

2006 MOUNTAIN PLOVER MONITORING IN TAOS COUNTY, NEW MEXICO



Submitted To:

**Bureau of Land Management**

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## EXECUTIVE SUMMARY

A potentially sizeable population of Mountain Plovers (*Charadrius montanus*) resides during the spring and summer on the Bureau of Land Management's (BLM) North Unit in northern Taos County, New Mexico. BLM contracted Hawks Aloft, Inc., to conduct population monitoring studies on the North Unit in 2001. Initial monitoring determined general distribution patterns for Mountain Plovers on the North Unit, but a standardized method of estimating density and population size was needed. In 2005 and 2006, we employed distance sampling at 245 roadside point counts along eight transects. We used DISTANCE 5.0 to estimate a density of 0.019 plovers/ha. Based on a map of Mountain Plover locations (N=285) from 2001-2006 on the North Unit, along with a published estimate of home range size (56 ha), we determined that at least 7,728 ha could be considered occupied habitat. We projected a population size of 146 Mountain Plovers for that portion of habitat. If the entire North Unit is occupied (approximately 50,000 ha), the population estimate could approach 1,000 Mountain Plovers. We suspect that the true population size currently resides between those figures. Although estimated Mountain Plover density on the North Unit is considerably less than densities estimated for populations in other regions, the large size of the North Unit, along with BLM management practices that generally support the continued existence of plovers and prairie dogs, makes this a valuable site for Mountain Plover conservation in New Mexico. The apparent decline in observations from 2005 to 2006 on the North Unit is noteworthy. Continued monitoring at established survey points will help determine the magnitude of any long-term population trends, should they occur.

## INTRODUCTION

Mountain Plovers (*Charadrius montanus*) inhabit short-grass prairies and shrub-steppe habitat in the western Great Plains and the Colorado Plateau (Knopf 1996). Due to concerns over habitat loss and apparent negative population trends (Knopf 1994), the U.S. Fish and Wildlife Service proposed to list the Mountain Plover as threatened (U.S. Department of Interior 1999). Because data indicated that the degree of threats was not significant enough to endanger the species in the future, they withdrew the proposed listing (U.S. Department of Interior 2003). This decision was based, in part, on research documenting the use of cultivated fields by Mountain Plovers (Knopf and Rupert 1999).

Recent population studies in Colorado (Wunder et al. 2003) and Wyoming (Plumb et al. 2005) indicate that the North American population might be 11,000 to 14,000 birds, greater than the 8,000 to 10,000 birds estimated before the proposal to list Mountain Plover (Knopf 1996). Although much of the research contributing to status decisions has focused on core breeding populations, relatively little is known about populations near the edge of the breeding range, such as in New Mexico (but see Tolle 1976, Sager 1996). Determining the size of Mountain Plover populations in New Mexico and monitoring trends can improve global estimates and assist future status decisions.

A potentially sizeable Mountain Plover population exists in Taos County, New Mexico, on land managed by the Bureau of Land Management (BLM). In 2001 and 2003, BLM contracted Hawks Aloft, Inc., to conduct Mountain Plover surveys on the approximately 50,000-ha North Unit. Results from these surveys indicated general plover distribution, as well as probable breeding status for at least some individuals; however, the surveys were not designed to estimate population size or trends. In 2004 and 2005, we

attempted to estimate population size using distance sampling techniques. We used off-road driving transects in 2004, but were unable to approach the minimum sample size of 60-80 observations, as recommended by Buckland et al. (2001), to generate a reasonable population estimate. We modified our approach in 2005, basing our distance sampling on roadside point count surveys. The use of two-track roads on the North Unit improved our coverage of the site, yielding a more reasonable sample. The use of standardized point count surveys also established an easily repeatable framework for monitoring population changes over time. We continued distance sampling at the same survey points in 2006 to estimate population size based on a more robust data set, as well as to explore potential population changes.

## STUDY AREA

We conducted fieldwork on BLM's North Unit, a short-grass plain in northern Taos County, New Mexico, about 15 km north of the town of Tres Piedras (Fig. 1). The approximately 50,000-ha study site extends from Highway 285 east to the Rio Grande gorge, and from Cerro de la Olla north to the Colorado border. The North Unit is grazed by cattle, sheep, elk (*Cervus elaphus*), and pronghorn antelope (*Antilocapra americana*). Vegetation at the site primarily consisted of low stature (<0.25 m tall) blue grama (*Bouteloua gracilis*), prickleaf dogweed (*Thymophylla acerosa*), rabbitbrush (*Chrysothamnus* spp.), winterfat (*Eurotia lanata*), snakeweed (*Gutierrezia sarothrae*), four-winged saltbush (*Atriplex canescens*), and western wheatgrass (*Agropyron smithii*). Although relatively flat, the terrain of the North Unit includes a labyrinth of shallow depressions and crests lined with scattered volcanic rock.

## METHODS

We conducted point counts using Mountain Plover survey guidelines suggested by Williams (1997) and the U.S. Fish and Wildlife Service (1999). Point counts are used to survey a variety of species and habitats (Bibby et al. 2000). This method can work well for Mountain Plovers, because birds are relatively easy to detect in their open habitat when they are present. In 2005, we established 245 survey points along eight roadside transects on the North Unit at 0.3-mile intervals (Fig. 2), as recommended by Williams (1997). We were satisfied with this distance, because we considered that 0.3 miles was far enough to prevent the same individuals from being counted at multiple points and close enough to maximize the number of points we could survey in one morning.



