Mountain Plover Population Trends In Central and Northeastern Montana

BY:

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ABSTRACT

Permanent point count transects were established in 1992 in central, northeastern and southwestern Montana to monitor mountain plover (*Charadrius montanus*) population trends in these areas. At the time, these were considered to be Montana's 2nd, 3rd and 4th largest mountain plover populations. During the 23 year period from 1992 to 2014, these transects were surveyed during 10 different years with the last counts for the Central and Northeastern Montana Study Areas occurring in 2014, and the last count for the Southwestern Montana Study area occurring in 2004. The count of adult mountain plovers in the Central Study Area declined in a saw-tooth manner from 103 adult birds in 1992 to 13 birds in 2014. In the Northeastern Study Area, mountain plovers counted along the transect started at 17 in 1992, peaked at 36 in 1996, dipped to 12 in 2004, and ended with a final count of 17 in 2014. Mountain plover numbers in the Southwestern Study Area progressively declined from a high of 33 adult birds in 1992 to no birds found in the Study Area in 2004. Cause of mountain plover decline in the Central Study Area was attributed to conversion of native grasslands to cultivated cropland and introduced grasses, a drastic decline in domestic sheep numbers, and an overall reduction in livestock grazing. In the Southwestern study area, the collapse of the mountain plover population was attributed to a housing development, a log home factory, poisoning of prairie dogs, and the lack of livestock grazing. The Northeastern Study Area was almost entirely public lands, and habitat conditions have been relatively stable. Mountain plovers in this study area are associated with bentonitic soils with low plant production and high amounts of bare soil. In the other 2 study areas, mountain plovers were found primarily on private land and were associated with intensively grazed sites and black-tailed prairie dog (*Cynomys ludovicianus*) colonies.

INTRODUCTION

Since the late 1980s, there has been concern about the population status of mountain plovers across their breeding range in the western United States (Leachman and Osmundson 1990). The annual U.S. Fish and Wildlife Service (USFWS) breeding bird surveys from 1963 through 1993 showed a 3.7 percent annual decline in mountain plover numbers, representing a 63 percent overall population decline during that 30 year period (Knopf and Rupert 1999). From 1994 to 2009, the breeding bird surveys suggest a lower rate of decline of 1.1 percent per year (USFWS 2011). For the past 2 decades, the mountain plover has been periodically listed as a candidate species as well as been proposed for listing under the Endangered Species Act as threatened. This history of changing conservation status is really quite unique, and is not often seen with other rare vertebrate species.

In 1999, the U.S. Fish and Wildlife Service proposed listing mountain plovers as "Threatened" based on a declining population trend from Breeding Bird Survey data (about 3.7% per year (USFWS 1999)). This listing effort was undertaken fully by the USFWS as opposed to being

petitioned for listing by an outside group. The listing effort was unusual and was based out of the Lakewood, Colorado USFWS office which apparently did not have full authority to officially list species. As a result, the listing effort was reinstated, but not before an administrative change in Washington D.C. In September of 2003, the USFWS subsequently decided to withdraw the proposed listing of the mountain plover (USFWS 2003). In November 2006, Forest Guardians and the Biological Conservation Alliance sued the USFWS over the withdrawal of the proposal to list the mountain plover as Threatened (*Forest Guardians, et al. v Ken Salazar et al.*, Case No. 3:06-cv-02560-MMA-BLM), and in August 2009, the USFWS agreed to submit a notice in the Federal Register re-opening the proposal to list the mountain plover and provide opportunity for public comment. On 11 May 2011, the USFWS announced the mountain plover did not warrant protection under the ESA citing that about 20,000 plovers remained rather than the previously estimated 11,000-13,000 adult birds (USFWS 2011). In their decision notice, the USFWS noted that the larger population size was not related to increasing numbers of birds, but rather a better accounting of bird numbers.

A common criticism of the Breeding Bird Survey data is that it is insensitive to changes in rare species abundance, and may substantially over or under estimate overall population change because of sampling bias. For example, so few mountain plovers were detected in Montana on Breeding Bird Survey routes, the USFWS did not project a state-wide trend in their 2011 decision notice to not list the plover (USFWS 2011). Knopf (2008) in 1990 decided to establish permanent point count transects for mountain plovers in the Pawnee National Grassland (PNG) in northeastern Colorado which was considered the species stronghold at the time, and in southern Phillips County, Montana which also contained a significant population of plovers associated with black-tailed prairie dogs. In 1992, Knopf encouraged us to establish similar permanent point count transects for mountain plovers in 3 other Montana areas where we had documented mountain plover occurrence (FaunaWest 1991), and he provided us details of how to establish permanent point counts similar to his effort.

In 1992, we developed routes along public roads through 3 mountain plover use areas in central, northeastern and southwestern Montana, and placed permanent point count stations along these routes. From 1992 to 2004, we surveyed these census routes for mountain plovers a total of 9 times. During this time period we documented the loss of mountain plovers from southwestern Montana, a slow decline of plovers in central Montana, and fluctuating numbers of plovers in northeastern Montana. During the summer of 2014, we were able to resurvey the routes through central and northeastern Montana. This report summarizes the results of the 2014 survey effort.

STUDY AREAS

Figure 1 is a list of known mountain plover populations found since 1991 in Montana, their habitat association and population status, and Figure 2 shows the general location of areas where mountain plovers have been observed in Montana since 1991. During 2014, mountain plover trend counts were only conducted in the Central and Northeastern Montana Study Areas (Areas 2 and 3 in Figure 2).

Population Area	Habitat Association	Population Status
1. Phillips, Blaine, N. Fergus & N. Petroleum Counties	Grasslands: Prairie dog colonies & some use of barren areas with glacial till	In 1991, this was the probably the largest mountain plover population. Plovers were found in 18-53% of the prairie dog colonies & in 69% of prairie dog acreage. Mountain plovers remain, but greatly reduced from pre-plague numbers in the 1980s.
2. Wheatland, Golden Valley, & Musselshell Counties (Central Study Area)	Grasslands: Stockwater sites grazed by sheep and cattle. Also in a few prairie dog colonies	118 adults counted in 1992 (includes birds between census stations.) Only 14 adults observed in 2014. Population in collapse.
3. Valley County (Northeastern Study Area)	Dwarf shrub communities associated with silty overflow sites and bentonitic soils	39 adults counted in 1996 in peak year. Plovers remain in this area in low numbers in 2014.
4. Jefferson, Madison, & Broadwater Counties (Southwestern Study Area)	Grasslands: Prairie dog colonies, and stockwater sites grazed by cattle	35 adults counted in 1992. Population considered extirpated by 2004.
5. Treasure & Rosebud Counties	Grasslands: Prairie dog colonies, dwarf shrub communities associated with silty overflow sites and bentonitic soils	64 adults counted in 1998. Population status unknown in 2014, but plague has decimated prairie dog colonies.
6. Carter County	Dwarf shrub communities associated with silty overflow sites and bentonitic soils	Plovers found here 1994-1997 with 2 adults counted in 1995 the most observed. 2014 status unknown.
7. Carbon County	Dwarf shrub communities and blue grama flats	Plovers recorded here 1996-1998, 2003 -2005 with 3 adults counted in 1997 and 6 adults in 2005. Nests and broods were observed in 1998, 2003 and 2005. No plovers were observed in 2014.
8. Teton County	Grasslands: Ridge grazed by sheep	6 adult birds reported using the area prior to 1996. No birds found in 1996 and 1998. Population persumed extirpated.
9. Toole County	Grasslands: Grazed by cattle and Richardson's ground squirrels	2 adults counted in 1996 No birds found in subsequet surveys in 1997 and 1998. Population persumed extirpated.

Figure 1: List of known mountain plover populations found since 1991 in Montana, their habitat association and population status.

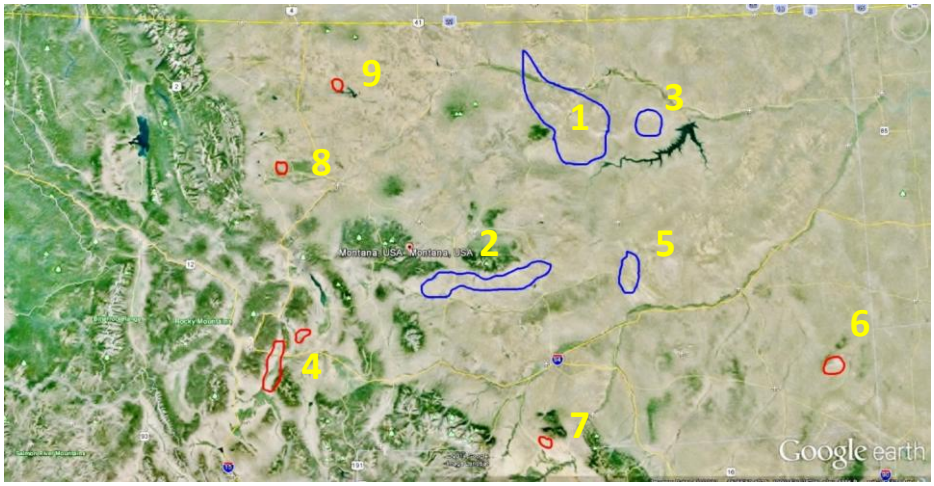

Figure 2: Known areas with mountain plover populations in 1991. Areas in red designate populations thought to be extirpated while those in blue are believed to currently have mountain plovers. Map numbers correspond to populations listed in Figure 1.

