2009 Annual Report: White-tailed Prairie Dog (*Cynomys leucurus*) Colony Mapping in the Pinedale Anticline Project Area

Report Prepared for

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Introduction

The 2008 Record of Decision for the Supplemental Environmental Impact Statement for the Pinedale Anticline Oil and Gas Exploration and Development Project in Sublette County, Wyoming requires monitoring of white-tailed prairie dog (*Cynomys leucurus*) populations. To report occurrence and distribution of white-tailed prairie dogs as part of this monitoring effort, Hayden-Wing Associates, LLC was contracted to map prairie dog colonies on the Pinedale Anticline Production Area (PAPA) and the adjacent White-Tailed Prairie Dog Reference Area in 2009. Efforts to track changes in prairie dog population size will begin in 2010.

White-tailed prairie dogs are one of five species of prairie dog (*Cynomus* spp.) in North America. Two species occur in Wyoming, white-tailed and black tailed prairie dogs (*Cynomys ludovicianus*). Black-tailed prairie dogs occur in short-grass prairie in the eastern part of Wyoming and are known for their dense colonial structure and highly evolved social behavior. White-tailed prairie dogs occur primarily in sagebrush steppe and although they are highly social, they occur in looser colonies and at lower densities (~12/acre; Menkens and Anderson 1989) than black-tailed prairie dogs (Hoogland 1981). Only white-tailed prairie dogs occur in the Pinedale Anticline area, and throughout this report will simply be referred to as prairie dogs.

Prairie dogs are considered keystone species that strongly influence biodiversity (reviewed by Facka et al. 2008), and are important to over 50 vertebrate species including Bureau of Land Management (BLM) Sensitive Species such as burrowing owls (*Athene cunicularia*), ferruginous hawks (*Buteo regalis*), mountain plovers (*Charadrius montanus*), and the federally endangered black-footed ferret (*Mustela nigripes*; Campbell and Clark 1981). Wyoming Game and Fish Department lists the white-tailed prairie dog as a species of concern because population status and trends have not been quantified, and because its habitat is vulnerable (WGFD 2005).

Study Area

This study was conducted within Sublette County, Wyoming, on the Pinedale Anticline Production Area (PAPA; 198,037 acres) and the White-Tailed Prairie Dog Reference Area (43,843 acres) located on adjacent land to the west of the PAPA. Land ownership is >80% BLM with lesser amounts of state and private land. Elevation within the study area ranges from approximately 6,850 feet to 7,750 feet, and average annual precipitation is about 10-12 inches (USDA-NRCS 2009). The study area consists primarily of Wyoming big sage land cover, with lesser amounts of mixed grass prairie, mountain big sage, desert shrub, irrigated crops, and riparian (Wyoming GAP analysis 1996; Figure 1). The northern and eastern portions of the PAPA are slightly higher and wetter, supporting taller, denser stands of Wyoming big sage along with some mountain big sage. The central and southern portions of the PAPA, as well as the Reference Area, are lower and drier, supporting shorter stands of Wyoming big sage along with Mixed Grass Prairie and Desert Shrub cover types.

Methods

We carried out white-tailed prairie dog surveys in two stages—aerial surveys, followed by ground mapping of colonies. We conducted aerial surveying on June 17-18, 2009 by flying along transects that were oriented in a north-south direction and spaced at 0.5-mile intervals throughout both the PAPA and adjacent Reference Area. We flew at 500 feet above ground level and marked potential prairie dog colonies using both a hand-held Garmin® iQue™ Global Positioning System (GPS) unit and the airplane's GPS system (Figure 2). Potential colonies marked from the air were used as survey points during the ground surveys.

We conducted ground surveys on foot from July 7 to July 30. Survey points consisted of all prairie dog colonies mapped in previous years, as well as potential colonies identified during the aerial survey. Generally, three different types of burrows occurred at survey points: Uinta ground squirrel (*Spermophilus armatus*) burrows, very old burrows with the entrances collapsed, or open prairie dog burrows. The three burrow types were difficult to distinguish during aerial surveys, but were identifiable from the ground. When a survey point was found to have open prairie dog burrows we proceeded to map the colony. We delineated colony boundaries based on open prairie dog burrows (either occupied or unoccupied); collapsed burrows or burrows occupied by ground squirrels were not considered part of the colony. Though we defined colonies as groups of burrows located within 200 m of each other, we partitioned these into sub-colonies which we defined and mapped as groups of burrows separated by less then 30 m. This effectively excluded large gaps within the colony that had no burrows and gives a more precise representation of the area occupied by burrows. We mapped each sub-colony by recording the location of a burrow on the edge of a sub-colony, and then searching the area within 30 meters of that burrow for the next burrow occurring along the sub-colony edge. If another burrow was located within 30 meters, the location was entered. This technique was repeated until the sub-colony edge was defined by the points located along the perimeter and we returned to the starting burrow, closing the polygon and providing accurate delineation of the sub-colony. Sub-colonies that were separated by less than 200 m were considered to collectively comprise one colony and were assigned the same identification number. Groups of burrows that were separated by 200 m or more were considered distinct colonies.