We conducted point count surveys along pre-existing roads in the North Unit.

In 2006, we visited the same 245 survey points, relocating them using Universal Transverse Mercator (UTM) coordinates (Appendix 1). Coverage of these transects (25-35 points each) required eight survey mornings, and we surveyed each transect close to the date they were surveyed in 2005 (four in late April, three in late May, and one in June). April surveys were conducted after the usual spring migration period (see Knopf 1996); therefore, we considered that most, if not all, observed plovers were summer residents of the North Unit. We began surveys within 20 minutes after sunrise and finished within four hours. The observer drove to each point and recorded all Mountain Plovers observed in three minutes. Upon arriving at a point, the observer noted the time and quickly scanned the immediate vicinity before leaving the vehicle. The observer then stepped out of the vehicle and thoroughly scanned every direction. Three minutes were usually enough to complete visual coverage of surrounding habitat; at some points, we needed (and took) more time to complete our scans. We used one lead observer, as recommended by the U.S. Fish and Wildlife Service (1999), and this observer was the same for all points in 2005 and 2006.

We detected Mountain Plovers either by sight or by sound. No conspecific tape playback was used. When a plover was detected, we recorded the distance (in meters) of the bird from the survey point. This distance was an estimation, based on previous training and practice exercises. We assigned a UTM coordinate to each plover observed but did not approach them. Therefore, the coordinates are estimates, based on the survey point coordinates and the estimated distance and direction of the bird from the point. If a plover changed locations during a point count survey, we recorded only its distance and location when first observed. We recorded plovers first observed in flight as flyovers,

unless we strongly suspected that we flushed them from surveyed habitat. In that case, we recorded the distance to where we thought they were disturbed. We noted any additional species observed during point counts and list them in Appendix 2. We also recorded general weather data, including sky conditions and wind speed.

We calculated a detection rate for Mountain Plovers. Detection rates do not measure absolute abundance, but they can be used as a relative measure for comparison among years. We define detection rate as the number of plovers observed divided by the number of points surveyed (245). Mountain Plovers observed between survey points, but not during the point counts, were not included in detection rates. We include these observations in a general distribution map (Fig. 3). We compare the 2006 detection rate with the 2005 detection rate, using 95% confidence intervals.

We estimate density of Mountain Plovers on the North Unit using two methods. First, we calculate density based on the actual area surveyed and the number of plovers detected in that area. For the area surveyed, we included only habitat within 100 m of each survey point. We considered that detectability would be high within 100 m of the survey point and less at greater distances. A 100-m radius circle around 245 survey points corresponded to 769 ha. We divided the number of plovers observed within 100 m by 769 to get an estimate of plovers/ha.

Second, we used program DISTANCE 5.0 (Thomas et al. 1998) to estimate Mountain Plover density, based on our point count data and a model of detection probability as a function of distance. We considered the six models suggested by Buckland et al. (2001), and used in Mountain Plover population studies by Wunder et al. (2003) and Plumb et al. (2005) in Colorado and Wyoming, respectively. These models

included the uniform key function with cosine and simple polynomial expansion series (1 and 2), the half-normal key function with cosine and hermite polynomial expansion series (3 and 4), and the hazard-rate key function with cosine and simple polynomial expansion series (5 and 6). All models were based on data stratified by year. We selected the best model based on Akaike's Information Criterion (AIC). Because AIC only evaluates the strength of competing models relative to each other, we considered goodness-of-fit P values to determine if the models fit the data well. We used continuous distances and truncated the outermost distance from the data. We present our density estimate as the number of birds per hectare.

To estimate population size for the North Unit, we projected our density estimate on a portion of the site considered to be occupied habitat (see Wunder et al. 2003, Plumb et al. 2005). Based on the average plover home range size documented by Knopf (1996), we used ArcGis to generate a grid of 56-ha cells overlaid on a map with plotted location coordinates for all Mountain Plovers observed on the North Unit from 2001-2006. We added the number of cells containing a Mountain Plover location, and we considered the product of the number of cells and the area of each cell (56 ha) to be the amount of occupied habitat. We recorded 285 Mountain Plover locations from 2001-2006, and these locations intersected 138 cells (7 were added in 2006). We multiplied the plover density estimate by the resulting estimate of occupied habitat (7,728 ha) to acquire an estimate of potential population size for Mountain Plovers in occupied portions of the North Unit. Because this area represents only about 15% of the North Unit, and we can not be certain that the remaining portion was unoccupied, we also projected our density estimate on the entire North Unit to estimate a potential upper limit for population size.

## RESULTS

In 2006, we observed 46 Mountain Plovers at 31 different locations in the North Unit (Fig. 3). We observed a single plover at 19 different locations and two or more plovers in close proximity to each other at 12 other locations, indicating possible pairs. We observed fewer Mountain Plovers in 2006 than in 2005 (N=69), 2004 (N=97) or 2003 (N=80). Search effort varied among some years, but the search efforts in 2005 and 2006 were fairly consistent.

We observed 24 Mountain Plovers during point count surveys in 2006 (Appendix 1), yielding a detection rate of  $0.10 \pm 0.05$  birds per point, lower than the  $0.16 \pm 0.05$  birds per point (N=38 plovers) recorded in 2005. In 2006, we observed most Mountain Plovers along transects 5 (points 136-161, N=12, 50%) and 7 (points 187-215, N=9, 38%), on the northwest and southwest portions of the North Unit, respectively (Fig. 2). We observed a similar concentration of Mountain Plovers on these two transects (24 of 38, 63%) in 2005. Although we detected 14 fewer plovers in 2006 than in 2005, the average distance of observed plovers from the survey points was similar between years (122 m in 2005 and 124 m in 2006). In 2006, we observed 10 plovers within 100 m of survey points. Based on a total area of 769 ha within 100 m of all survey points, we estimate a density of 0.013 birds/ha, down from 0.021 birds/ha in 2005.