The Central Study Area

The Central Study Area was located along the southern benches of the Little Belt, Big Snowy and Little Snowy Mountain Ranges (Area 2 in Figure 2) in central Montana, and occupied an area of approximately 2,565 km^2. Landownership was almost entirely private with a normal complement of State lands (2 sections per township). The only exception was the eastern portion which included some Federal lands managed by the Bureau of Land Management (BLM) and USFWS. These 2 Federal land holdings each contained a black-tailed prairie dog colony used by mountain plovers. The elevation within this study area ranged from 1100 -1700 m.

The major native habitat in this study area was the needle-and-thread grass (*Stipa comata*)/blue grama (*Bouteloua gracilis*) habitat type (STCO/BOGR) (Mueggler and Stewart 1978). Dominant plant species included needle-and-thread grass, blue grama, threadleaf sedge (*Carex filifolia*), June grass (*Koeleria cristata*), fringed sagewort (*Artemisia fridgida*), fleabane (*Erigeron* spp.), and tufted milkvetch (*Astrasgalus spatulatus*). At higher elevations, scattered bunches of blue bunch wheatgrass (*Agropyron spicatum*) occurred within the STCO/BOGR habitat. Vegetative height at heavily grazed sites in this study area were generally less than 10 cm, while at ungrazed to moderately grazed sites it ranged from 10-20 cm. The western wheatgrass (*Agroupyron smithii*)/blue grama habitat type (AGSM/BOGR) occurred in heavily grazed valley bottoms. This habitat type in the Central Study Area contained very little big sagebrush (*Artemisia tridentata*).

Topographically, this study area consisted of broad gravel ridges or benches extending south from the Little Belt and Snowy Mountain Ranges. This topographic condition extended from Haymaker Creek on the west all the way to the eastern terminus of the Little Snowy Mountains,

a distance of 106 km. In some areas, these ridges were poorly defined and appeared to be more like alluvial fans. Where ridges were well developed, they were separated by broad valleys. Ridges, alluvial fans, and valleys in this area were all inclined 1-2%, sloping southward away from the mountains for a distance of 16-24 km. At the southern margins of the ridges in Golden Valley and Musselshell Counties, soils changed from limestone gravels to heavy clays derived from shale, and the topography became more dissected by drainages. Seven black-tailed prairie dog colonies were located along this transition zone. Approximately 9% of the land around census stations had been disturbed by agriculture in 1992 when the trend count transect was established, and by 2014, 27% of the area was disturbed by agriculture. However, since we specifically sited our census stations in areas of native grasslands, the actual amount of land disturbed by agriculture across the entire study area was actually much greater than this. In 1992, we estimated that 34% of the landscape across the entire study area had been altered by agriculture.

The Northeastern Study Area

The Northeastern Study Area was located 24 km southwest of Glasgow in northeastern Montana, and comprised about 648 square km (Area 3 in Figure 2). Land ownership in this study area was almost entirely Federal and State, and included the entire Little Beaver Creek drainage and portions of Miller Coulee and Brazil, Sagehen, and Lone Tree Creeks. This study area had extensive bentonite deposits, some of which were previously mined (a minimum of 10 mined sites). The physiography of the area consisted of broad (> 0.8 km across) low gradient (< 1% slope) valley bottomlands with deeply incised drainages, gently sloping ridge sides with exposed shale and bentonite deposits, and narrow, relatively level ridge tops. Elevation of the study area ranged from 682-804 meters.

The valley bottomlands in the Northeastern Study Area were dominated by silty overflow range sites. These were areas where sheet-flow water occurs during intense rain storms and deposits fine bentonite alluvium to form barren light colored hardpan soils. Vegetation on these hard pan soils was sparse and dominated by Nuttall's saltbush (*Atriplex nuttalli*), plains prickly pear cactus (*Opuntia polycantha*), Nuttall's alkali-grass (*Puccinella nuttalliana*), and blue grama. Big sagebrush and western wheatgrass were also present in these areas. We refer to these silty overflow range sites as the ATNU habitat type. Within these hardpan areas were hummocks of soils dominated by blue grama.

The riparian habitat associated with the incised drainages through these sites were dominated by silver sagebrush (*Artemisia cana*) and western wheatgrass, and there were virtually no plains cottonwood trees (*Populus deltoides*) or willows (*Sallix* spp.) in these drainages. Generally, there were gentle rises on either side of the valley bottoms dominated by almost pure stands of yellow eriogonum (*Eriogonum flavum*) and Richardson's rubberweed (*Hymenoxys richardsonii*). We referred to these sites as the ERFL habitat. The ATNU and ERFL habitat types had an extremely low vegetative height profile of <10 cm and a high percentage of bare-ground (around 90%).

Many of the ridge sides in this study area were dominated by creeping juniper (*Juniperus horizontalis*), elk sedge, (*Carex geyeri*), western wheatgrass and prairie sandgrass (*Calamovilfa longifolia*). We refer to these sites as the JUHO habitat type. The vegetative height profile of the JUHO habitat type was variable, but generally ranged from 10-25 cm. Slopes on these sites were 5-10%.

Other ridge sides in the study area had exposed bentonite deposits. These areas were nearly devoid of vegetation and we referred to them as bentonite barrens. Ridge tops in the Northeastern Study Area were dominated by western wheatgrass, blue grama, and scattered big sagebrush. We refer to these sites as the AGSM/BOGR habitat type. A shallow layer of glacial till covered the ridges, and was characterized by frequent areas of coarse gravel, small coble and hardpan soils. The glacial till was also found to a lesser extent in the valley bottoms and on the ridge sides. Nuttall's saltbush became locally abundant in some of these hardpan sites. Overall, this study area had extremely depauperate plant communities.

During the 1950s and 1960s, the BLM constructed many trans-valley detention dams and spreader dikes in Little Beaver Creek, Lone Tree Creek and adjacent drainages to reduce the frequency and intensity of flash floods. In addition, many of the bottomland areas dominated by the ATNU and ERFL habitat types were contour furrowed during this period and planted to crested wheat grass (*Agropyron cristatum*). Approximately half of the potential mountain plover habitat in this study area was lost at this time due to these range improvement projects. At present, many of the detention dams have silted in and the dam structures have been breached by flood events. The large mud flats remaining behind the dams are dominated by squirrel-tail grass (*Hordeum jubatum*) and Mexican dock (*Rumex mexicanus*).

METHODS

During 1991, several areas with previous records of mountain plover observations were surveyed for mountain plover occurrence (FaunaWest 1991). Phillips County (Area 1 in Figure 1) with a known mountain plover population was excluded from this survey at the request of the Bureau of Land Management – which was the primary funding agency of the survey. The Central, Northeastern and Southwestern Montana Study Areas were identified at this time as areas with mountain plover populations that would be suitable for long-term monitoring.

Transect Placement

In 1992, trend count transects were established in each study area. The routes through the study areas and the actual census stations for the trend count transects were determined after carefully surveying each of the study areas for mountain plover occurrence in May and June 1992. The census stations were established at sites where mountain plovers were either observed, or at sites that appeared to contain suitable habitat for mountain plovers even though no mountain plovers

were observed at the site. These trend count transects consisted of a series of permanent point count census stations.

Initially there were 90 census stations in the Central Study Area and 70 census stations in the Northeastern Study Area, but 2 census stations in the Northeastern Study Area were dropped from the transect due to a washed out road (mountain plovers were never seen at these stations during the years they were surveyed). Mountain plovers were found at only 7 sites in the Southwestern Study Area, so the census in this area was not directly comparable to the other 2 study areas.

All census stations were placed along public roads with legal access. Initially the location of the census stations was based on a legal description with a written description of the location. In the Central Study Area, readily identifiable features along the roads were used to locate the census stations (e.g. cattle guards, culverts, stock tanks, road signs, road intersections, homesteads, etc.). In the Northeastern Study Area, we used similar descriptions but the roads were not surfaced with gravel or well maintained, and we placed piles of rock at many of the census stations. Once GPS became available, all the census stations were given a latitude/longitude coordinate. Appendix A lists the latitude and longitude coordinates of each census station.

In 1992, when we set up the permanent census transect across the Central Study Area, we recorded the habitat (i.e. native grass, introduced grass, cultivated wheat) surrounding each of the census stations. In 2014, we again recorded the habitat at the census stations. Since most of the stations were located on section lines along roads, it was relatively easy to designate a northeast, southeast, southwest and northwest quarter at each census station, and record the habitat in each quarter quadrant. For the 90 census stations, there were a total of 360 quarter quadrants where we recorded the habitat.

