White-tailed Prairie Dog Monitoring for the Pinedale Anticline Project Area 2011

Final Report

Joel Thompson, Troy Rintz, and Shay Howlin
Western EcoSystems Technology, Inc.
2003 Central Ave.
Cheyenne, WY 82001

November 21, 2011

INTRODUCTION

In 2008, the BLM issued its Record of Decision for the Supplemental Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project, which included specific requirements for monitoring of wildlife populations which may be impacted by the development, including impacts to the white-tailed prairie dog (*Cynomys leucurus*). The specific monitoring components outlined by the Pinedale Anticline Project Office (PAPO) in the Wildlife Monitoring and Mitigation Matrix (Appendix B in 2008 BLM ROD) that would trigger mitigation for sensitive species (i.e., white-tailed prairie dog and pygmy rabbit [*Brachylagus idahoensis]*) included documentation of three consecutive years of decline in presence/absence or an average of 15% decline in numbers of individuals each year over three years. The methodology proposed for monitoring prairie dogs was to 1) identify white-tailed prairie dog towns on public lands within the Pinedale Anticline Project Area (PAPA) and Reference areas, 2) monitor towns for white-tailed prairie dog presence/absence, and 3) monitor trends in relative abundance of prairie dogs.

In 2010, a pilot study was conducted to assess the potential implementation of an occupancy modeling protocol (Mackenzie et al. 2006) as recommended by the University of Wyoming COOP Unit. Following the 2010 field season and analysis, it was determined that the occupancy modeling approach was not feasible due to sample size requirements and high costs. Prior to the 2011 survey season it was decided that the original protocol would be implemented, which was based on the mapping of prairie dog towns and estimation of the density of active prairie dog burrows within mapped towns. A survey effort conducted in 2009, which incorporated an aerial survey of the PAPA and Reference areas along with on-the-ground mapping of prairie dog towns (Hayden Wing Associates 2009), was utilized as the baseline for the 2011 surveys.

The objectives of the 2011 field surveys were to: 1) delineate white-tailed prairie dog towns within the PAPA, Core, and Reference areas in order to make comparisons to areas occupied by prairie dogs in 2009; and 2) determine the density of active white-tailed prairie dog burrows estimate population sizes within all mapped towns to establish a baseline for future comparisons.

METHODS

Field Methods

<u>Prairie Dog Town Mapping:</u> Prairie dog towns identified and mapped in 2009 were visited and mapped again in 2011. New prairie dog towns observed while travelling throughout the project areas were also mapped and added to the existing database of prairie dog towns. Prairie dog towns were mapped based on the BLM survey protocol (BLM 2011) by recording the location of a burrow on the edge of the town with a hand-held GPS unit, then searching the area within 30 meters (m) of the burrow for the next burrow occurring along the edge of the prairie dog town. If another burrow was located within 30 m, the location was recorded on the GPS and served as a polygon vertex. This technique was repeated until the prairie dog town edge was defined by the points (i.e., vertices) located along the perimeter of the town and the surveyor returned to the starting burrow, closing the polygon and providing accurate delineation of the prairie dog town.

Towns located on private lands that were not legally accessible were mapped on aerial photos from observations points on adjacent roads and later digitized using ArcGIS 10.1 (GIS). All towns were mapped regardless of size, as long as they met the eight burrows/acre density criteria defined in the BLM protocol. This resulted in a number of small towns being mapped. Although some towns were not of substantial size in 2011, future surveys will allow for documentation of the expansion or abandonment of these small towns.

Active Burrow Survey: Surveys to estimate burrow densities were based on the techniques described in Biggins et al. (1993). After completing the field mapping of all towns within the study area, GPS data were imported into a GIS for analysis. Within the GIS, each mapped town was overlaid with a series of parallel transects oriented in a north-south direction and spaced 60 m apart. Transects were downloaded to handheld GPS units for use in the field. Utilizing the GPS units and pre-determined transect lines, observers walked transects and counted the number of burrows (active and inactive) within 1.5 m of either side of each transect line, resulting in strip transects of three meters width. Burrows were counted if greater than seven centimeter in diameter and deep enough that the end could not be seen. Each burrow was identified as active or inactive, with active burrows defined by the presence of fresh prairie dog scat within 0.5 m of the burrow entrance. Burrows on the edge of transects (i.e., 1.5 m from the transect line) were counted if more than half of the burrow entrance was located within the strip transect (Biggins et al. 1993). Observers carried two handheld counters, utilizing one for recording the total numbers of burrows and one for recording the number of active burrows.