Based on both years of data (38 observations in 2005 and 24 observations in 2006) we used DISTANCE 5.0 to estimate density and potential population size on the North Unit. The half-normal key expression with cosine series expansion provided the best fit to the detection function, based on lowest AIC. A goodness of fit test indicated that our models fit the data (P=0.51). Our selected model provided a density estimate of

1.9 birds/km<sup>2</sup>, or 0.019 birds/ha (95% confidence interval = 0.012-0.029). Based on 7,728 ha of occupied habitat, we estimate a population size of 146 birds in documented habitat (95% confidence interval = 93-224).

## DISCUSSION

Although there is a considerable Mountain Plover population on the North Unit, our density estimate is smaller than estimates from other regions. Our density estimate of about 2 plovers per square km is lower than estimates of 7.9 plovers/km<sup>2</sup> in South Park, Colorado (Wunder et al. 2003), 6.0 plovers/km<sup>2</sup> in the Pawnee National Grasslands (Graul and Webster 1976), and 4.5 plovers/km<sup>2</sup> in Wyoming (Plumb et al. 2005). Nevertheless, the North Unit is a potentially important site for Mountain Plovers. Covering nearly 50,000 ha, it probably contains one of the largest Mountain Plover populations in New Mexico under a single management authority. The presence of numerous prairie dog colonies and livestock grazing on the North Unit favor the short vegetation structure required by plovers (Dechant et al. 1998). The interest demonstrated by BLM in monitoring prairie dogs and Mountain Plovers on the North Unit is an encouraging sign that populations for both species might remain relatively secure, compared to many other New Mexico sites.

By continuing distance sampling in 2006, we were able to refine our 2005 density estimate and alleviate concerns that an inadequate sample size constrained our previous analysis. We compiled more than sixty observations in 2005 and 2006, thereby meeting the standard of 60-80 observations recommended by Buckland et al. (2001) as a minimum for density estimation. The accuracy of our density estimate might still be

affected by possible bias associated with roadside surveys. Because Mountain Plovers use sparsely vegetated open areas, and have been seen on roads, roadside bias could be positive or negative, if indeed there is a bias. Conducting off-road surveys would remedy any bias, but it would also reduce spatial coverage, thereby limiting our sample of Mountain Plover observations, as we discovered in 2004. Using roads in 2005 provided a considerably greater sample of observations than off-road surveys in 2004, although still fewer than the recommended minimum, and the use of roads also allowed us to better avoid potential disturbance to nesting birds. We continued roadside surveys in 2006, recognizing the value of this standardized search effort for providing a more robust density estimate, as well as exploring potential population changes.

Our population estimate depends greatly on the portion of the North Unit we use to project our density estimate. We considered that 7,728 ha were occupied, based on locations documented from 2001-2006; however, we can not be confident that the remainder of the nearly 50,000-ha North Unit was unoccupied. If Mountain Plovers occupy the entire North Unit at the same density we estimated (0.019 birds/ha), our population estimate would approach 1,000 birds. Many observations were concentrated on a few transects, and three of the eight transects yielded no observations in either 2005 or 2006. Covering habitat with many plovers and habitat with few or no plovers, the eight transects might be fairly representative of the entire North Unit. If this is true, the actual population size might be closer to what could be projected for the entire North Unit (nearly 1,000 plovers) than to what is projected for documented habitat (146 plovers). We suspect that the true population size currently resides between those figures. Future monitoring can improve our knowledge of how Mountain Plovers are distributed at the

site and provide greater confidence in how we project density estimates across the North Unit to determine population size.

Because of the recent attempt to list Mountain Plover as a threatened species (U.S. Department of Interior 1999), and the lack of evidence for threats cited in the withdrawal of the proposed rule (U.S. Department of Interior 2003), it is important to determine if known populations are increasing or decreasing. We have observed fewer Mountain Plovers on the North Unit in each of the last three years, but the decrease in detection rates from 2005 to 2006 is the first apparent decline we have measured with a consistent survey effort. Considerable overlap in confidence intervals indicates some uncertainty over the magnitude of this decline; however, the relatively low number of observations in 2006 is reason for concern, and reason to continue monitoring. Long-term monitoring of established survey points will allow us to place current detection rates in the proper temporal perspective and to more accurately identify population trends.

At the beginning of the 2006 season, we discovered a series of photographs, taken in 2001, of occupied Mountain Plover territories. We attempted to return to these sites in 2006 to photograph evidence of obvious 5-year habitat differences (e.g., vegetation height) that could influence Mountain Plover numbers. Unfortunately, the open terrain with few prominent landmarks made it difficult to relocate with any certainty the 2001 photo points. In 2006, we photographed many sites occupied by Mountain Plovers; we photographed from roads and assigned UTM coordinates to each photo point to facilitate future visual comparisons, if desired (see back page for examples). In the absence of rigorous vegetation sampling, future photo comparisons might provide an informative evaluation of habitat changes and associated changes in Mountain Plover numbers.