Transect Counts

Mountain plovers were counted at each permanent census station either from, or standing next to, a parked vehicle. A 10 minute scan of the surrounding area was made with binoculars and a spotting scope. All mountain plovers observed in the vicinity of the census station were counted and recorded. Due to irregularities in topography and vegetative height, the radius of the survey area at each census station varied considerably between census stations and study areas.

In the Central Study Area, changes in land use (e.g. farmed vs. not farmed, grazed vs. not grazed) were common. Similarly, in the Northeastern Study Area, slight undulations in topography frequently resulted in “blind spots” within the area scanned with binoculars. As a result of these issues we did not attempt to extrapolate a mountain plover density estimate for each of the study areas. However, because the census stations were permanent, these issues were relatively consistent between years, and changes in mountain plover numbers were considered reflective of changes in overall numbers of mountain plovers in each study area.

Survey Frequency

The census routes in the Central and Northeastern Study Areas were surveyed in 1992, 1994-2000, 2004 and 2014 for a total of 10 times in 23 years. The Southwestern Study Area was surveyed 1992-2000 and 2004, but it was not surveyed in 2014 because the population appeared to be extirpated in 2004. Generally we tried to conduct the surveys in late June and early July when most mountain plovers had completed nesting and were accompanied by broods. This time period also preceded the departure of mountain plovers from the study areas for their annual migration.

In this report, the term "population" is used in reference to a local group of breeding mountain plovers within a specified area. It does not imply that the group of birds is genetically distinct, reproductively isolated or otherwise unique. We have no data concerning dispersal and movement between breeding mountain plover populations in Montana, nor how these individual birds might segregate or mix in wintering areas or during migration.

RESULTS

Mountain Plover Census Results for the Central Study Area

The 2014 census count of the Central Montana Study Area resulted in observations of 13 adult mountain plovers at 4 of the 90 census stations. Six of these mountain plovers were observed at the 2 prairie dog colonies at the east end of the study area. Six mountain plovers were observed in an area with a cluster of homestead buildings that has been consistently used by mountain plovers throughout the survey period. This group of plovers was accompanied by a single chick. The other adult plover, and the only one observed west of Highway 191, was on Jenkins Lane in an area where we have previously observed many mountain plovers associated with flocks of sheep. This bird was accompanied by a downy chick. Thus, with only 2 broods observed, the average number of chicks per brood was 1.0. We did note that mountain plovers on each of the prairie dog colonies exhibited distraction displays suggesting that they had chicks. We observed only 1 mountain plover between survey stations in 2014 and that was between stations 79 and 80 at the homestead cluster.

Mountain Plover Census Results for the Northeastern Study Area

Seventeen adult mountain plovers were observed at 11 of the 68 census stations along the survey route. Overall, in July 2014, we observed 62 mountain plovers representing 36 separate observations. Forty-eight of the birds were classified as adults and 14 were chicks representing 9 broods (1.55 chicks per brood). Some of these observations could have been the same birds observed on 2 different days while we were conducting other work in this area. The actual total number of adult mountain plovers observed would be less than 48.

DISCUSSION

Central Study Area

Overview

The Central Study Area was previously considered to be Montana's second largest mountain plover population after the Phillips/Blaine Counties population. Historically, Silloway (1903) described the mountain plover as being a regular summer resident in Fergus County, Montana from May through September. At this time, Fergus County included all or parts of Judith Basin, Wheatland, Golden Valley, and Musselshell Counties. However, by 1981, Watts and Eichhorn noted that 4 bird species associated with short grass prairie in this area (the mountain plover, burrowing owl (*Athene cunicularia*), long-billed curlew (*Numenius americanus*), and grasshopper sparrow (*Ammodramus savannarum*)) were much reduced from Silloway's description.

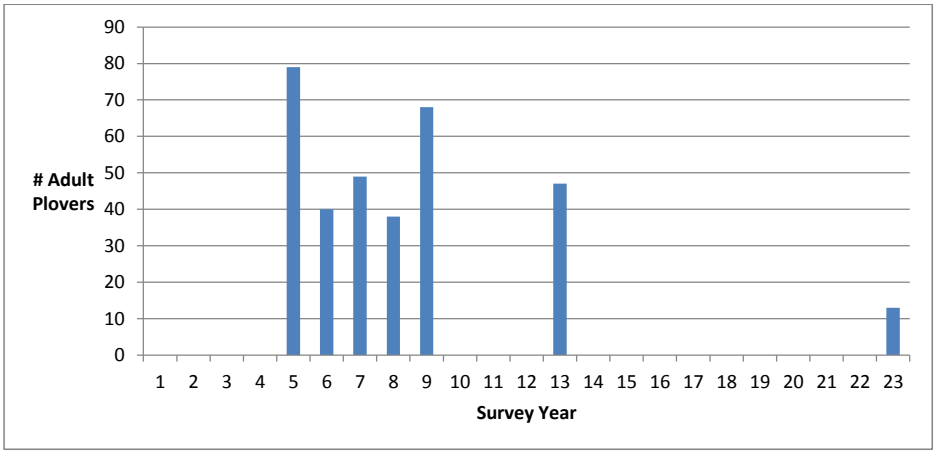

Figure 3: Mountain plover population trend at the Central Montana Study Area from 1992 to 2014

The highest mountain plover count during the 23 year period of this survey was 103 adult birds at 35 stations in 1992, while the 2014 count was clearly the lowest count, both for total numbers and number of stations where plovers were observed (Figure 3). We consider this a significant decline in mountain plovers and it appears that the Central Montana Study Area mountain plover population is on the brink of total collapse.

Comment [RG1]: Shouldn't the X axis in Figure 3 be labeled with the year (1992, 1993, etc.)?

In 1992, while establishing our census route through the Central Study Area, we counted 118 different adult mountain plovers (103 plovers at census stations and 15 in between stations). At that time, it was apparent that there were other areas with mountain plovers that could not be effectively viewed from public roads, and that the actual number of plovers was greater than this

minimum count. We estimated that possibly double or triple the number of mountain plovers that we observed could reside in the Central Study Area in 1992 (Knowles and Knowles 1993). However, in 2014, we did not see any other areas (e.g. heavily grazed stock water sites) where we thought mountain plovers might be present off of our route suggesting that there was little chance that mountain plovers simply shifted their distribution to areas not along the census route.

The 103 adult mountain plovers observed on our very first census in 1992 was the highest count we obtained during the 23 year period. Subsequent surveys over the next 7 survey years showed a lower but fluctuating population. Due to these annual variations in the census counts during the 1990s, the declining population trend did not become apparent until the 2004 and 2014 census counts when only 47 and 13 adult mountain plovers were observed, respectively. When the 10 census counts are viewed over the 23 survey years, it is apparent that the mountain plover population in this area was actually declining throughout the entire period with each peak count slightly lower than the previous peak.

Haymaker Creek in the Central Montana Survey Area

Pettingill (1981 - first edition was published in 1951) stated that the gravel road (now called Haymaker Road) running north from Two Dot, Montana (this road had our census stations 1-10 on the Central Study Area and borders Haymaker Creek) was ***the*** place in Montana to find mountain plovers. He described mountain plovers to be found on the road and on either side of the road. His descriptions make it sound like mountain plovers were very common in this area in 1951. Haymaker Creek was also the collection site of 4 mountain plovers by Grinnell in 1876 when traveling from Fort Carroll (located on the Missouri River) to Yellowstone National Park (Grinnell 1876). Grinnell's collection of mountain plovers near Haymaker Creek clearly shows that mountain plovers were present in the Central Study Area prior to settlement.

In 1992, we observed 14 mountain plovers at the 10 census stations along Haymaker Road. In subsequent survey years, we were always able to observe mountain plovers along Haymaker Road although the numbers followed the same downward trend observed for the rest of the Central Survey Area. However, in 2014, we did not observe a single mountain plover at the 10 census stations on Haymaker Road nor did we see any mountain plovers in between the census stations. These results are highly significant because there have been no obvious habitat changes from 1992 to 2014 at the 10 census stations along Haymaker Road. In fact, this area remains dominated by the STCO/BOGR habitat type with virtually no agricultural development.

The Haymaker Ranch during the 1990s was managed by an out-of-state owner who traditionally grazed about 2,000 yearling cattle that were brought onto the ranch in the spring and sold in the fall. During our 2004 mountain plover survey, we learned that the ranch had sold. Information recently posted on the Hall and Hall ranch real-estate website states that Haymaker Ranch had been leased the past several years to a local rancher as a cow/calf operation, and that the ranch was just sold again for 8.4 million dollars. The website describes the ranch as being about

30,000 acres of mostly deeded land with only 960 acres cultivated in the Haymaker Creek bottomlands.

