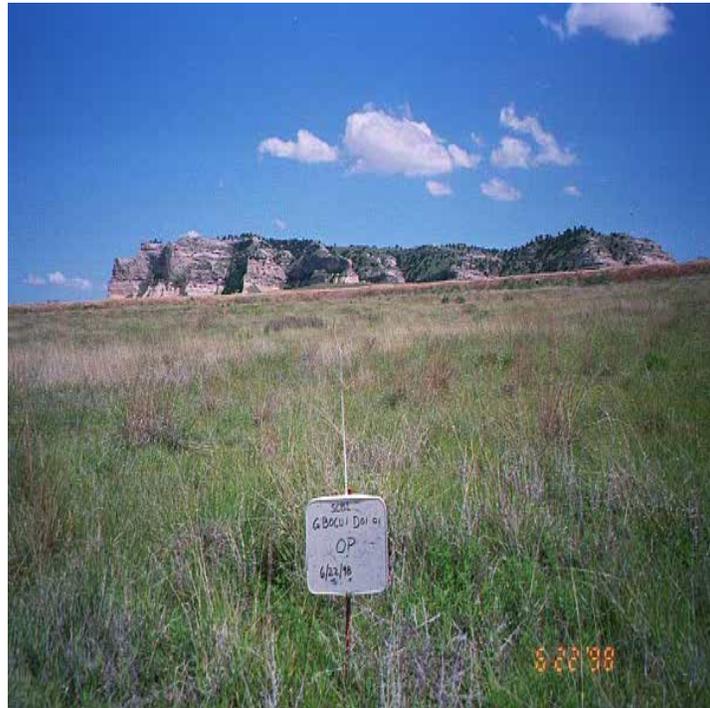


Figure 7. Comparison of vegetation characteristics from June 22, 1998 (primarily native mixed grass prairie) to July 10, 2013 (primarily non-native *Bromus* spp.) at Northern Great Plains Fire Ecology Program monitoring plot GBOCU1D0102 (OP to 30P).

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Appendix A: 2013 Repeat Photography



Figure 8. Photographs taken on July 10, 2013 in the four cardinal directions at photopoint site SCBL_PDog_001.



Figure 9. Photographs taken on July 10, 2013 in the four cardinal directions at photopoint site SCBL_PDog_002.

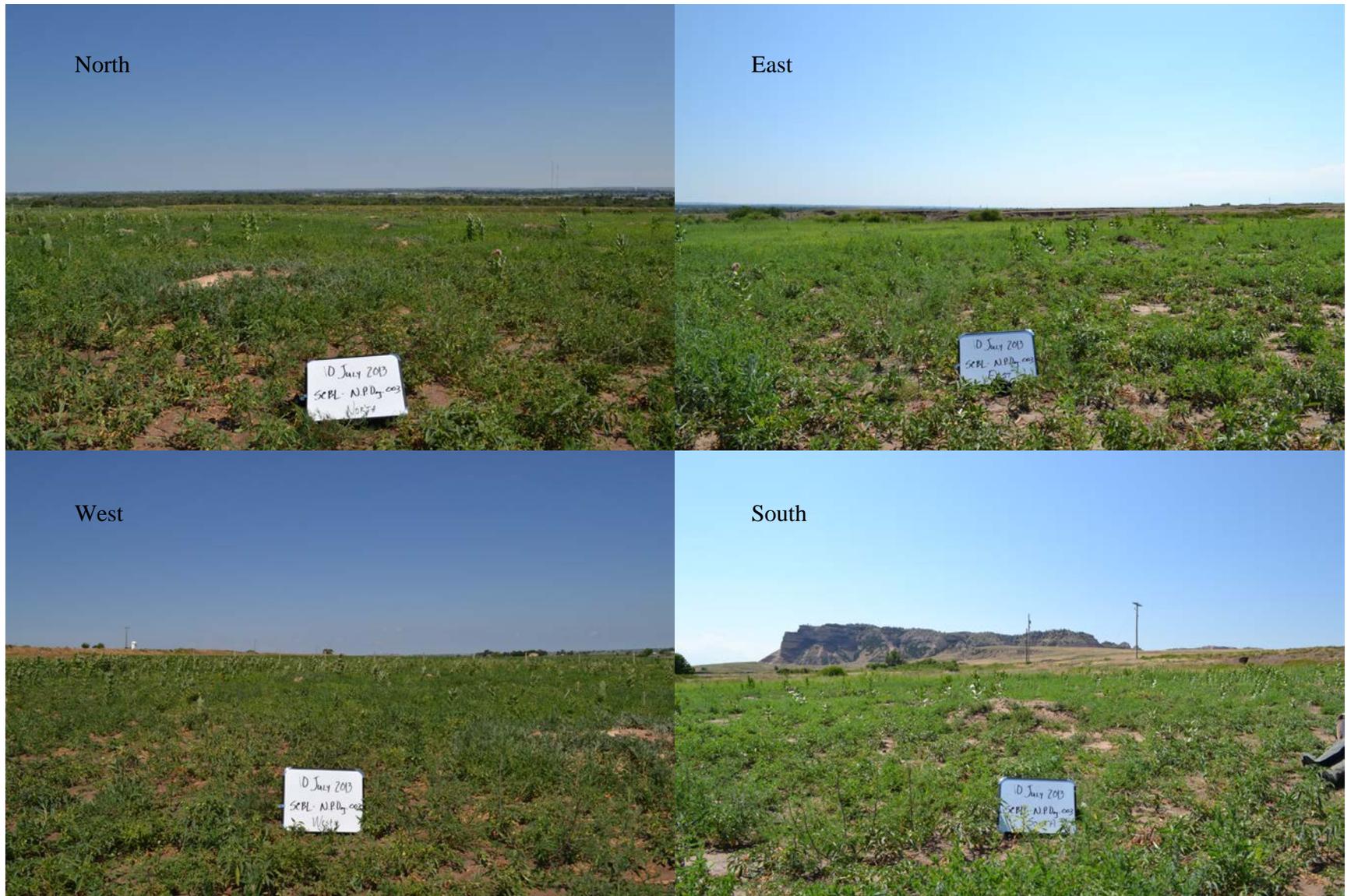


Figure 10. Photographs taken on July 10, 2013 in the four cardinal directions at photopoint site SCBL_PDog_003.



Figure 11. Photographs taken on July 10, 2013 at NGPN plant community monitoring site SCBL_PCM_0006. A50, B50, and B0 represent plot corners.