## ACKNOWLEDGMENTS

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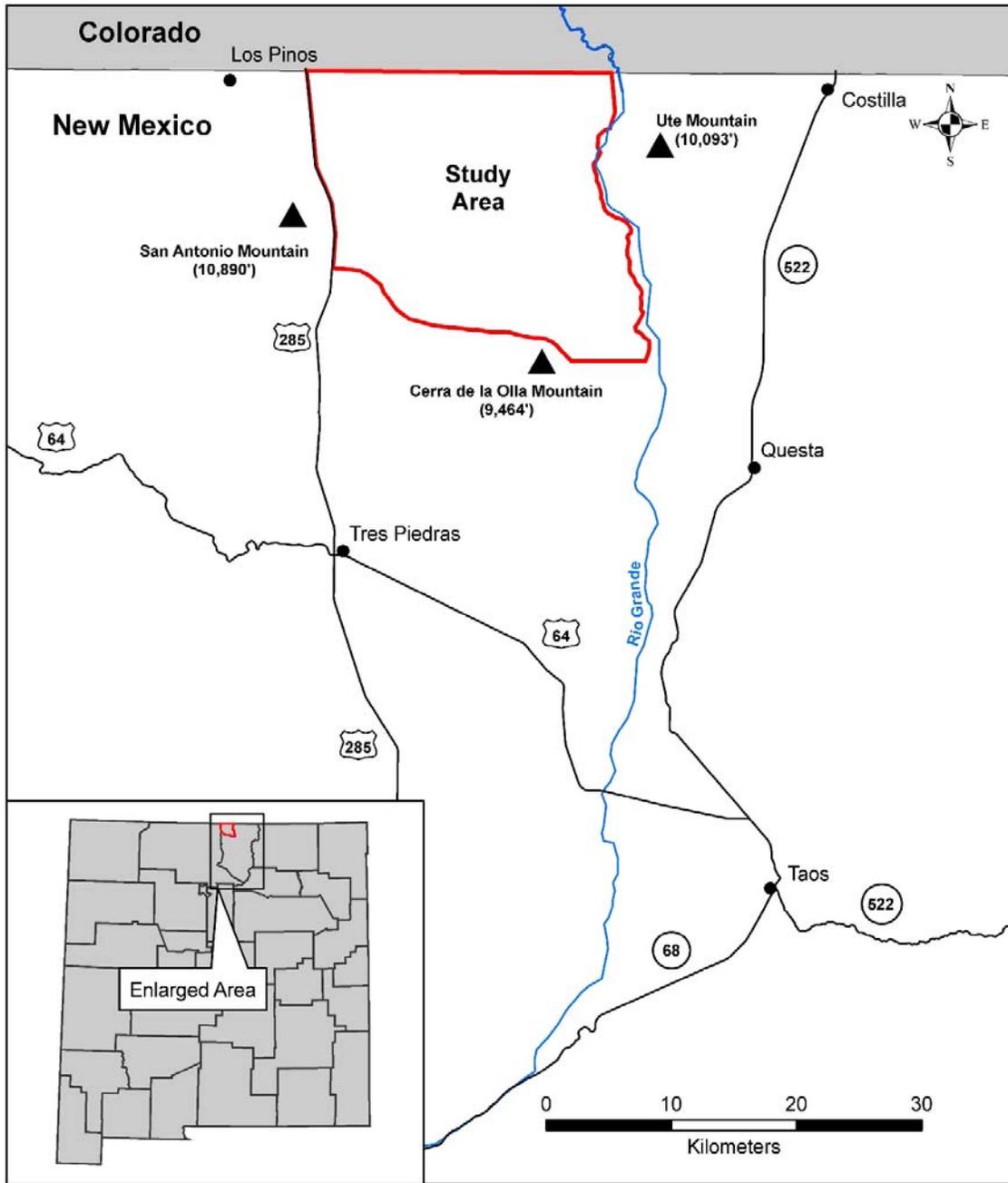


Figure 1. Location of the North Unit Mountain Plover study site, managed by the Bureau of Land Management, in Taos County, New Mexico.