During the 2014 survey, we did not see any cattle at the 9 census stations located on the Haymaker Ranch. There were cattle present at the 10th station located on a ranch immediately north of the Haymaker Ranch. Signage at this ranch showed that the Booth Ranch was being leased by the Miller Brothers. Long-term changes in livestock numbers and grazing practices in this Haymaker Creek area probably have contributed to increased vegetation height and plant density to a level that is not tolerated by mountain plovers. Knopf (2008) considered reduced grazing intensity on the PNG resulted in a gradual increase of vegetation to a level not tolerated by mountain plovers. Augustine and Derner (2012) reported that even intensive spring/summer cattle grazing was not sufficient to return grassland habitat on the PNG to conditions suitable for mountain plover use.

The Lewis Ranch portion of the Central Survey Area

The Lewis Ranch (officially named T-Bench Ranch) in the Central Study area is a good example of the importance of intensive livestock grazing to mountain plovers. This ranch was voluntarily entered into the Montana Centennial Register of Natural Areas in the 1980s by the Nature Conservancy because of the abundance of mountain plovers. Part of this ranch classification was a pledge from the Lewis's not to sodbust their ranch.

When we first visited the ranch in May 1985, mountain plovers were abundant and the area around the ranch headquarters had been intensively grazed during winter and spring. Mr. Kenneth Lewis, who managed the ranch, passed away in 1993 and his widow, Janet, did not continue the ranching operation at a similar level. Our surveys documented the decline of mountain plovers following the loss of cattle. In 1992, we counted 18 mountain plovers on the ranch, and by 1997 we were unable to find any mountain plovers. In 2004, we visited with Janet and she also commented that plovers were gone from the ranch and that plover numbers in the surrounding area were also way down. During the 2014 survey, we talked to people managing this ranch, and learned that Janet had passed away a few years ago and that the Wilks brothers had recently purchased the ranch when the estate was finally settled. The Lewis Ranch again had cattle on it, but we did not find any mountain plovers at the census stations on the ranch.

Habitat Changes within the Central Survey Area

Although there were no obvious habitat changes on the Haymaker Creek portion of the Central Study Area, there were considerable habitat changes elsewhere in the study area. During the 23 year period, there was a significant decrease in native grass habitat and a corresponding increase in introduced grass (mainly crested wheatgrass) and cultivated wheat at the census stations. Surprisingly, many of the wheat fields documented in 1992 had subsequently been planted to introduced grasses, and much of the gain in wheat came from cultivation of native grassland. Figures 4 and 5 show this decline of native grasslands from 91% of the quarter quadrants at

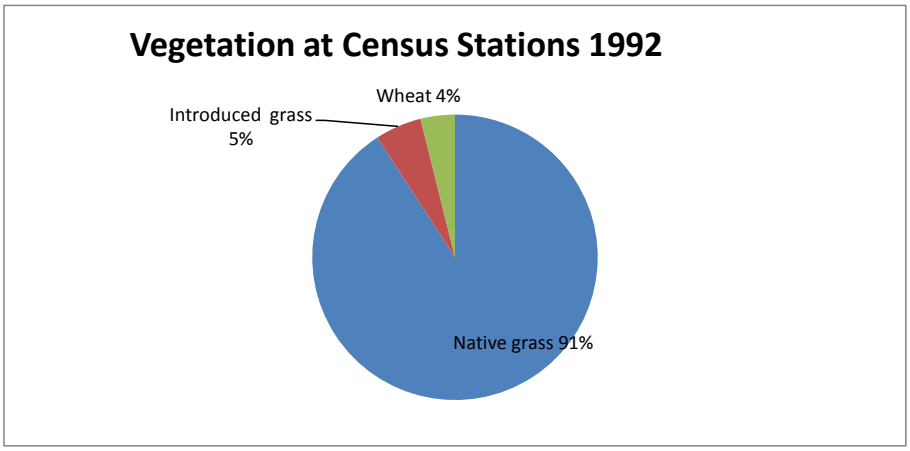

Figure 4: Percentage of 360 quarter quadrants at 90 permanent census stations in the Central Montana Study Area.

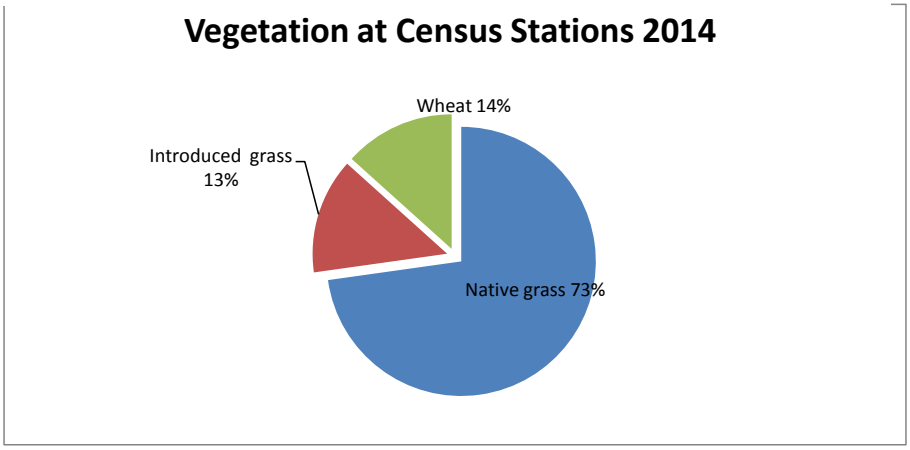

Figure 5: Percentage of 360 quarter quadrants at 90 permanent census stations in the Central Montana Study Area in July 2014 that were comprised of native grassland, introduced grasses or cultivated wheat.

census stations in 1992 to 73% of the quarter quadrants in 2014. At the same time, wheat increased from 4% to 14% and introduced grass increased from 5% to 13%. Thus, wheat and introduced grasses increased from 9 to 27% of the quarter quadrants from 1992 to 2014. It is important to note that these figures do not accurately represent the amount of wheat and introduced grass across the entire study area as a whole, since the census stations were initially placed in areas with native grasslands where mountain plovers were found or were likely to be found. The actual percentage of cultivated wheat and introduced grass pasturelands across the study area was much greater than this. In 1992, we estimated that only 66% of the Golden Valley and Wheatland Counties portion of the Central Study Area remained in native grassland.

The conversion of native grasslands to wheat and introduced grass during this 23 year period has been an ongoing process that we noted early in the survey period. In the early years of this survey we were suspicious that the Conservation Reserve Program (CRP) had encouraged sodbusting. Our suspicions were based on windmills and stock tanks located in wheat fields with piles of fence posts and rolls of old barb wire along the field edges, and immediately adjacent to these wheat fields were fields of crested wheatgrass. This suggested that the crested wheatgrass fields were formerly wheat fields that had been placed into the CRP, and that pasture land (as indicated by water developments) had been sodbusted. When we questioned the District Conservationist at the Natural Resource Conservation Service office for Musselshell County about this, he acknowledged that this was a problem, but refused to let us examine their farm files to document the extent of sodbusting.

Twenty-three years later we now have a measure of sodbusting for 90 specific points, and it was significant. Sodbusting in the 1980s was probably even more significant following the start of the CRP program in 1983 when there were absolutely no provisions to discourage sodbusting. In 1992, we were told by ranch-hands that were rebuilding fences drifted over with dirt from wheat fields, that the area in western Musselshell County had a 2 township area (68 square miles) sodbusted during the 1980s. During the 1990s, farmers were required to file a farm conservation plan prior to sodbusting (only necessary if they wanted to remain in government farm programs) which may have curtailed some sodbusting during the period we conducted mountain plover surveys.

Mountain Plover Response to Conversion of Native Grasses to Introduced Grasses

At the census stations that had been converted to wheat or introduced grasses, we continued to monitor the stations for mountain plovers, and during all 10 surveys we had only a single observation of a mountain plover using a census station converted to wheat. In this case, it was using a chemical fallow field in an area where wheat stubble had been flattened by equipment. During the 2014 survey, none of the census stations with wheat or introduced grasses had mountain plovers.

Two native grassland census stations (22 and 65) used by mountain plovers early in the survey were converted to crested wheatgrass, and mountain plovers were never seen at these sites after the conversion. Crested wheatgrass has a vegetative height profile too tall for mountain plovers.

Comment [RG2]: Citation?

Much of the privately owned native rangelands in eastern Montana has incrementally been converted to crested wheatgrass over the past century. All the Bankhead Jones Act lands reclaimed by the Federal government and now managed by the BLM were also planted to crested wheatgrass in the 1930s. This massive and widespread conversion of native prairie to introduced grasses across eastern Montana permanently excluded mountain plovers from broad areas. When the USFWS (2011) stated that 31 million acres of eastern Montana was grasslands and that sodbusting was not an important issue, they failed to note that the vast majority of these grasslands were not suitable for mountain plover use.