The status of each mapped sub-colony was assessed during its delineation. Status was determined by searching the colony for signs of recent activity (i.e., prairie dogs, recent droppings, digging, tracks, trails). Status was recorded for each polygon as: <u>Occupied</u> (i.e., animals or fresh sign observed), <u>Unoccupied</u> (i.e., mounds or burrows present, no fresh sign or animals observed, and mounds/burrows show various stages of abandonment), or <u>Not Surveyed</u> (due to inaccessibility on private land).

We recorded all data directly into custom-built geodatabase feature classes on Garmin® iQue™ GPS units running ArcPad 7.1 mobile GIS software. Spatial data depicting prairie dog colonies were generated using ArcGIS® 9.2 software. Geographic coordinate system is North American Datum 1983 (NAD 83). Projected coordinate system is Universal Transverse Mercator (UTM), Zone 12 North.

Results

Within the study area we identified a total of 184 survey points, consisting of 155 potential prairie dog colonies recorded during aerial survey and an additional 29 points from colonies mapped in previous years (Table 1). There were 175 survey points on or immediately adjacent to public land within the study area. Of these, 67 contained prairie dog burrows. The survey points which did not have open prairie dog burrows had Uinta ground squirrel burrows or old collapsed burrows, which from the air are difficult to distinguish from prairie dog burrows. Nine survey points were on private land within the study area. At three of these points we observed prairie dog colonies that we roughly mapped from a distance. Three points were determined from a distance to have no prairie dog colonies, and three were not visible from public land.

We located and mapped 67 prairie dog colonies totaling 6,222 acres in size (Table 2; Figure 3). Colonies ranged in size from 0.27 acres to 600 acres, and averaged 93 acres. Some of these colonies were composed of multiple sub-colonies as described in the methods. Of 130 mapped sub-colonies, only 15 were unoccupied totaling 2% of the total colony acreage. Prairie dog colonies covered 2.3% (4,248 acres) of the PAPA, 3.5% (1,483 acres) of the Core Development Area within the PAPA, and 4.8% (1,974 acres) of the Reference Area.

As defined by Biggins et al. (1988), prairie dog colonies separated by less than 4.34 miles are considered a complex. Complexes with at least 200 acres of white-tailed prairie dog colonies have potential to provide habitat for the federally endangered black-footed ferret, while complexes of over 1,000 acres may be considered as potential sites for ferret reintroductions (USDI-BLM 2009). We identified two prairie dog complexes on the PAPA (Figure 4). One complex occupies the central portion of the PAPA and Reference Area and contains 5,620 acres of mapped colonies. The other is located in the southeast portion of the PAPA and contains 603 acres of mapped colonies. Both complexes likely extend beyond the boundaries of the study area and therefore may be larger than our data reveals.

As in previous years, prairie dog colonies were only in the lower, drier portions of the study area where Wyoming big sage was shorter and interspersed with mixed grass prairie and desert shrub communities (Wyoming GAP analysis 1996; Figure 1). At all potential prairie dog locations in the higher elevation areas with denser Wyoming and mountain big sage, we found only Uinta ground squirrel burrows.

Most prairie dog colonies we identified were in the same general areas as in previous years but exact boundaries often differed. To ensure consistency of sampling areas, we compared among years only on public land within the PAPA. The area of intersection (overlap) for 2008 and 2009 colonies accounted for 53% of the total acreage delineated in the two years, while 16% of the area was newly delineated in 2009, and 32% of the area delineated in 2008 was not found to have prairie dog colonies in 2009 (Table 3).

Within the public land of the entire PAPA, prairie dog colonies were found to occupy a smaller area than in previous years—4,218 acres in 2009 compared with 5,211 acres delineated in 2008, and 4,823 acres in 2007 (Table 4). Within the Core Development Area, however, prairie dog

colonies expanded to 1478 acres in 2009 compared to 1,376 acres in 2008, and 1,206 acres in 2007 (Table 5).