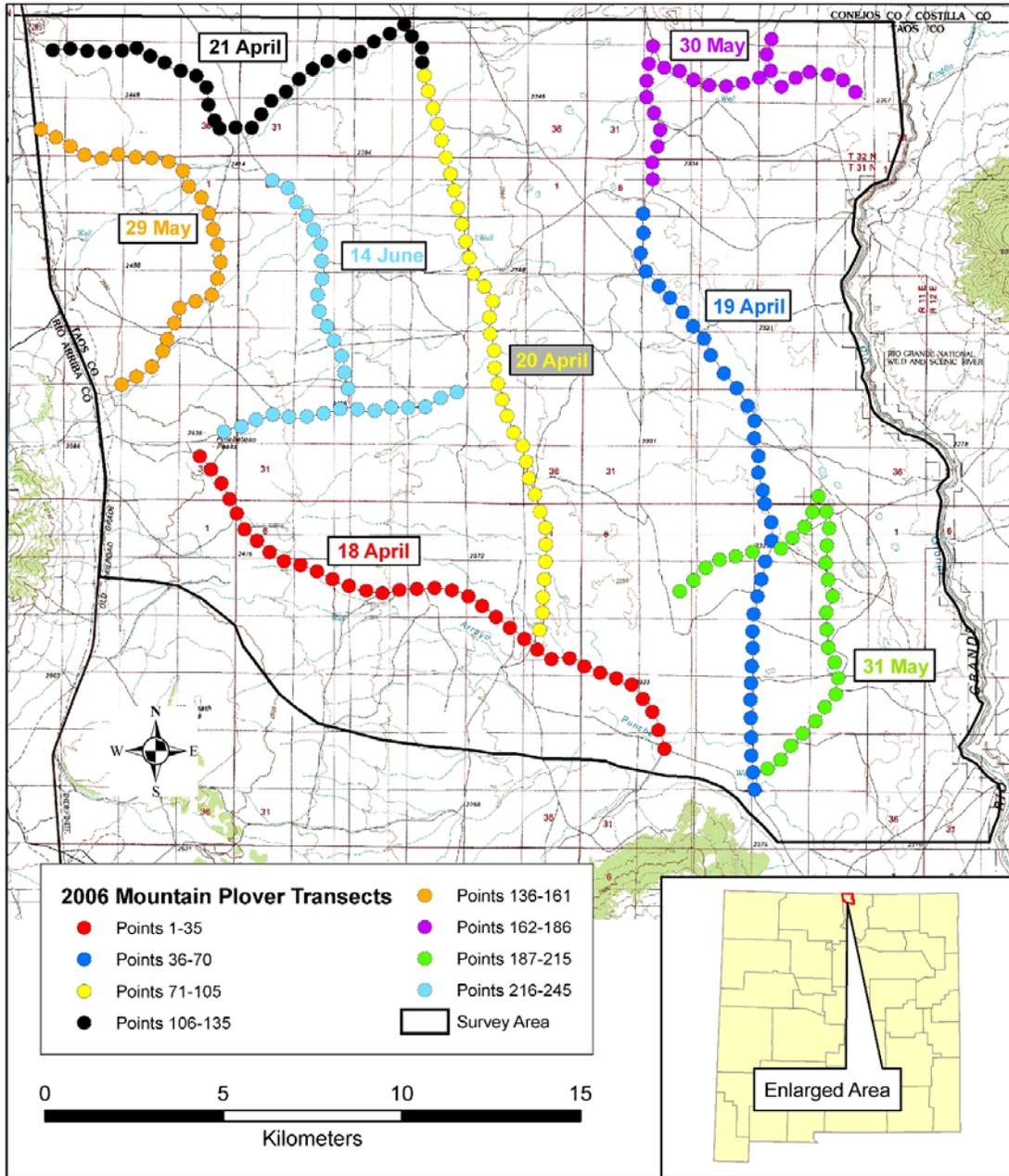


Figure 2. Location of 245 Mountain Plover point count survey stops used in 2005 and 2006 on the North Unit, Taos County, New Mexico.