Database Management

A Microsoft Access database was designed to enter and maintain the survey data. Quality assurance and quality control (QAQC) was conducted on all data collected and entered into the database. The project managers reviewed data forms to insure completeness and legibility, and corrected problems which were detected.

Data Analysis

Prairie Dog Town Mapping: Total and average area of mapped prairie dog towns were summarized for each area of interest (PAPA, Core, and Reference areas). Throughout this report the PAPA refers to the area within the PAPA boundary (Figure 1), but outside of the Core area. Towns that overlapped area boundaries were split among those areas and acreages assigned accordingly. Contiguous towns which extended outside of any study area of interest were mapped and included in the area containing at least a portion of the town. Acreages of towns mapped in 2011 were compared to acreages of towns mapped in 2009 to assess changes in prairie dog distribution over time for each of the three areas of interest.

Burrow Density: Density of white-tailed prairie dog burrows (total burrows and active burrows) was estimated for each prairie dog town. The area surveyed within each town was the length of transects walked within the town multiplied by the transect width of three meters. Burrow density was calculated as the number of burrows observed divided by the area surveyed. Burrow densities for each area (Core, PAPA, and Reference) were calculated by averaging across all prairie dog towns within the area. The total number of active burrows was estimated by

extrapolating the density of active burrows within each town to the area of the town. The number of prairie dogs was then estimated by extrapolating the total number of active burrows using the conversion factor of 0.073 white-tailed prairie dogs per active burrow (Biggins et al. 1993). Confidence intervals on burrow density and total active burrows were estimated using a bootstrap resampling approach (Manly 1997). Individual transects were considered subsamples within a census of towns, though transect to transect variation could not be estimated with the data. The bootstrap approach simulates variation present in the data as a substitute for inter-town variation. Towns in each area were resampled with replacement to obtain a sampling intensity equal to the spatial area of all towns within the area (1,431 acres in the Core, 2,878 acres in the PAPA, and 2,003 in the Reference areas). Total burrows and burrow densities were estimated for each bootstrap sample. Confidence intervals for the observed estimates were estimated by the 2.5th and 97.5th percentiles of the bootstrap distribution.

It was not possible to assess changes in burrow densities or estimated population size from previous years as 2011 was the first year of data collection. Active burrow densities and population estimates from 2011 will be used as the baseline for future comparisons.

RESULTS

Prairie Dog Town Mapping

The mapping of prairie dog towns began on June 16 and was completed on June 30, 2011. There were 108 prairie dog towns mapped (Figure 1; Table 1). Thirty towns (27.8%) had no active burrows documented. Three of the 30 towns without any documented active burrows were considered to be occupied based on visual observations of prairie dogs, leaving 27 towns (25% of mapped towns) with no prairie dogs or active burrows documented. Twenty-one of the 27 were classified as activity unknown due to the timing of surveys (e.g., early morning when animals weren't likely to be active), while six were classified as unoccupied. All 27 of these towns were small (less than 7 acres) and had nine or fewer total burrows counted during transect surveys.

The total area of towns mapped in 2011 was 6,312 acres (Table 1), which represented an overall increase of 1.4% over 2009 (Table 2). Within the Core area, the acreage of mapped towns decreased by 3.5% from 2009 to 2011 (Table 2). Within the PAPA and Reference areas, the acreage of mapped towns increased by 4.1% and 1.5%, respectively (Table 2).

Table 1. Number and area of white-tailed prairie dog towns mapped in 2011.

Area	Number of Towns[1]	Total Acreage Of Towns	Avg. Town Size
Core	23*	1,431	62
PAPA	52*	2,878	55
Reference	37	2,003	54
Total	108	6,312	58

*Includes portions of towns that overlapped boundaries and were split among areas.