Discussion

Within the PAPA, prairie dog colonies occupied less area in 2009 than was delineated in either of the previous two years (13% less than in 2007, and 19% less than in 2008). White-tailed prairie dogs exhibit wide inter-annual and intra-annual population swings (Menkens and Anderson 1989), driven primarily by large variations in productivity. Menkens and Anderson (1989) speculate that temporal variation in the quantity and quality of vegetation may cause these fluctuations. Additionally, all prairie dog species are highly susceptible to sylvatic plague (*Yersinia pestis*; Cully and Williams 2001). This disease can spread via other mammals carrying plague infected fleas, so outbreaks can occur with a random patchy distribution rather than spreading in waves (Cully and Williams 2001). Since white-tailed prairie dog colonies have the lowest densities among prairie dog species, plague spreads more slowly within their colonies, they experience lower mortality rates, and their colonies may recover more quickly (Menkens and Anderson 1991, Cully and Williams 2001). Nevertheless, local mortality in a plague epizootic may exceed 85% in white-tailed prairie dogs and is an important concern for the conservation of this species (Anderson and Williams 1997).

Though our inter-annual comparison of mapped prairie dog colonies suggests a possible population decline, the results should be interpreted cautiously. Delineation of white-tailed prairie dog colony boundaries is somewhat subjective because of indefinite colony boundaries (Andelt et al. 2009). It is likely that the differences in delineated boundaries stem from a difference in mapping techniques. Our 2009 delineations appear to be at a finer grain than those of previous years' maps (Figure 3), thus within colonies we identified gaps between patches of burrows that perhaps would have been lumped into larger patches in previous years. Another complicating feature of many prairie dog towns in the Pinedale Anticline study area is the presence of Uinta ground squirrels. Though burrows of these species can be readily distinguished when scat is present, the burrows themselves show much overlap in size and shape. Uinta ground squirrels frequently occur at the edges of prairie dog colonies, and sometimes in patches within prairie dog colonies. In some areas it appeared that ground squirrel mounds may have been mapped in previous years as part of prairie dog colonies. It is also possible that areas presently occupied by ground squirrels were used by prairie dogs last year, though in the literature we could not find any documentation of ground squirrels using abandoned prairie dog mounds.

While the area occupied by prairie dog colonies decreased within the PAPA as a whole, it increased within the Core Development Area in 2009 relative to previous years (23% more area than in 2007 and 7% more than in 2008). Although comparisons of mapped areas should be made with caution, this suggests that prairie dog populations may be increasing within the developed areas, or at least doing better in developed areas than in undeveloped areas. In several locales we observed them in reclaimed areas. These areas may be attractive to prairie dogs because of the less compacted soil, and the shorter vegetation and lack of shrubs. While white-tailed prairie dogs commonly inhabit areas with moderate shrub cover, they are uncommon in areas with tall or dense shrubs. Though prairie dogs may be colonizing reclaimed areas, it is not

possible to assess the overall development impact on their populations without knowing their status within those areas before development began. Also, since white-tailed prairie dog density is extremely variable (Menkens and Anderson 1989), colony area is not necessarily a good proxy for population size. Nevertheless, the apparent increase in prairie dog colonies within the Core Development Area is a positive sign.

Occurrence of prairie dogs at the Pinedale Anticline study area coincides well with differences in elevation and land cover types (Wyoming GAP Analysis 1996). Within the study area they inhabit areas below 7,250 feet in elevation, and areas where Wyoming Big Sage land cover is intermixed with mixed grass prairie or desert shrub cover types (Figure 1). Within areas where Wyoming big sage is mixed with mountain big sage land cover, there are very few colonies. Those that do occur within that cover type only occur near the edge, within 400 m of a drier land cover. Although white-tailed prairie dogs are more tolerant of shrubs than other prairie dog species (Clark 1977), it is possible that dense shrub cover or tall shrubs reduce their ability to detect predators. Menkens and Anderson (1989) were not able to find significant correlations between vegetation and white-tailed prairie dog demography, but they concede that vegetation associations are likely to exist for this species. We were not able to identify any strict habitat associations during casual field observations. We observed much heterogeneity among habitat occupied by prairie dogs on the Pinedale Anticline study site on a small scale—ranging from open grasslands to dense sagebrush steppe (often within the same colony). But on a landscape scale the tall, dense sagebrush appears to be avoided.