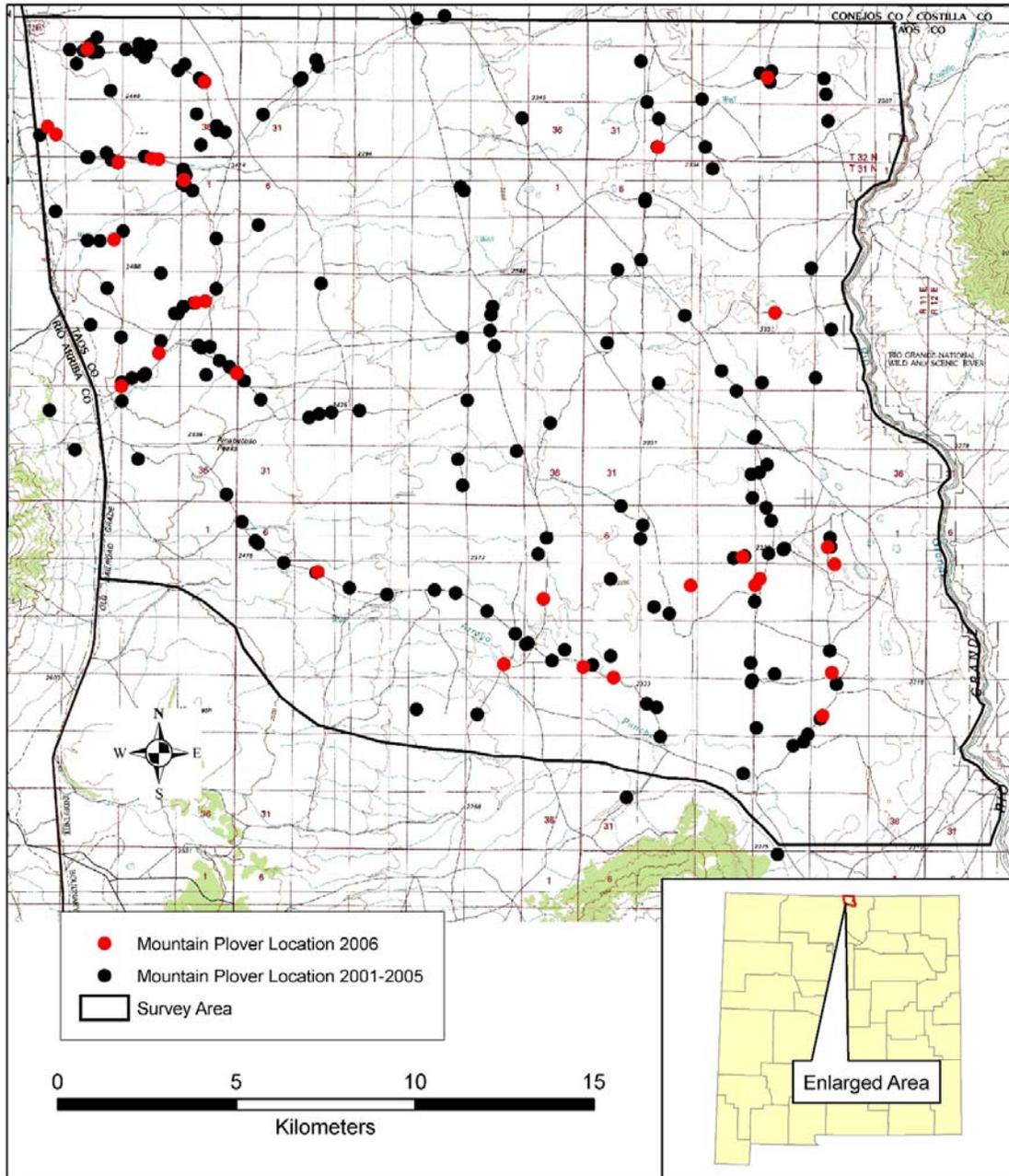


Figure 3. Locations of Mountain Plovers observed in 2006 (in red) and in previous years (in black) on the North Unit, Taos County, New Mexico.

Appendix 1. Universal Transverse Mercator coordinates (North American Datum 27) of Mountain Plover survey points and 2006 results on the North Unit, Taos County, New Mexico.

Transect	Point	Easting	Northing	Survey Date	# Plovers
1	1	429270	4073948	April 18, 2006	0
1	2	429098	4074477	April 18, 2006	0
1	3	428933	4074992	April 18, 2006	0
1	4	428666	4075356	April 18, 2006	0
1	5	428352	4075761	April 18, 2006	0
1	6	427918	4075940	April 18, 2006	0
1	7	427465	4076092	April 18, 2006	0
1	8	427023	4076272	April 18, 2006	0
1	9	426610	4076502	April 18, 2006	0
1	10	426103	4076482	April 18, 2006	0
1	11	425707	4076747	April 18, 2006	0
1	12	425346	4077044	April 18, 2006	0
1	13	424936	4077364	April 18, 2006	0
1	14	424548	4077668	April 18, 2006	0
1	15	424161	4077971	April 18, 2006	0
1	16	423772	4078253	April 18, 2006	0
1	17	423313	4078422	April 18, 2006	0
1	18	422830	4078480	April 18, 2006	0
1	19	422329	4078461	April 18, 2006	0
1	20	421840	4078425	April 18, 2006	0
1	21	421369	4078337	April 18, 2006	0
1	22	420913	4078407	April 18, 2006	0
1	23	420427	4078537	April 18, 2006	0
1	24	419966	4078730	April 18, 2006	0
1	25	419535	4078952	April 18, 2006	0
1	26	419070	4079128	April 18, 2006	0
1	27	418608	4079244	April 18, 2006	0
1	28	418211	4079496	April 18, 2006	0
1	29	417849	4079816	April 18, 2006	0
1	30	417504	4080132	April 18, 2006	0
1	31	417288	4080586	April 18, 2006	0
1	32	417081	4080988	April 18, 2006	0
1	33	416858	4081433	April 18, 2006	0
1	34	416570	4081821	April 18, 2006	0
1	35	416254	4082189	April 18, 2006	0
2	36	431792	4072801	April 19, 2006	0
2	37	431755	4073290	April 19, 2006	0
2	38	431700	4073763	April 19, 2006	0
2	39	431699	4074276	April 19, 2006	0
2	40	431686	4074820	April 19, 2006	0
2	41	431681	4075332	April 19, 2006	0

Transect	Point	Easting	Northing	Survey Date	# Plovers
2	42	431695	4075798	April 19, 2006	0
2	43	431711	4076277	April 19, 2006	0
2	44	431740	4076796	April 19, 2006	0
2	45	431734	4077266	April 19, 2006	0
2	46	431770	4077752	April 19, 2006	0
2	47	431871	4078247	April 19, 2006	0
2	48	431975	4078725	April 19, 2006	0
2	49	432090	4079233	April 19, 2006	0
2	50	432266	4079815	April 19, 2006	0
2	51	432264	4080330	April 19, 2006	0
2	52	432086	4080860	April 19, 2006	0
2	53	432023	4081234	April 19, 2006	0
2	54	431893	4081729	April 19, 2006	0
2	55	431901	4082203	April 19, 2006	0
2	56	431780	4082705	April 19, 2006	0
2	57	431794	4083193	April 19, 2006	0
2	58	431598	4083616	April 19, 2006	0
2	59	431291	4084112	April 19, 2006	0
2	60	430932	4084526	April 19, 2006	0
2	61	430563	4085048	April 19, 2006	0
2	62	430376	4085506	April 19, 2006	0
2	63	430067	4085865	April 19, 2006	0
2	64	429782	4086247	April 19, 2006	0
2	65	429426	4086664	April 19, 2006	0
2	66	429105	4086993	April 19, 2006	0
2	67	428747	4087402	April 19, 2006	0
2	68	428602	4087918	April 19, 2006	0
2	69	428681	4088487	April 19, 2006	0
2	70	428672	4089034	April 19, 2006	0
3	71	425775	4077304	April 20, 2006	0
3	72	425850	4077790	April 20, 2006	0
3	73	425857	4078224	April 20, 2006	0
3	74	425904	4078724	April 20, 2006	0
3	75	425934	4079226	April 20, 2006	0
3	76	425943	4079710	April 20, 2006	0
3	77	425930	4080184	April 20, 2006	0
3	78	425786	4080637	April 20, 2006	0
3	79	425638	4081115	April 20, 2006	0
3	80	425474	4081577	April 20, 2006	0
3	81	425392	4082044	April 20, 2006	0
3	82	425298	4082490	April 20, 2006	0
3	83	425041	4082861	April 20, 2006	0
3	84	424855	4083333	April 20, 2006	0
3	85	424721	4083792	April 20, 2006	0
3	86	424596	4084245	April 20, 2006	0