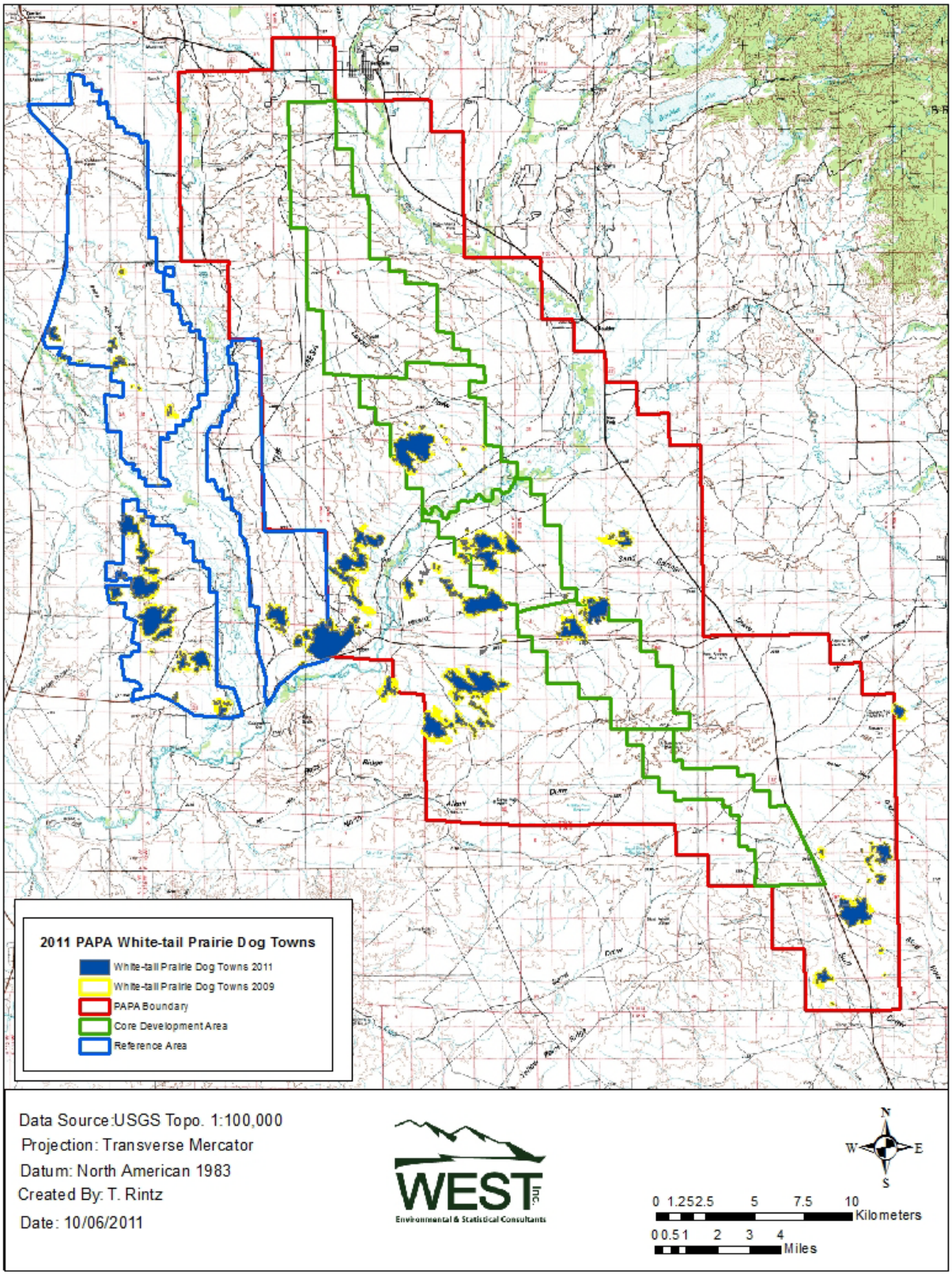

Figure 1. White-tailed Prairie Dog Towns mapped on the Pinedale Anticline Project Area (PAPA) and Reference areas.

Table 2. Change in acreage of mapped white-tailed prairie dog towns between 2009 and 2011.

Year	2009	2011	Change in Acreage (2009 to 2011)	% Change in Acreage (2009 to 2011)
Core	1,483	1,431	-52	-3.5
PAPA	2,765	2,878	113	4.1
Reference	1,974	2,003	29	1.5
Total	6,222	6,312	90	1.4

Burrow Density

Mean burrow density was 82.18 burrows/ac in the Core, 96.41 burrows/ac in the PAPA, and 53.39 burrows/ac in the Reference areas (Table 3). Active burrow density was 30.62 active burrows/ac in the Core, 41.52 active burrows/ac in the PAPA, and 17.98 active burrows/ac in the Reference areas (Table 4). The proportion of total burrows considered active was similar across the three areas, varying from 35 to 42%. The number of active burrows was estimated for each area (Table 5) and then used to estimate prairie dog population sizes within the three areas (Table 6). The estimated number of white-tailed prairie dogs occupying the three areas varied from a low of 1,871 in the Core to 4,074 in the PAPA (Table 6).