The mapping of colonies is an excellent way of identifying occurrence and distribution of white-tailed prairie dogs, and a valuable step in the monitoring of this species in the Pinedale Anticline Production Area. More objective quantitative methods are available for monitoring prairie dog population changes, including an index of abundance based on visual counts of prairie dogs (Menkens et al. 1990), mark re-sight methodology (Severson and Plumb 1998, Facka et al. 2008), and occupancy modeling (MacKenzie et al. 2003, Andelt et al. 2009). We are currently investigating the potential for one or more of these methods for monitoring Pinedale Anticline prairie dog population change beginning in 2010.

Literature Cited

Andelt, W. F., G. C. White, P. M Schnurr, and K. W. Navo. 2009. Occupancy of random plots by white-tailed and Gunnison's prairie dogs. Journal of Wildlife Management 73:35-44.

Anderson, S. H., and E. S. Williams. 1997. Plague in a complex of white-tailed prairie dogs and associated small mammals in Wyoming. Journal of Wildlife Diseases 33:720-732.

Biggins, D., B. Houston, B. Miller, B. Oakleaf, T. Clark, and A. Dood. 1988. A system for evaluating black-footed ferret habitat. U.S. Fish and Wildlife Service Draft Report, 40p.

Campbell, T. M., III, and T. W. Clark. 1981. Colony characteristics and vertebrate associates of white-tailed and black-tailed prairie dogs in Wyoming. American Midland Naturalist 105:269-275.

Clark, T. W. 1977. Ecology and ethology of the white-tailed prairie dog (Cynomys leucurus). Milwaukee Public Museum Publications in Biology and Geology no. 3.

Cully, J. F., and E. S. Williams. 2001. Interspecific comparisons of sylvatic plague in prairie dogs. Journal of Mammalogy 82:894-905.

Facka, A. N., P. L. Ford, and G. W. Roemer. 2008. A novel approach for assessing density and range-wide abundance of prairie dogs. Journal of Mammalogy 89:356-364.

Hoogland, J. L. 1981. The evolution of coloniality in white-tailed and black-tailed prairie dogs (Sciuridae: *Cynomys leucurus* and *C. ludovicianus*). Ecology 62:252-272.

MacKenzie, D. I., J. D. Nichols, J. E. Hines, M. G. Knutson, and A. B. Franklin. 2003. Estimating site occupancy, colonization, and local extinction when a species is detected imperfectly. Ecology 84:2200-2207.

Menkens, G. E., and S. H. Anderson. 1989. Temporal-spatial variation in white-tailed prairie dog demography and life histories in Wyoming. Canadian Journal of Zoology 67:343-349.

Menkens, G. E., and S. H. Anderson. 1991. Population dynamics of white-tailed prairie dogs during an epizootic of sylvatic plague. Journal of Mammalogy 72:328-331.

Menkens, G. E., D. E. Biggins, and S. H. Anderson. 1990. Visual counts as an index of white-tailed prairie dog density. Wildlife Society Bulletin 18:290-296.

Severson, K. E., and G. E. Plumb. 1998. Comparison of methods to estimate population densities of black-tailed prairie dogs. Wildlife Society Bulletin 26:859-866.

United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS). 2009. State Annual Data Summaries. Available at <http://www.wcc.nrcs.usda.gov>

United States Department of the Interior, Bureau of Land Management (USDI – BLM). 2009. Wildlife survey protocol: Pinedale field office, version 2, April 2009. Available at <http://www.blm.gov/pgdata/etc/medialib/blm/wy/field-offices/ pinedale/wildlife.Par.87771.File.dat/PFOprotocol>.

Wyoming Game and Fish Department (WGFD). 2005. Comprehensive Wildlife Conservation Strategy. Available at <http://gf.state.wy.us/wildlife/CompConvStrategy/index.asp>

Wyoming GAP Analysis. 1996. Land Cover for Wyoming, edition 2. University of Wyoming, Spatial Data and Visualization Center. Available at <http://www.sdvc.uwyo.edu/24k/landcov.html>

Table 1. Status of prairie dog survey points in the Pinedale Anticline study area in 2009.