In Nebraska, Oklahoma, and eastern Colorado there are reports of mountain plovers using fallow fields of cultivated wheat, millet and corn, but there is also a high level of nest destruction in these fields (Shackleford 1997, Knopf and Rupert 1999, Bly et al. 2008). Shackleford (1997), after documenting mountain plover use in fallow cultivated fields in Oklahoma, conducted a mountain plover survey across the distributional range of mountain plovers from Oklahoma to Montana looking specifically at cultivated fields. He found very little use of cultivated fields from Wyoming northward.

Dr. Robert Eng (pers. comm.) collected a mountain plover on 22 April 1972 about 13 km north of Harlowton, MT (this specimen is in the Montana State University Vertebrate Museum) within the Central Montana Study Area. He reported the actual collection site to be grasslands at the time, but when we examined the site in the 1990s, it had already been converted to cultivated croplands and no mountain plovers were found.

Association of Mountain Plovers with Sheep

Early in our survey efforts for the Central Study area, we observed the association of mountain plovers with sheep. We frequently saw mountain plovers associated with flocks of sheep and feeding on insects flushed by the grazing sheep. Sheep graze grasses closer to the ground than cattle, and appear to more evenly graze a pasture creating the appearance of a well groomed lawn. When we first noted this association of mountain plovers with sheep, we suggested that the USDA develop some kind of incentive program for sheep producers in the Central Montana Study Area to continue raising sheep in areas with mountain plovers. We were concerned that most sheep ranchers appeared to be nearing retirement age and we thought that the new ranch managers would switch from sheep to cattle. Even in the 1990s it was apparent that there was a long-term decline in sheep numbers in Montana (Figure 6).

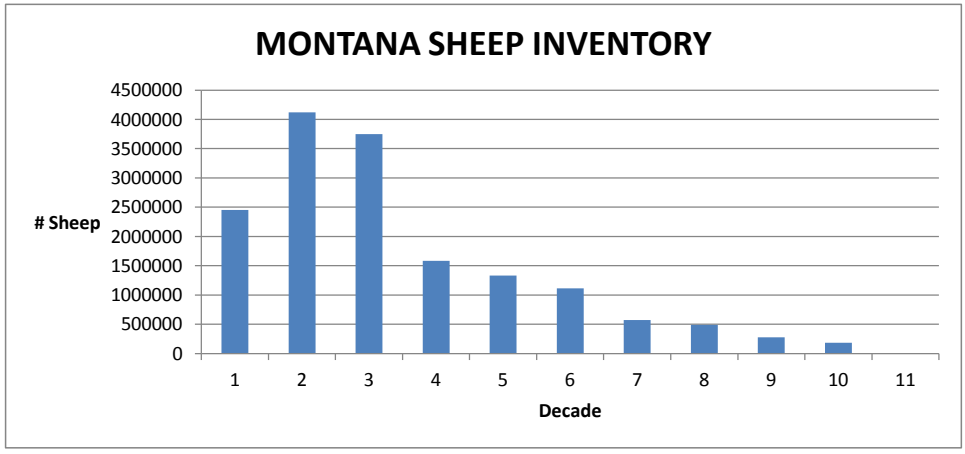

Figure 6: Montana sheep inventory from 1920 to 2010 showing the rise and fall of sheep numbers in Montana.

The loss of sheep in Montana has been a long-term trend starting in the 1940s. Peak sheep numbers in Montana were recorded in the 1930s, and this probably explains why mountain plovers persisted during this period despite the massive prairie dog poisoning campaigns of the 1920s and 1930s.

During the 2014 survey, we observed only 1 small flock of sheep in Haymaker Creek bottomlands immediately north of Two Dot (this area was not officially part of the census route), and a larger flock of sheep in a crested wheatgrass field in the Hopley Creek area (station no. 22) that had been sodbusted. During the 2014 survey we talked to a fuel truck driver delivering diesel fuel to ranches in the area, and the driver confirmed our observations that most large flocks of sheep were gone. The truck driver also mentioned that livestock numbers overall were down across the area. The absence of cattle that we observed along Haymaker Creek was also apparent in other areas of the Central Study Area.

Another aspect associated with sheep dominated ranges was intensive predator control which might also have benefited mountain plovers through increased reproductive success. Knopf (2008) commented that predator control prior to the 1972 ban of compound 1080 was beneficial to mountain plovers, and that without predator control on the PNG the swift fox (*Vulpes velox*) became the dominant predator of mountain plover nests and chicks. During the 1990s, when sheep were more abundant on the Central Montana Study Area, we frequently saw coyote carcasses draped across the top strand of barb-wire fences which was an indication that predators were actively being controlled at that time.

The association of mountain plovers with sheep has only been briefly mentioned by 2 other authors. Plumb (2004) working in Wyoming noted that grazing by cattle and sheep was pervasive in areas that he found mountain plovers. McGaugh (1998) noted that wintering mountain plovers in the Antelope Valley and near Harper Dry Lake in California were using irrigated alfalfa fields that were grazed by wintering flocks of sheep. (Note: We have conducted desert tortoise surveys in the Harper Dry Lake alfalfa fields - the wintering flocks of sheep are gone and all of the irrigated fields have now been converted to solar energy plants. These fields were specifically chosen for solar development because the desert had already been disturbed by agriculture. The 2011 USFWS(2011) finding of not warranted for mountain plover listing did not even mention this loss of a known wintering area.)

Other Habitat Changes including windfarms

There have been other changes to the study area besides conversion of native grassland to wheat and introduced grasses, and the loss of sheep and cattle. A large wind farm is now present south of Judith Gap in an area which had recorded mountain plover use (Flath 2003 and TRC 2008). Although the wind farm was not been placed directly on any of our census stations, wind turbines were in the relative vicinity of two census stations (31 and 32). These two stations are located next to Highway 191, and both previously had consistent mountain plover use during previous surveys. In addition to the windfarm, in 2014 at these same 2 census stations, we

observed that Montana Dept. of Transportation had built large wooden snow fences along this entire stretch (1.6 km) of the highway. No mountain plovers were found in this area in 2014.

At these 2 stations there was also a change in livestock grazing that may have contributed to the abandonment of these sites by mountain plovers. One site was formerly grazed summer-long by both cattle and sheep while the other site was grazed by sheep. In 2014, both sites were only grazed by cattle. Augustine and Derner (2012) noted that even with double the recommended grazing rates by cattle during spring and summer, it was not sufficient to provide suitable habitat for mountain plovers on the PNG in northeastern Colorado. They also reported that mountain plovers remaining on the PNG were associated with black-tailed prairie dog colonies and burned areas.

Change in Mountain Plover distribution

The distribution of mountain plovers in the Central Study Area has changed over the years. In 1992, mountain plovers were distributed along the entire length of the 90 census stations all the way from Haymaker Creek on the west to the Lake Mason National Wildlife Refuge prairie dog colony on Willow Creek on the east (about 106 km). Some areas such as Haymaker Road, Highway 191 census stations, the Lewis Ranch, and the homestead cluster were initially mountain plover hot spots. As mountain plover numbers began to decline at these and other sites due to changing habitat conditions, a higher percentage of mountain plovers were found at the 2 prairie dog colonies (1 on BLM, 1 on USFWS) located at the east end of the transect.

In 2004, 32 of the 47 (68%) adult birds counted at the census stations were observed in the prairie dog colonies. In 2014, 46% (6 birds) of the adult plovers were found on these colonies. However, the observed decline from 32 birds on the colonies in 2004 to 6 birds in 2014 is of concern. We did visit these 2 prairie dog colonies in early July 2005 and found 21 mountain plovers at that time (Knowles and Knowles 2006).

Also in July 2005 we visited known mountain plover "hot spots" along the census route and observed 3 adults and 5 young on gravel roads west of Highway 191 and 5 adults and 1 young on gravel roads east of Highway 191. We attribute these distributional shifts to an overall decline of mountain plovers in the Central Montana Study Area. This decline also represents a decline in the mountain plover range distribution due to changing habitat conditions.

Comparison of the Declines of the Central Montana and Pawnee National Grasslands Mountain Plover Populations

We have included a graph of the mountain plover population trend for the Pawnee National Grasslands (PNG) (Knopf 2008) (Figure 7) because the PNG decline appears very similar to the Central Montana Study Area decline (i.e. fluctuating numbers and each peak count lower than the previous peak). However, the main difference is that the collapse of the mountain plover population at the PNG occurred over a much shorter period than what we observed for the Central Montana Study Area, but the end results appear similar. Based on Knopf's (2008) documentation of the mountain plover population collapse within the PNG in the mid-1990s,

there is little chance of mountain plover populations recovering following a dramatic decline such as this.