Transect	Point	Easting	Northing	Survey Date	# Plovers
3	87	424507	4084687	April 20, 2006	0
3	88	424497	4085171	April 20, 2006	0
3	89	424392	4085646	April 20, 2006	0
3	90	424364	4086116	April 20, 2006	0
3	91	424456	4086571	April 20, 2006	0
3	92	424219	4086987	April 20, 2006	0
3	93	423919	4087338	April 20, 2006	0
3	94	423788	4087795	April 20, 2006	0
3	95	423698	4088254	April 20, 2006	0
3	96	423597	4088737	April 20, 2006	0
3	97	423485	4089208	April 20, 2006	0
3	98	423375	4089692	April 20, 2006	0
3	99	423270	4090152	April 20, 2006	0
3	100	423144	4090610	April 20, 2006	0
3	101	423023	4091098	April 20, 2006	0
3	102	422916	4091561	April 20, 2006	0
3	103	422789	4092014	April 20, 2006	0
3	104	422647	4092486	April 20, 2006	0
3	105	422543	4092926	April 20, 2006	0
4	106	412131	4093647	April 21, 2006	0
4	107	412625	4093684	April 21, 2006	0
4	108	413102	4093619	April 21, 2006	2
4	109	413592	4093589	April 21, 2006	0
4	110	414070	4093628	April 21, 2006	0
4	111	414485	4093704	April 21, 2006	0
4	112	414862	4093478	April 21, 2006	0
4	113	415265	4093287	April 21, 2006	0
4	114	415716	4093065	April 21, 2006	0
4	115	416152	4092918	April 21, 2006	0
4	116	416437	4092590	April 21, 2006	1
4	117	416490	4092098	April 21, 2006	0
4	118	416660	4091667	April 21, 2006	0
4	119	416812	4091430	April 21, 2006	0
4	120	417254	4091458	April 21, 2006	0
4	121	417707	4091454	April 21, 2006	0
4	122	417970	4091831	April 21, 2006	0
4	123	418259	4092217	April 21, 2006	0
4	124	418665	4092472	April 21, 2006	0
4	125	419032	4092819	April 21, 2006	0
4	126	419413	4093110	April 21, 2006	0
4	127	419831	4093327	April 21, 2006	0
4	128	420309	4093474	April 21, 2006	0
4	129	420756	4093584	April 21, 2006	0
4	130	421131	4093881	April 21, 2006	0
4	131	421573	4094104	April 21, 2006	0

Transect	Point	Easting	Northing	Survey Date	# Plovers
4	132	421982	4094361	April 21, 2006	0
4	133	422190	4094033	April 21, 2006	0
4	134	422475	4093705	April 21, 2006	0
4	135	422479	4093293	April 21, 2006	0
5	136	414058	4084222	May 29, 2006	2
5	137	414476	4084439	May 29, 2006	0
5	138	414905	4084720	May 29, 2006	0
5	139	415210	4085155	May 29, 2006	3
5	140	415338	4085500	May 29, 2006	0
5	141	415539	4085953	May 29, 2006	0
5	142	415679	4086381	May 29, 2006	0
5	143	416134	4086562	May 29, 2006	1
5	144	416585	4086744	May 29, 2006	0
5	145	416742	4087199	May 29, 2006	0
5	146	416830	4087674	May 29, 2006	0
5	147	416750	4088167	May 29, 2006	0
5	148	416620	4088593	May 29, 2006	0
5	149	416503	4089049	May 29, 2006	0
5	150	416295	4089491	May 29, 2006	0
5	151	415943	4089809	May 29, 2006	2
5	152	415779	4090240	May 29, 2006	0
5	153	415380	4090504	May 29, 2006	0
5	154	414898	4090607	May 29, 2006	1
5	155	414453	4090623	May 29, 2006	0
5	156	413964	4090703	May 29, 2006	2
5	157	413503	4090590	May 29, 2006	0
5	158	413022	4090685	May 29, 2006	0
5	159	412621	4090939	May 29, 2006	0
5	160	412218	4091184	May 29, 2006	1
5	161	411796	4091413	May 29, 2006	0
6	162	428936	4090000	May 30, 2006	0
6	163	428933	4090473	May 30, 2006	0
6	164	429074	4090931	May 30, 2006	0
6	165	429147	4091399	May 30, 2006	0
6	166	428977	4091871	May 30, 2006	0
6	167	428771	4092316	May 30, 2006	0
6	168	428772	4092780	May 30, 2006	0
6	169	428837	4093257	May 30, 2006	0
6	170	428946	4093757	May 30, 2006	0
6	171	429263	4093142	May 30, 2006	0
6	172	429694	4093056	May 30, 2006	0
6	173	430087	4092801	May 30, 2006	0
6	174	430520	4092646	May 30, 2006	0
6	175	430998	4092626	May 30, 2006	0
6	176	431465	4092713	May 30, 2006	0