Survey point status	Number
Prairie dog burrows	67
No prairie dog burrows	
Ground squirrel burrows	78
Old mounds. Closed burrows.	5
Only presence/absence recorded	25
Subtotal	108
Private land (observed from distance)	
Point not visible	3
Prairie dogs observed	3
No prairie dogs observed	3
Subtotal	9
Grand total	184

Table 2. Summary of white-tailed prairie dog colonies mapped in the Pinedale Anticline study area in 2009.

Location	Number of colonies	Total acreage of colonies	Average colony size (acres)	Percent of colonies active	Percent of plot occupied
Core Development Area	17	1483	87	99	3.5
All PAPA	42	4248	101	98	2.3
Reference Area	25	1974	79	100	4.8
All	67	6222	93	98	2.8

Table 3. Area of intersection for mapped prairie dog colonies on public land within the Pinedale Anticline Production Area (PAPA) in 2009 and 2008.

Year	Acreage	Percent of total
2009 and 2008 intersection	3249	53
2009 only	969	16
2008 only	1962	32
2009 and 2008 union	6180	100

Table 4. Comparison of delineated prairie dog colonies among years within public land in the Pinedale Anticline Production Area (PAPA).

Year	Number of colonies	Total acreage of colonies	Avg. colony size (acres)
2009	37	4218	114.0
2008	40	5211	130.3
2007	40	4823	120.6

Table 5. Comparison of delineated prairie dog colonies among years within public land in the Core Development Area within the Pinedale Anticline Production Area (PAPA).

Year	# of colonies	Total acreage of colonies	Avg. colony size (acres)
2009	12	1478	123.2
2008	7	1376	196.6
2007	8	1206	150.7