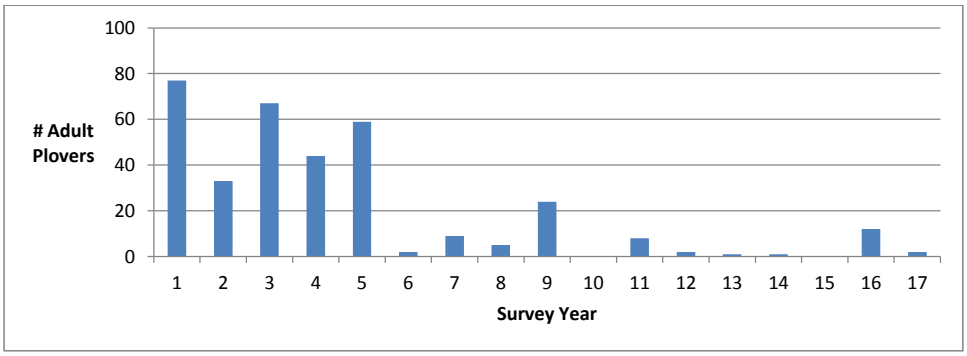

Figure 7: Mountain plover population trend at 112 census stations on the Pawnee National Grassland from 1990 to 2006. Data from Knopf 2008. Survey years 10 and 15 represent zero birds observed.

Knopf (2008) established his permanent trend count transect on the PNG in 1990. Knopf's (2008) trend count transect on the PNG had 112 census stations with 17 years (1990-2006) of survey data. His highest count occurred in 1990, his first survey year, with 77 adult birds observed. This can be compared to our highest count in the Central Study Area of 103 birds in 1992 at 90 census stations.

The decline of mountain plovers on the PNG followed a similar trend as seen on the Central Montana Study Area i.e. fluctuating numbers with population peaks showing a steady decline. On the PNG, a dramatic decline in mountain plover numbers was noted following a year of above average precipitation. Knopf (2008) believes that mountain plovers will not return to the PNG in similar numbers because traditional use of this area has been lost, and because of long-term habitat changes due to only moderate grazing intensity by cattle. Graul and Webster (1976) considered the PNG to be the "stronghold" for mountain plovers during the 1970s and had estimated over 20,000 mountain plovers in this area in 1970. Today, the mountain plover is considered a rare bird on the PNG (Augustine and Derner 2012). Knopf (2008) thought that mountain plover numbers on the PNG were actually at their peak in historic times during the 1930s, that they had been in a long-term decline ever since then, and that the population collapse that he documented was actually just a quick end to this long-term decline.

Mountain plovers on the Central Montana Study Area probably had been in decline for many years before we started our census effort similar to that described by Knopf (2008) for the PNG. At some low number, the mountain plover population becomes dysfunctional which is expressed as a population collapse. A few mountain plovers hang on in the remaining prime habitat sites, but these birds are too few to effectively recover the population. The Southwestern Study Area (Jefferson/Broadwater/Madison Counties), Toole, Teton, Carter, and Carbon Counties mountain plover populations are examples where remnant populations have gone extinct. The Central

Montana Study Area mountain plover population has entered a dysfunctional stage and is probably about 2 decades behind these other Montana populations that have already disappeared.

Northeastern Study Area Discussion

Overview

The Northeastern Study Area census route has been surveyed 10 times since 1992, and the number of adult mountain plovers observed at census stations along the route has ranged from a low of 12 plovers at 9 stations in 2004 to a high of 35 plovers at 21 stations in 1996 (Figure 8).

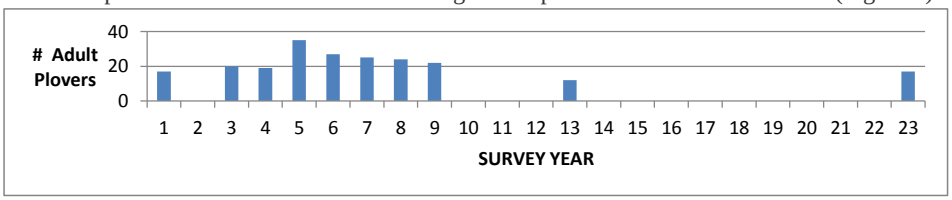

Figure 8: Mountain plover population trend on the Northeastern Study Area from 1992 to 2014.

We attribute the high number of mountain plovers observed in 1996 followed by a gradual decline through 2004 to possibly be the result of a sylvatic plague epizootic among black-tailed prairie dogs in the early to mid-1990s in Phillips County, forcing mountain plovers to search elsewhere for suitable habitat.

At one time, prairie dog colonies in adjacent Phillips County provided habitat for Montana's largest mountain plover population. Childers and Dinsmore (2008) estimated the number of plovers in this area at 758, and a decline of mountain plovers in Phillips County has been associated with the decline of prairie dog acreage (Knowles 1999, Dinsmore et al. 2005). With this decline of prairie dog acreage due to plague, mountain plovers were probably forced to look elsewhere for suitable habitat. Possibly some mountain plovers moved into the bentonite areas of Little Beaver Creek and adjacent drainages during the mid-1990s (survey year 5) which might explain the increase in numbers at that time.

As prairie dog colony acreage recovered following plague, mountain plovers may have returned to their primary habitat in Phillips County which might explain the decrease in survey numbers in the latter survey years. Another explanation for the decline is that the suitable habitat in the Northeastern Study Area is only capable of supporting a limited number of mountain plovers and that the population declined to a lower equilibrium level over a several year period.

The 17 mountain plovers observed at 11 census stations in 2014 were within the range of the number of mountain plovers observed during the previous survey efforts. Overall there is no discernable upward or downward trend of mountain plovers in this area from 1992 to 2014. The result of our census effort shows that mountain plovers remain in southern Valley County in low numbers.

Green (1982, 1983) and Green and Engle (1984) conducted mountain plover surveys in what is now our Northeastern Study Area in relation to bentonite mining. During his surveys of this area in the early 1980s, Green estimated mountain plover densities to range from 6.3-1.7 plovers per square kilometer during the 3 years (1982 – 1984) that he studied mountain plovers in the Northeastern Study Area. In 1992 (Knowles and Knowles 1993), we resurveyed Green's survey areas and estimated 1.9 birds per square kilometer. Childers and Dinsmore (2008) estimated a mountain plover density in this area of 1.6 birds per square kilometer, but their survey area may not have exactly duplicated Green's survey areas. However, these data provide a density estimate of mountain plovers in the same general area over a 22 year period (1982-2004) that shows some consistency in density from at least 1982.

Based on our density estimate of 1.9 birds per square kilometer in 1992 (Knowles and Knowles 1993) and using the cumulative area that mountain plovers were observed during Green's surveys and our surveys, we estimated about 100 adult mountain plovers in this area in 1992. While we have no actual quantitative data on the total number of mountain plovers in this area in 2014, since 1992 we have walked through most of the suitable mountain plover habitat in Little Beaver Creek and adjacent drainages and have a feel for how many mountain plovers might be in the Northeastern Study Area. In our opinion, this area currently supports less than 100 adult mountain plovers.

Childers and Dinsmore (2008) estimated the total number of mountain plovers in this area of Valley County to be about 160 adult birds. This estimate was based on 110 randomly selected point counts within the ACEC area of Little Beaver Creek using a technique based on studies by Wunder (2003) in South Park Colorado, and Plumb (2004), Plumb et al. (2005) in Wyoming. This population estimation technique involves randomly placed point counts yielding a density estimate which is then expanded across a survey area to estimate the entire population.

While point counts can accurately estimate mountain plover numbers around a point, meaningfully applying this density over a broad area is a different story. Unlike many species, mountain plovers are extremely site specific and not randomly distributed across the landscape. Thus, errors in density are amplified by projecting point count data to broad areas.

Both of these later studies (Wunder, 2003, Plumb, 2004 & Plumb et al., 2005) provided population estimates that were about double of the previous estimates for their respective survey areas (USFWS 2011). We believe that the estimate of 160 adult birds by Childers and Dinsmore (2008) is also too high an estimate for the Northeastern Study Area. Since mountain plovers are so site specific in this area, a better total count for a population estimate would be to systematically walk through the known sites used by plovers in late June/early July and count the number of adult mountain plovers flushed or otherwise encountered.

Habitat Changes

There appeared to be shifts in mountain plover distribution in the Northeastern Montana Study Area from 1992 to 2014. In 2014, we did not observe mountain plovers at stations near the abandoned bentonite plant and in the adjacent Brazil Creek. Early in our survey efforts these were good places to find mountain plovers, and Green (1982, 1983) and Green and Engle (1984) recorded many mountain plover observations in this area. In 2014, the vegetation in this area appeared too tall for mountain plovers' use.

Changes in cattle grazing may also have been a factor with changing mountain plover distribution. In 2004, no mountain plovers were found in Lone Tree Creek and the area appeared ungrazed that year. In 2014, a large number of cattle were present in Lone Tree Creek and we made 3 observations of mountain plovers in this area. However, in 2014, we did not observe any mountain plovers around Big Rock Reservoir, Grub Reservoir, and Sage Hen Creek. These were areas where we normally find mountain plovers. Cattle were not present at Big Rock Reservoir or Sage Hen Creek and only a few cattle were present at Grub Reservoir in 2014. Intensive cattle grazing is probably very important for mountain plovers even in this area of depauperate plant communities.