Table 3. Average burrow density (number per acre) in each area with 95% bootstrap confidence intervals.

		95% Confidence Interval	
Area	Density	Lower	Upper
Core	82.18	44.82	120.65
PAPA	96.41	48.61	155.56
Reference	53.39	41.54	66.68

Table 4. Average active burrow density (number per acre) in each area with 95% bootstrap confidence interval.

		95% Confidence Interval	
Area	Density	Lower	Upper
Core	30.62	16.20	47.20
PAPA	41.52	19.66	67.88
Reference	17.98	12.04	24.74

Table 5. Number of active burrows in each area with 95% bootstrap confidence interval.

		95% Confidence Interval	
Area	Number	Lower	Upper
Core	25,637	15,119	40,701
PAPA	55,812	38,300	79,170
Reference	31,951	21,436	44,622

Table 6. Number of white-tailed prairie dogs in each area, based on the Biggins conversion, with 95% bootstrap confidence interval.

		95% Confidence Interval	
Area	**Number**	**Lower**	**Upper**
Core	1,871	1,104	2,971
PAPA	4,074	2,796	5,779
Reference	2,332	1,565	3,257

Discussion

Because 2011 was the first year that data were collected on burrow densities and population sizes were estimated, the only data that could be used to address the Wildlife Monitoring and Mitigation Matrix in 2011 was the acreage of mapped prairie dog towns. There were 6,312 acres of prairie dog towns mapped in 2011 compared to 6,222 acres mapped in 2009. This represents an overall increase of 90 acres, or 1.4% (Table 2). The increase in mapped acreage was divided among the PAPA and Reference areas, where the area of mapped towns increased by 113 and 29 acres, respectively from 2009 to 2011 (Table 2). Within the Core area, the acreage of mapped towns decreased by 52 acres (Table 2).

Although some changes in acreages were observed (based on mapped towns) from 2009 to 2011, the changes were all quite small (less than 5%). It is unknown what may be responsible for the changes in mapped acreages. Prairie dog towns are dynamic in that boundaries change with every new burrow dug or old burrow that collapses. Even though town sizes may change from year to year, it seems reasonable to assume that prairie dog populations may not change in a parallel fashion, as prairie dog densities may vary within towns (especially within larger towns) such that some portions of a large town may have relatively high densities of prairie dogs, while other areas are mostly devoid of activity. Areas devoid of activity may deteriorate such that they are eliminated from towns during future mapping efforts, while high density areas may persist, thereby increasing the density of active burrows while overall town size may decrease. There is also potential for year-to-year variation due to differences in personnel conducting the mapping surveys and the ability to access all towns, especially those located on private properties.

In terms of active burrow densities, towns within the Reference areas had active burrow densities roughly half that of towns located in the PAPA and Core areas (17.98 compared to 41.52 and 30.62, respectively). It will be of particular interest in the future to see how burrow densities change in the three areas and how those changes compare to the acreage of occupied towns. Active burrow densities were transformed using the methods Biggins et al. (1993) to estimate the actual number of prairie dogs residing within each of the three areas. As expected, the estimated population size within each area followed the pattern of mapped acreages, with the Core having the smallest population (1,871), followed by the Reference areas (2,332), and PAPA (4,074; Table 6).

This was the first year that towns were assessed for active burrow densities and population numbers; therefore, it is unclear if there were any changes in these parameters from previous years. It is recommended that the methods implemented in 2011 to map prairie dog towns and estimate active burrow densities and population sizes be continued in 2012. Following the 2012 season, it will be possible to compare annual variations in both prairie dog abundance and acreage of prairie dog towns. At that time, data will begin to address the specific monitoring components outlined by the Pinedale Anticline Project Office (PAPO) in the Wildlife Monitoring and Mitigation Matrix. Due to the variability in the estimates of active burrow density and population numbers, it will likely take several years to document trends with statistical confidence.