Transect	Point	Easting	Northing	Survey Date	# Plovers
6	177	431930	4092858	May 30, 2006	0
6	178	432244	4093063	May 30, 2006	0
6	179	432132	4093520	May 30, 2006	0
6	180	432272	4093954	May 30, 2006	0
6	181	432539	4092612	May 30, 2006	0
6	182	432945	4092862	May 30, 2006	0
6	183	433339	4093023	May 30, 2006	0
6	184	433861	4092949	May 30, 2006	0
6	185	434269	4092792	May 30, 2006	0
6	186	434623	4092459	May 30, 2006	0
7	187	432152	4073394	May 31, 2006	0
7	188	432525	4073644	May 31, 2006	0
7	189	432810	4074039	May 31, 2006	0
7	190	433145	4074389	May 31, 2006	0
7	191	433500	4074734	May 31, 2006	1
7	192	433763	4075130	May 31, 2006	0
7	193	434073	4075489	May 31, 2006	0
7	194	434138	4075946	May 31, 2006	1
7	195	434040	4076393	May 31, 2006	1
7	196	433858	4076800	May 31, 2006	0
7	197	433815	4077311	May 31, 2006	0
7	198	433804	4077794	May 31, 2006	0
7	199	433980	4078254	May 31, 2006	0
7	200	433850	4078714	May 31, 2006	0
7	201	433791	4079189	May 31, 2006	1
7	202	433818	4079682	May 31, 2006	2
7	203	433884	4080161	May 31, 2006	0
7	204	433802	4080633	May 31, 2006	0
7	205	433588	4081070	May 31, 2006	0
7	206	433412	4080625	May 31, 2006	0
7	207	433191	4080208	May 31, 2006	0
7	208	432859	4079898	May 31, 2006	0
7	209	432533	4079595	May 31, 2006	2
7	210	431735	4079498	May 31, 2006	0
7	211	431265	4079382	May 31, 2006	0
7	212	430812	4079284	May 31, 2006	0
7	213	430428	4079048	May 31, 2006	0
7	214	430086	4078698	May 31, 2006	1
7	215	429700	4078398	May 31, 2006	0
8	216	416934	4082892	June 14, 2006	0
8	217	417411	4083030	June 14, 2006	0
8	218	417826	4083236	June 14, 2006	0
8	219	418298	4083370	June 14, 2006	0
8	220	418745	4083304	June 14, 2006	0
8	221	419253	4083318	June 14, 2006	0

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Transect	Point	Easting	Northing	Survey Date	# Plovers
8	222	419719	4083408	June 14, 2006	0
8	223	420179	4083526	June 14, 2006	0
8	224	420660	4083522	June 14, 2006	0
8	225	421152	4083477	June 14, 2006	0
8	226	421609	4083576	June 14, 2006	0
8	227	422092	4083568	June 14, 2006	0
8	228	422571	4083592	June 14, 2006	0
8	229	423000	4083838	June 14, 2006	0
8	230	423452	4084000	June 14, 2006	0
8	231	420408	4084097	June 14, 2006	0
8	232	420298	4084552	June 14, 2006	0
8	233	420219	4085021	June 14, 2006	0
8	234	420010	4085460	June 14, 2006	0
8	235	419813	4085856	June 14, 2006	0
8	236	419594	4086282	June 14, 2006	0
8	237	419545	4086750	June 14, 2006	0
8	238	419678	4087198	June 14, 2006	0
8	239	419661	4087692	June 14, 2006	0
8	240	419636	4088189	June 14, 2006	0
8	241	419446	4088574	June 14, 2006	0
8	242	419240	4088971	June 14, 2006	0
8	243	418960	4089346	June 14, 2006	0
8	244	418716	4089757	June 14, 2006	0
8	245	418280	4089972	June 14, 2006	0

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Appendix 2. Alphabetical list of 27 bird species detected during Mountain Plover surveys on the North Unit, Taos County, New Mexico in 2006.

Common Name	Scientific Name
American Kestrel	<i>Falco sparverius</i>
Brewer's Sparrow	<i>Spizella breweri</i>
Burrowing Owl	<i>Athene cunicularia</i>
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>
Common Nighthawk	<i>Chordeiles minor</i>
Common Raven	<i>Corvus corax</i>
Cooper's Hawk	<i>Accipiter cooperii</i>
Ferruginous Hawk	<i>Buteo regalis</i>
Golden Eagle	<i>Aquila chrysaetos</i>
Hairy Woodpecker	<i>Picoides villosus</i>
Horned Lark	<i>Eremophila alpestris</i>
Mountain Bluebird	<i>Sialia currocoides</i>
Mountain Plover	<i>Charadrius montanus</i>
Mourning Dove	<i>Zenaida macroura</i>
Northern Flicker	<i>Colaptes auratus</i>
Northern Harrier	<i>Circus cyaneus</i>
Northern Mockingbird	<i>Mimus polyglottos</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
Rock Wren	<i>Salpinctes obsoletus</i>
Sage Thrasher	<i>Oreoscoptes montanus</i>
Sharp-shinned Hawk	<i>Accipiter striatus</i>
Swainson's Hawk	<i>Buteo swainsoni</i>
Townsend's Solitaire	<i>Myadestes townsendi</i>
Turkey Vulture	<i>Cathartes aura</i>
Vesper Sparrow	<i>Pooecetes gramineus</i>
Violet-green Swallow	<i>Tachycineta thalassina</i>
Western Bluebird	<i>Sialia mexicana</i>



Some Mountain Plover territories contained relatively tall vegetation (above, 427824-4076011, NAD 27), yet many plovers were observed in bare, rocky scrapes with sparse grass cover (below, UTM 414058-4084222, NAD 27).