In 2004, we noted that the BLM had recently dug pit reservoirs at 2 census stations (16 and 26) that normally received mountain plover use. In 2014, mountain plovers were observed at both of these census stations close to the reservoirs, and at station 26 we actually observed a mountain plover standing on the spoils mound adjacent to the reservoir and a second mountain plover was in the area. Knopf (per. comm.) stated that, on the PNG, if water had leaked on the ground at stock tanks, killdeer (*Charadrius vociferus*) would be present and displace mountain plovers, but this did not seem to be an issue in the Northeastern Study Area.

The Northeastern Montana Study Area had previously been mined for bentonite at 10 sites. Six of the sites were old unreclaimed mine pits and 4 were newer (1980s) mine sites that were reclaimed at the start of our surveys. The reclaimed sites were initially planted with a seed mix of native grasses and sagebrush. Although there was good initial germination and growth, none of these plant species persisted at the reclaimed sites. Instead, a small forb rillscale (*Atriplex diocius*) invaded these sites and dominated the vegetation (Knowles and Knowles 2014). While conducting a vegetation analysis of these reclaimed sites in August 2013, we did observe mountain plovers to use this rillscale habitat at 1 reclamation site. We did not observe mountain plovers in 2013 and 2014 to use the unreclaimed sites, but they were found immediately adjacent to 3 of the unreclaimed sites (Knowles and Knowles 2014).

Other Surveys

Carbon County

During June 2014, while we were conducting golden eagle nest surveys in Carbon County, we took the opportunity to look for mountain plovers at a site along the Gyp Spring Road where we have previously recorded plovers. We also looked at other sites along the western side of the Pryor Mountains including a large black-tailed prairie dog colony, and at other sites with short vegetation. No mountain plovers were found at any of these sites. We also noted that the Warren whited-tailed prairie dog (*Cynomys leucurus*) colony was gone, the Duplex colony was mostly gone (it once had white tailed prairie dogs at one end and black tailed prairie dogs at the other), and no white-tailed prairie dogs were observed. Mountain plovers were observed at the Gyp Spring Road sites in 1996-1998, and 2003-2005. The 1998 observation was of an adult with 2 chicks, and the 2003 and 2005 observations included adults on nests.

Rosebud and Treasure Counties

We did not have opportunity to examine the area in Rosebud and Treasure Counties (north and south of Ingomar, MT) where mountain plovers occur in black-tailed prairie dog colonies as well as at silty overflow sites similar to the Northeastern Montana Study Area. However, Ryan Rauscher reported in 2012 (pers. comm.) that this prairie dog colony complex had been severely impacted by sylvatic plague and that the prairie dog colonies were greatly reduced in size. Based on observations in Phillips County, mountain plovers abandon prairie dog colonies that are impacted by plague (Knowles 1999, Dinsmore et al. 2005), and it is quite likely that the Rosebud/Treasure Counties mountain plover population is substantially reduced as well.

Stillwater County

In 2012, we conducted a prairie dog colony mapping survey near Big Lake in northern Stillwater County. This area is immediately south of the Central Montana Study Area and mountain plovers must pass over this area migrating into and out of the Central Study Area. We had previously searched some of the Big Lake prairie dog complex colonies prior to 2012 and not found any mountain plovers (Knowles and Knowles 2005). In 2012 we were able to conduct a more thorough survey of the colonies, but we were still unable to find mountain plovers. This colony complex appeared to have a plague epizootic in process in 2012 and many of the colonies were in various stages of die back. This colony complex is primarily in a low lying basin and may not be topographically suitable for mountain plovers.

Musselshell County

In 2012 we examined a 1,200-acre prairie dog colony in Musselshell County east of Highway 87 where mountain plovers were found in 2005 (Knowles and Knowles 2005). This colony appeared to be recovering from a plague epizootic that occurred sometime between 2005 and 2012, and the colony contained only about 200 acres of low density prairie dog activity. No mountain plovers were found . We also surveyed several other prairie dog colonies in this portion of Musselshell County and did not observe any mountain plovers.

Southwestern Study Area (Madison, Jefferson & Broadwater Counties)

No recent surveys have been conducted in the Southwestern Montana Study Area (Area 4 in Figure 2) since previous surveys had shown mountain plover numbers steadily declining to a non-detectable level by 2004. Figure 9 shows this declining population trend for the Southwestern Montana Study Area. Loss of mountain plovers from this area can be attributed to a housing development, poisoning of prairie dogs, construction of a log home factory, and vegetative changes associated with insufficient livestock grazing.

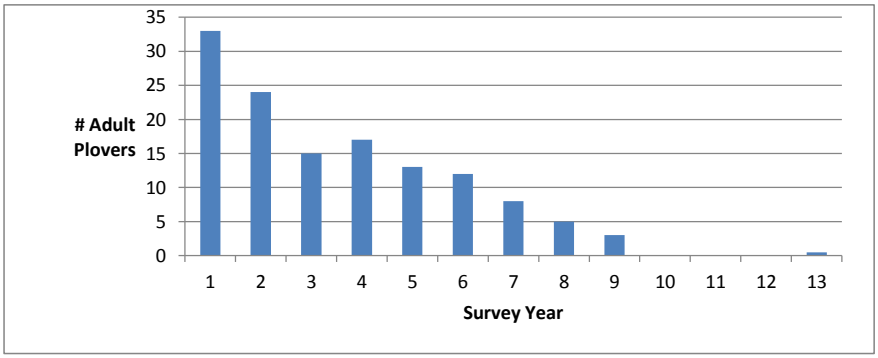

Figure 9: Mountain Plover population trend at the Southwestern Montana Study area from 1992 to 2004. Survey year 13 (2004) represents zero birds observed.

CONSERVATION CONSIDERATIONS

The formula for extinction is to fragment and isolate populations, degrade the habitat, and impose a catastrophic event on the remaining population. It is clear that, since settlement of Montana, mountain plover populations have been fragmented and isolated due to prairie dog control/plague, conversion of native grasslands to cultivated cropland and introduced grasses, and changing grazing intensity and patterns by large herbivores.

We have gathered sufficient data to demonstrate that mountain plover populations are either extinct or in rapid decline at 2 of our 3 long-term study areas (Southwestern and Central). It is apparent that the mountain plover numbers remaining in the Central and Northeastern Study Areas are small, isolated, and vulnerable to extinction. The habitat conditions in each of the study areas have certainly been degraded from presettlement conditions. Prairie dog colonies are reduced, fire has been virtually eliminated, intensive grazing by migratory bison herds is absent, and much native grassland has been converted to cultivated cropland or introduced grasses.

Of the 9 recently identified mountain plover populations in Montana, extinction appears to have already occurred in the Southwestern Study Area (Jefferson, Broadwater and Madison Counties), and the Teton, Toole, Carter and Carbon Counties populations. The Phillips/Blaine and

Treasure/Rosebud County populations are probably greatly reduced due to plague epizootics in prairie dogs (Knowles 1999, Dinsmore et al. 2005). Mountain plovers in the Northeastern Study Area (Valley County population) have fluctuated over the past 2 decades, but remain in low numbers and are certainly vulnerable to catastrophic events. Mountain plover numbers in the Central Montana Study Area (Golden Valley/Wheatland/Musselshell Counties) are so low (and decreasing) that it is also highly vulnerable to catastrophic events and extinction.

In the Northeastern Study Area, the BLM implemented a large scale range improvement program that destroyed about half of the suitable mountain plover habitat in the 1950s and 1960s. There has also been past bentonite mining in the core area used by mountain plovers. Since all bentonite deposits in this area had been claimed prior to the ACEC designation, the designation does not restrict future bentonite mining at the claim sites. Other catastrophic events which could cause local extinction would include unusual weather events (hail storms, spring blizzards, flash flooding etc.), sylvatic plague in prairie dogs, the elimination of sheep grazing, and government policies which favor sodbusting. As metapopulations become fragmented and isolated, the probability of local populations recovering following catastrophic events decreases and the probability of losing the entire metapopulation increases proportionately with the loss of its member populations.

In our opinion, the small and isolated mountain plover populations that we have studied in Montana are repeated throughout their breeding range on the Great Plains. The largest population of 2000-3000 plovers in South Park, Colorado is, in reality, a small isolated population. The same can be said for the Phillips/Blaine Counties population in Montana. What we have witnessed with the loss and decline of small and isolated mountain plover populations in Montana is likely being repeated elsewhere. The PNG is certainly an example of how vulnerable these small populations are to habitat change and catastrophic events.