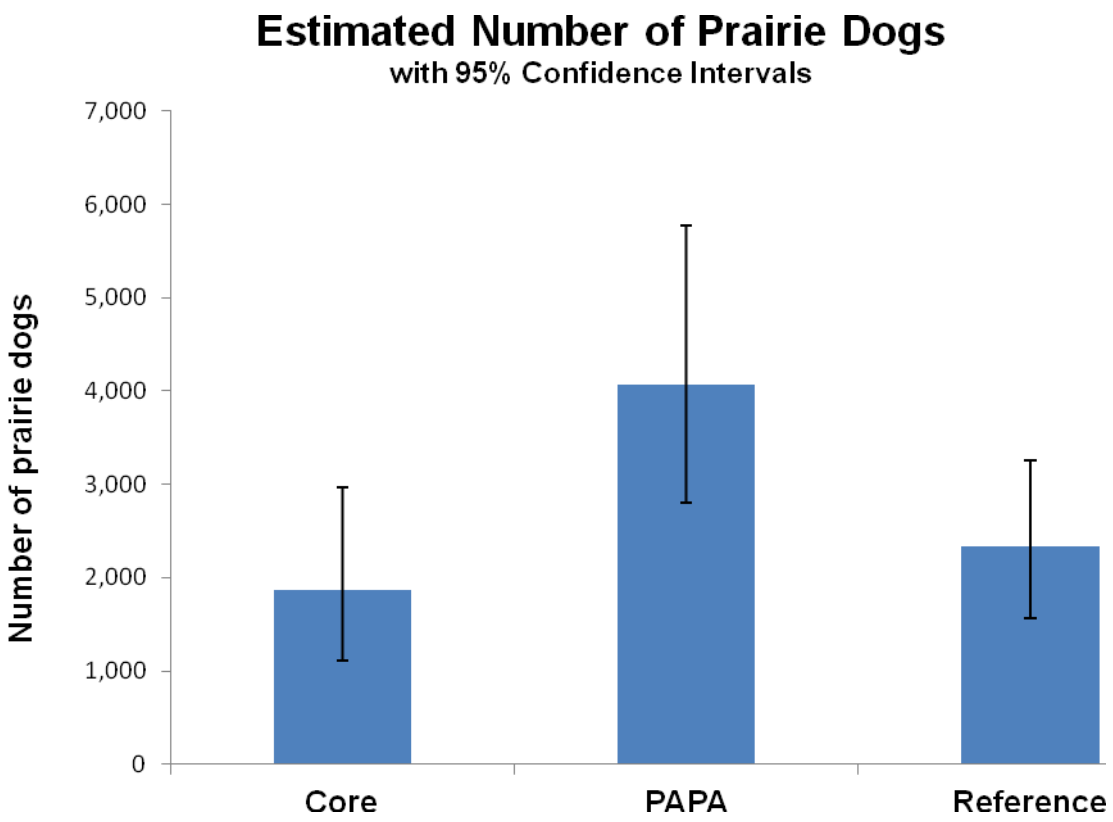

Figure 2. Estimated number of white-tailed prairie dogs documented in 2011 on the Core, PAPA, and Reference areas. Vertical lines represent 95% bootstrap confidence intervals.

References

Biggins, D.E., Miller, B.J., Hanebury, L.R., Oakleaf, B., Farmer, A.H., Crete, R., and Dood, A., 1993, A technique for evaluating black-footed ferret habitat, *in* Oldemeyer, J.L., Biggins, D.E., Miller, B.J., and Crete, R., eds., Management of prairie dog complexes for the reintroduction of the black-footed ferret: Washington, D.C., U.S. Fish and Wildlife Service, Biological Report 13, p. 73–88.

Bureau of Land Management [BLM}. 2011. Wildlife Survey Protocols. Pinedale Field Office, Pinedale, Wyoming. Version 2.3 January 2011. Available online at: http://www.blm.gov/pgdata/etc/medialib/blm/wy/field-offices/pinedale/wildlife.Par.93566.File.dat/Protocols.01.28.11.pdf.

Hayden-Wing Associates, LLC. 2009. 2009 annual report: white-tailed prairie dog (Cynomys leucurus) colony mapping in the Pinedale Anticline Project Area. Report prepared for the Bureau of Land Management, Pinedale Anticline Project Office, Pinedale, Wyoming. Report prepared by Hayden-Wind Associates, LLC, Laramie, Wyoming. 17pp.

MacKenzie, D.I., J.D. Nichols, J.A.Royle, K.H.Pollock, L.L. Bailey, and J.E.Hines. 2006. Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurance. Academic Press, New York.

Manly, B.F.J. 1997. Randomization, Bootstrap and Monte Carlo Methods in Biology, 2nd Edition. Chapman and Hall, London.