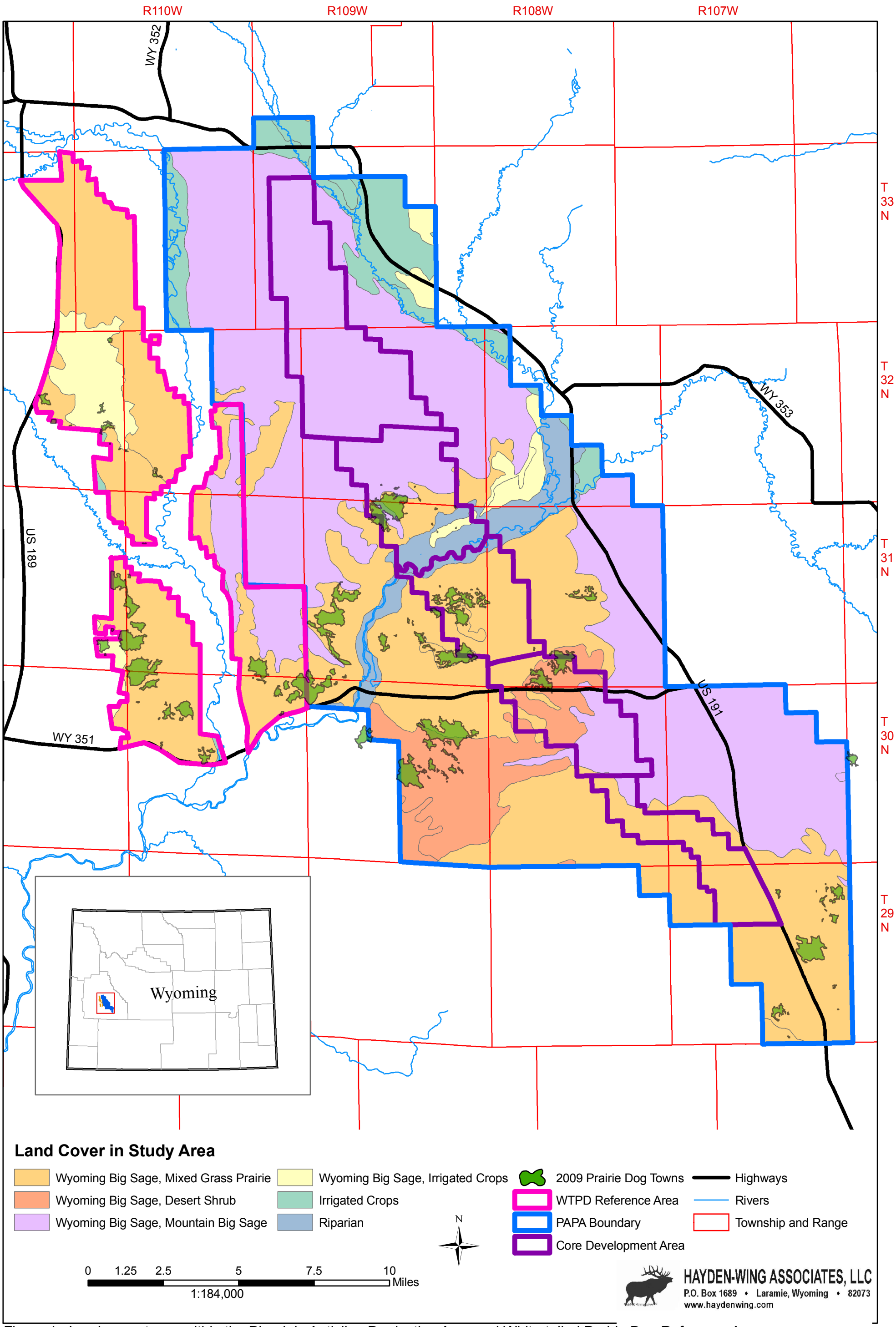

Figure 1. Land cover types within the Pinedale Anticline Production Area and White-tailed Prairie Dog Reference Area (from Wyoming GAP data).