USFWS 2011 Ruling

The USFWS (2011), in their decision to not list the mountain plover as threatened, made many outrageous statements of which some applied to Montana directly. They attributed 18.5 million acres of suitable mountain plover habitat in Montana and later stated there was 31 million acres of grassland habitat available for mountain plovers. They totally ignored the fact that the mountain plover is a very site specific bird and if exact habitat characteristics are not met, they are not capable of successfully nesting and rearing young. Without any doubt, only a fraction of one percent of Montana's grassland habitat is suitable for mountain plover nesting and brood rearing. Where mountain plover habitat is lost, birds do not simply move over to a new location. There may be plenty of potential mountain plover habitat in Montana, but very little of it is suitable for mountain plover use. Mountain plover require large level upland areas (>20 ha) of very short vegetation (< 8 cm tall), and lots of bare ground (>30%) for successful nesting. And these areas need to be sufficiently abundant and closely spaced to support a viable population.

USFWS (2011) claims that the black-tailed prairie dog is a resilient species not likely to decline and that rangeland conversion to agriculture remains insignificant. For Montana, they specifically state that the threat of future destruction of both prairie dog and mountain plover habitat through agricultural conversion is minimal. These statements are in direct conflict with what is happening with plague epizootics in Montana's major prairie dog colony complexes, rozol poisoning of prairie dogs on private lands, and sodbusting in Montana. The document also treats all prairie dog acres in Montana as being mountain plover habitat, when in fact most of Montana's prairie dog acreage is not suitable for mountain plovers because of the topographic setting or size and distribution of the colonies. For example, mountain plovers require at least 20 ha of upland prairie dog habitat in broad level prairie to be suitable for nesting, but the majority of prairie dog colonies in Montana are less than 20 ha and most of the prairie dog colonies in southeastern Montana are located in drainages.

MANAGEMENT SUGGESTIONS

Although the remaining mountain plover populations may exhibit resilience on a short term basis, there is no guarantee that these populations will persist in the long-term under present habitat conditions. These Montana mountain plover populations will be vulnerable to extinctions due to catastrophic events on the breeding grounds, wintering areas, and along migratory routes. Further declines in habitat suitability can also be expected. A conservation strategy should be developed and implemented immediately for each area of Montana where mountain plovers still persist in Montana. Of the 4 areas where mountain plovers are known to remain (Central Study Area, Northeastern Study Area, Phillips/Blaine Counties, Rosebud/Treasure Counties) there is significant Federal landownership, and there are opportunities to preserve and enhance mountain plover habitat. Unfortunately, mountain plovers that were associated with private lands in Montana are pretty much gone. Mountain plover conservation efforts on the PNG following the collapse of that mountain plover population have demonstrated that it is extremely unlikely that the population can be recovered once it is lost. Conservation efforts in Montana should be focused on areas with public lands and in areas that still contain viable mountain plover numbers.

Examples of management actions that might benefit mountain plovers would be:

1) Increased cattle grazing in the Northeastern Study Area both in numbers and length of grazing season - there should be no rested pastures,

2) Areas on BLM and USFWS lands on the Central Study Area located between the 2 prairie dog colonies with known mountain plover use have level ridges that should be burned annually in the fall, and

3) Prairie dogs should be encouraged on public lands such as in Phillips/Blaine and Rosebud/Treasure Counties – this could include increased livestock grazing and restriction of prairie dog shooting.

ACKNOWLEDGEMENTS

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APPENDIX A
LIST OF PERMANENT CENSUS STATIONS

Table A1. List of census stations for the Central Montana Study Area showing the latitude/longitude coordinates and number of mountain plovers observed at each station in 2014. Latitude/longitude coordinates are in decimal degrees North and West respectively.

Station Number	Latitude	Longitude	
1	46.60596	110.09472	
2	46.60608	110.08334	
3	46.59613	110.08315	
4	46.55727	110.08284	
5	46.53366	110.08288	
6	46.51907	110.08292	
7	46.51188	110.08295	
8	46.49002	110.08300	
9	46.47514	110.07729	
10	46.46618	110.07201	
11	46.51888	109.89285	
12	46.52661	109.89333	
13	46.52818	109.91395	1 adult 1chick
14	46.53316	109.92274	
15	46.53334	109.89279	
16	46.55288	109.89285	
17	46.56258	109.89306	
18	46.56279	109.95605	
19	46.59184	109.95655	
20	46.61501	109.97758	
21	46.63176	109.97757	
22	46.64759	109.97766	
23	46.66096	109.97754	
24	46.67890	109.97737	
25	46.67910	109.91117	
26	46.67885	109.89067	
27	46.67133	109.87207	
28	46.66442	109.86518	
29	46.62099	109.83911	
30	46.62097	109.77496	
31	46.61966	109.76950	
32	46.62809	109.76614	
33	46.65017	109.51240	
34	46.65016	109.49814	
35	46.65015	109.49142	
36	46.61286	109.45195	

37	46.60671	109.45203	
38	46.61347	109.53565	
39	46.64763	109.52934	
40	46.60658	109.61997	
41	46.60662	109.60806	
42	46.60658	109.44386	
43	46.60654	109.43655	
44	46.60654	109.43082	
45	46.60660	109.41395	
46	46.60660	109.40586	
47	46.60669	109.36837	
48	46.60664	109.32040	
49	46.60680	109.30458	
50	46.61783	109.31550	
51	46.63231	109.32567	
52	46.63588	109.31505	fence across road
53	46.64294	109.32587	
54	46.64998	109.32602	
55	46.60644	109.26247	
56	46.56431	109.26241	
57	46.55555	109.26235	
58	46.54858	109.26791	
59	46.54918	109.28334	
60	46.55755	109.28333	
61	46.57518	109.28342	
62	46.60641	109.28363	
63	46.60664	109.24155	
64	46.60660	109.22053	
65	46.60659	109.21114	
66	46.62338	109.17834	
67	46.62561	109.17580	
68	46.63139	109.16905	
69	46.63550	109.15769	
70	46.64280	109.15739	
71	46.63561	109.14703	
72	46.63562	109.13628	
73	46.63517	109.12624	
74	46.63471	109.11590	
75	46.63486	109.10516	
76	46.63500	109.09187	
77	46.62880	109.11581	
78	46.62022	109.10533	
79	46.61196	109.09927	6 adults 1 chick
80	46.60567	109.09454	
81	46.60559	109.08385	
82	46.60511	109.07491	

83	46.59466	109.07377	
84	46.58724	109.07378	
85	46.56785	108.82985	4 adults
86	46.69587	108.87565	2 adults
87	46.60540	109.10485	
88	46.60510	109.11410	
89	46.60655	109.16782	
90	46.60657	109.17841	

Table A2. List of census stations for the Northeastern Montana Study Area showing the latitude/longitude coordinates and number of mountain plovers observed at each station in 2014. Latitude/longitude coordinates are in decimal degrees North and West respectively.

1	48.15575	107.02760	
2	48.15440	107.02740	
3	48.13466	107.02284	
4	48.13266	107.02419	
5	48.13889	107.02692	
6	48.12982	107.02615	
7	48.12601	107.02884	
8	48.11735	107.03214	1 adult, 1 chick
9	48.11483	107.03256	
10	48.11535	107.03613	
11	48.10678	107.03414	
12	48.10302	107.03478	
13	48.10043	107.03376	
14	48.10013	107.02390	1 adult, 2 chicks
15	48.11532	107.03661	
16	48.10579	107.04050	
17	48.10529	107.04828	
18	48.10112	107.04193	2 adults
19	48.09737	107.04634	
20	48.09306	107.04366	1 adult
21	48.08993	107.04343	
22	48.08805	107.04140	
23	48.08783	107.03280	
24	48.08779	107.02836	1 adult
25	48.08863	107.02379	1 adult, 2 chicks
26	48.06009	107.01414	
27	48.05466	107.01249	
28	48.05399	107.00594	
29	48.07309	107.11197	
30	48.07385	107.11865	
31	48.07511	107.12421	
32	48.07529	107.13184	
33	48.07777	107.14201	1 adult, 1 chick
34	48.07799	107.14642	
35	48.08155	107.15601	
36	road washed out		
37	road washed out		
38	48.08615	107.16241	
39	48.09138	107.17580	2 adults, 1 chick
40	48.09561	107.18223	
41	48.10162	107.18877	

42	48.10085	107.19588	
43	48.09694	107.19980	
44	48.10851	107.15733	1 adult, 1 chick
45	48.11052	107.14880	
46	48.11267	107.13735	
47	48.10622	107.11801	
48	48.10314	107.08270	
49	48.10348	107.07739	
50	48.10389	107.07132	
51	48.10468	107.05924	
52	48.14025	107.01911	
53	48.14863	107.01536	
54	48.15352	107.00993	
55	48.12182	107.00578	4 adults, 2 chicks
56	48.11659	107.00550	1 adult
57	48.11319	107.00552	
58	48.10936	107.00404	
59	48.10670	107.00240	1 adult
60	48.09931	106.99402	
61	48.08543	106.96106	
62	48.07757	106.87993	
63	48.05785	106.90051	
64	48.05422	106.90260	
65	48.05147	106.90413	
66	48.02833	106.87733	
67	48.03789	106.91533	
68	48.03460	106.92613	
69	48.02771	106.93740	
70	48.04697	106.89822	