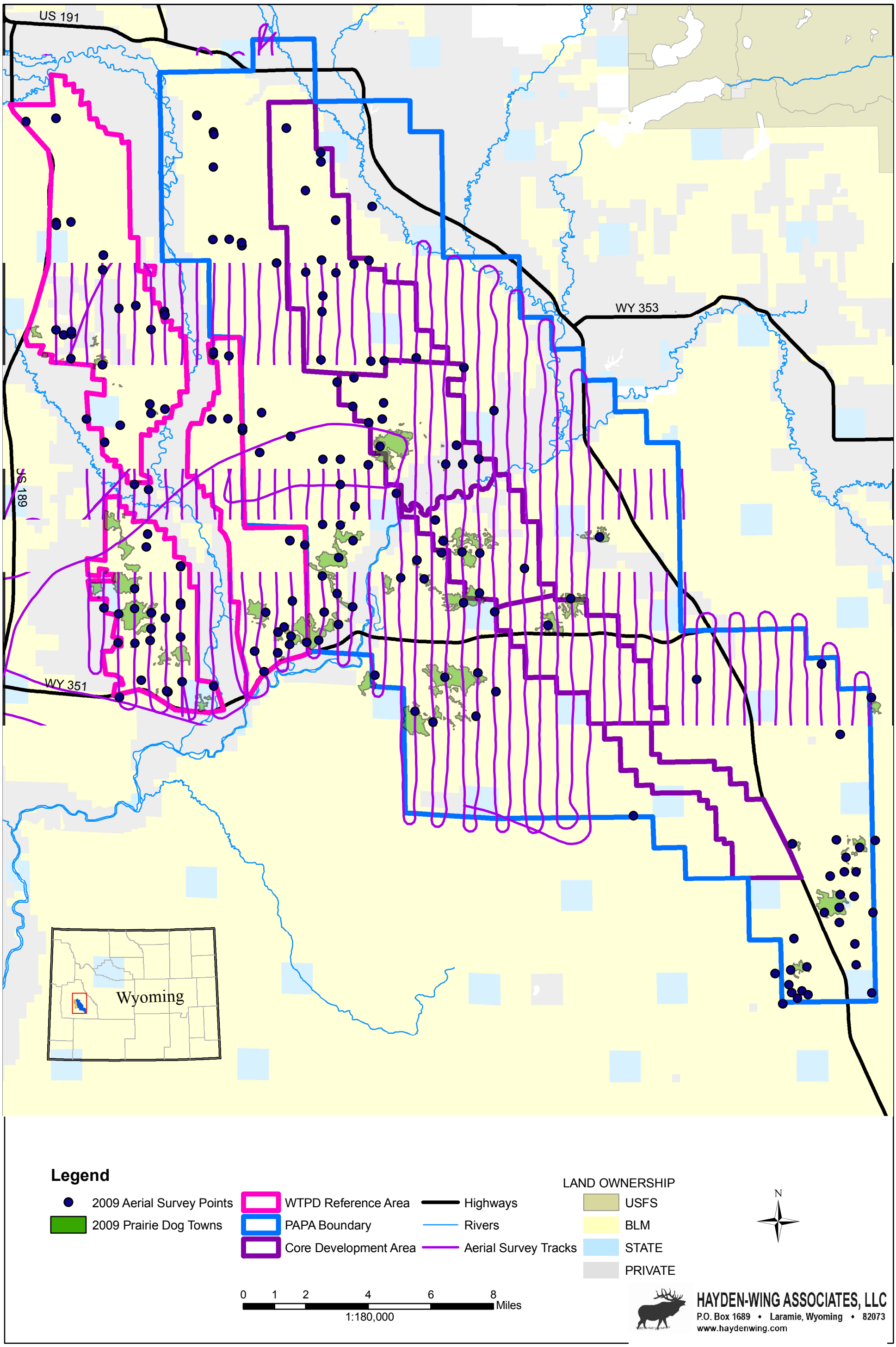

Figure 2. Aerial survey tracks and survey points in the Pinedale Anticline Production Area and White-tailed Prairie Dog Reference Area in 2009.

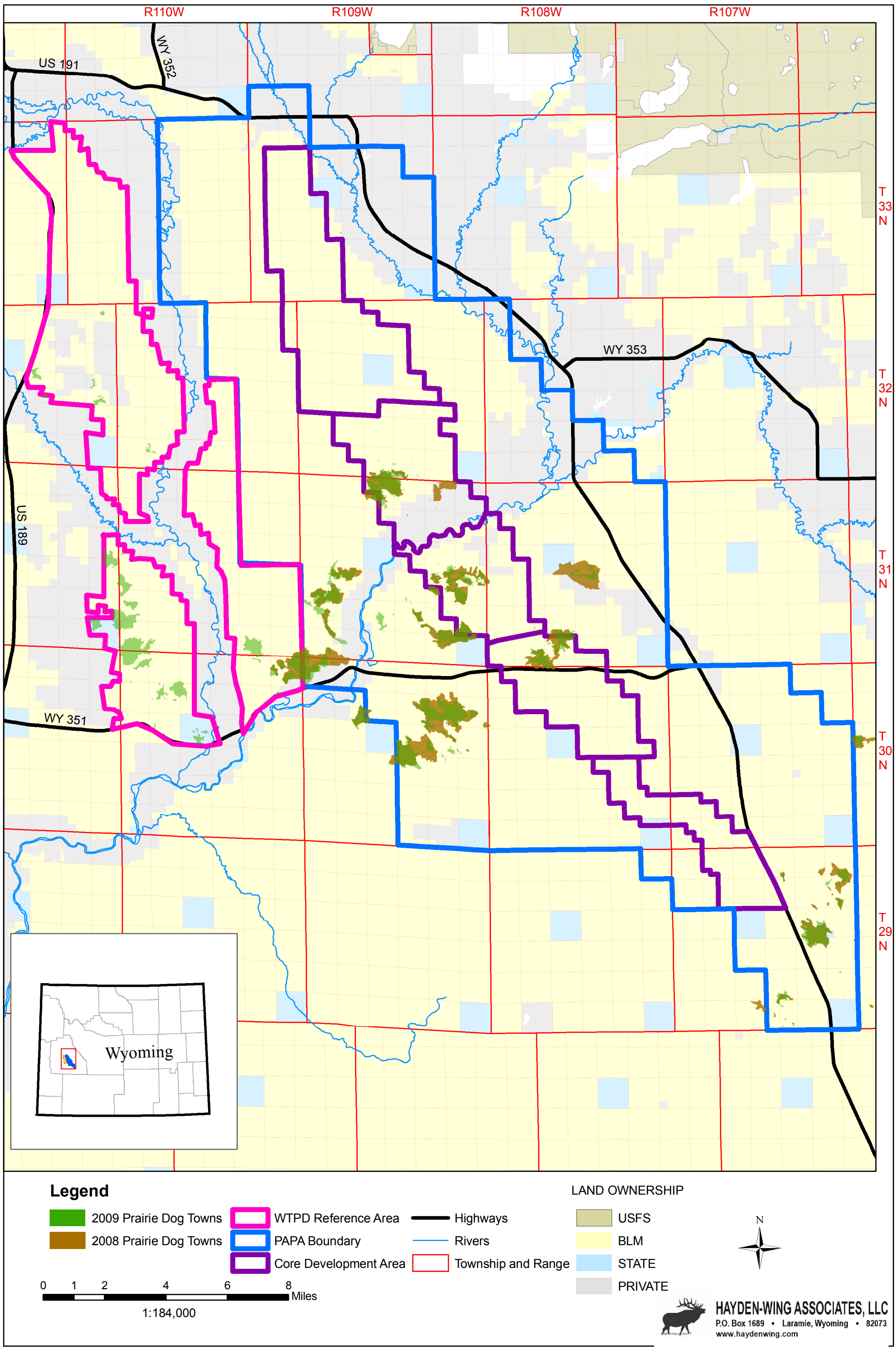

Figure 3. White-tailed prairie dog colonies in the Pinedale Anticline Production Area and White-tailed Prairie Dog Reference Area in 2009 and 2008.

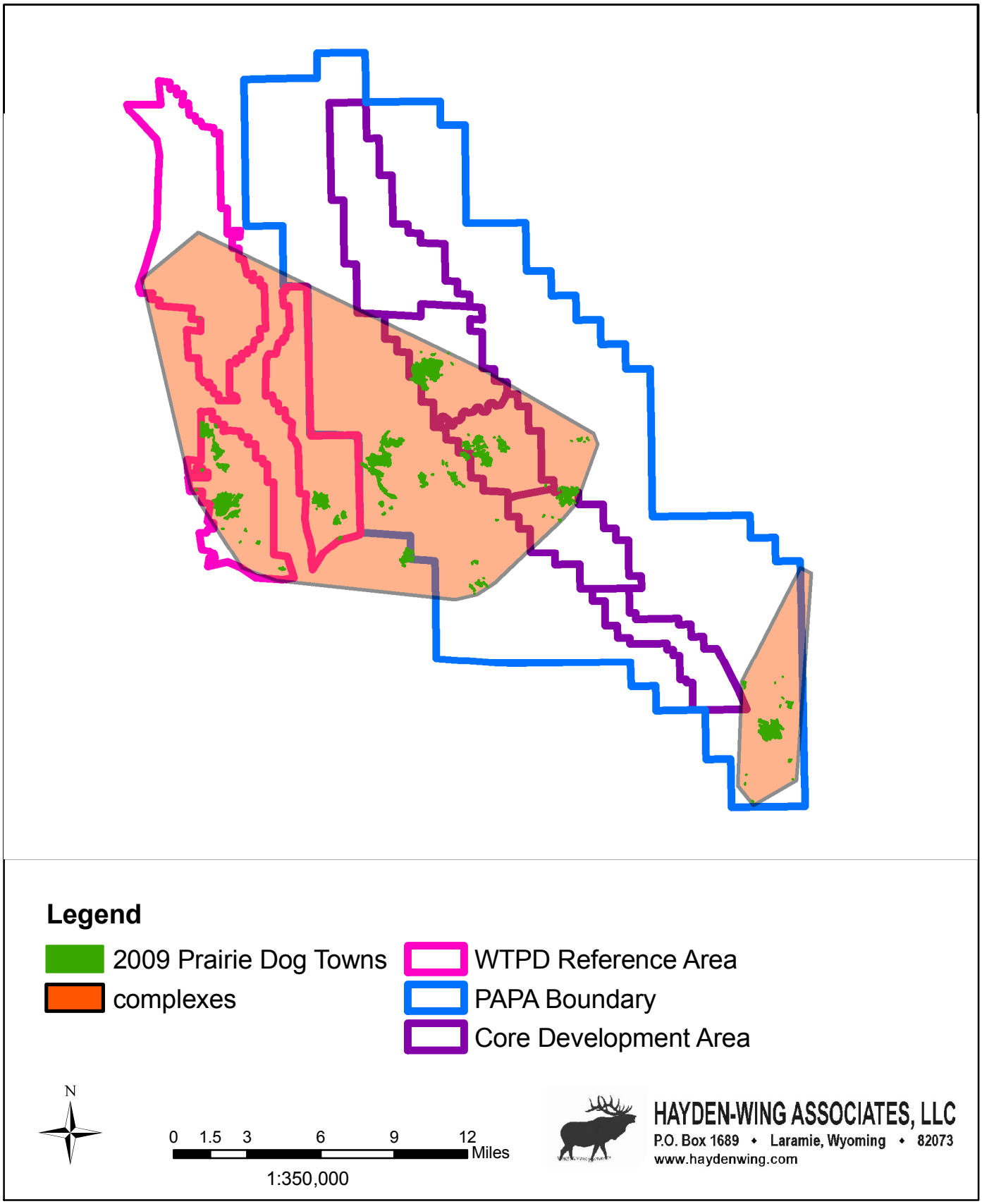

Figure 4. White-tailed prairie dog complexes in the Pinedale Anticline Production Area and White-tailed Prairie Dog Reference Area in 2009.