Canada: Surveys and Records up to 2005.

Richard Knapton

Geoffrey L. Holroyd

Helen E. Trefry

Prairie and Northern Region 2006
Canadian Wildlife Service

Technical Report Series Number 448

TECHNICAL REPORT SERIES
CANADIAN WILDLIFE SERVICE

This series of reports, established in 1986, contains technical and scientific information from projects of the Canadian Wildlife Service. The reports are intended to make available material that either is of interest to a limited audience or is too extensive to be accommodated in scientific journals or in existing CWS series.

Demand for these Technical Reports is usually confined to specialists in the fields concerned. Consequently, they are produced regionally and in small quantities; they can be obtained only from the address given on the back of the title page. However, they are numbered nationally. The recommended citation appears on the title page.

Technical Reports are available in CWS libraries and are listed in the catalogue of the National Library of Canada in scientific libraries across Canada. They are printed in the official language chosen by the author to meet the language preference of the likely audience, with a résumé in the second official language. **To determine whether there is significant demand for making the reports available in the second official language, CWS invites users to specify their official language preference. Requests for Technical Reports in the second official language should be sent to the address on the back of the title page.**

SÉRIE DE RAPPORTS TECHNIQUES DU SERVICE CANADIEN
DE LA FAUNE

Cette série de rapports donnant des informations scientifiques et techniques sur les projets du Service canadien de la faune (SCF) a démarré en 1986. L'objet de ces rapports est de promouvoir la diffusion d'études s'adressant à un public restreint ou trop volumineuses pour paraître dans une revue scientifique ou l'une des séries du SCF.

Ordinairement, seuls les spécialistes des sujets traités demandent ces rapports techniques. Ces documents ne sont donc produits qu'à l'échelon régional et en quantités limitées; ils ne peuvent être obtenus qu'à l'adresse figurant au dos de la page titre. Cependant, leur numérotage est effectué à l'échelle nationale. La citation recommandée apparaît à la page titre.

Ces rapports se trouvent dans les bibliothèques du SCF et figurent aussi dans la liste de la Bibliothèque nationale du Canada utilisée dans les principales bibliothèques scientifiques du Canada. Ils sont publiés dans la langue officielle choisie par l'auteur en fonction du public visé, avec un résumé dans la deuxième langue officielle. **En vue de déterminer si la demande est suffisamment importante pour produire ces rapports dans la deuxième langue officielle, le SCF invite les usagers à lui indiquer leur langue officielle préférée. Il faut envoyer les demandes de rapports techniques dans la deuxième langue officielle à l'adresse indiquée au verso de la page titre.**

Mountain Plover in Canada: Surveys and Records up to 2005.

Le Pluvier montagnard au Canada : relevés et mentions jusqu'en 2005.

Richard Knapton, Geoffrey L. Holroyd and Helen E. Trefry

Canadian Wildlife Service, Room 200, 4999 - 98 Avenue, Edmonton, Alberta, T6B 2X3

Canadian Wildlife Service Technical Report Series No. 448
Série de rapports techniques n° 448

photos by Geoff Holroyd, 2005

This report may be cited as:

Knapton, R., G.L. Holroyd and H.E. Trefry. 2006.
Mountain Plover in Canada: Surveys and Records up to 2005.
Canadian Wildlife Service Technical Report Series No. 448.
Prairie and Northern Region. Edmonton, Alberta. iv + 50pp.

Published by the authority of the
Minister of Environment
Canadian Wildlife Service

Catalogue No. CW69-5/448E
ISBN 0-662-42510-3

Copies may be obtained from:

Geoff Holroyd
Canadian Wildlife Service
Rm 200, 4999 - 98 Avenue
Edmonton, Alberta
T6B 2X3
Canada

Email: geoffrey.holroyd@ec.gc.ca

Summary

The Mountain Plover was described along the Montana-Canada border by the US boundary commission team in 1874. All of their specimens were collected in Montana. Since then this species has been recorded 44 times in Canada. The first confirmed breeding record was in 1979; prior authors did not consider Mountain Plover a Canadian breeding species. In the past 25 years, there are 16 Canadian records of eggs or flightless young and 10 records of pairs suspected of breeding; the remaining records were of singles or in the non-breeding season. The species was first listed as an endangered species in Canada in 1987 partly based on a perceived decline from 1980 to 1986. Intensive searches for Mountain Plovers in 2005, together with field work for Burrowing Owls in key plover habitat from 1998-2005 resulted in only a few additional records. A reevaluation of the status of plovers in Canada indicates that it is a peripheral species with no evidence that it was ever a common or regular breeder in southern Alberta and Saskatchewan. Despite major declines in the core of its breeding range in Montana and Colorado it occasionally continues to appear at isolated sites in low breeding numbers in Canada at the northern limit of its range, probably fluctuating with climatic conditions and the availability of overgrazed nesting habitat. It remains to be seen if the Mountain Plover is a regular breeder in Canada. We recommend additional searches for this species in specific and local habitats available in Alberta and Saskatchewan.

Résumé

Le Pluvier montagnard a été observé en 1874 le long de la frontière entre le Montana et le Canada par l'équipe de la commission de la frontière américaine. Tous les spécimens avaient été recueillis au Montana. Depuis, l'espèce a été mentionnée 44 fois au Canada. La première mention attestée de reproduction remonte à 1979; auparavant, les auteurs pensaient que le Pluvier montagnard ne nichait pas au Canada. Pour les 25 dernières années, on compte au Canada 16 mentions d'oeufs ou de jeunes n'ayant pas atteint l'âge de l'envol ainsi que 10 mentions de couples nicheurs présumés; les autres mentions se rapportent à des solitaires ou à des observations faites en dehors de la saison de reproduction. On a décidé d'attribuer à l'espèce le statut d'espèce en voie de disparition au Canada en 1987 en partie à cause d'un déclin perçu de 1980 à 1986. Des recherches

intensives de l'espèce effectuées en 2005, de même que des recherches visant la Chevêche des terriers réalisées dans l'habitat essentiel des pluviers dans la période 1998-2005, n'ont produit que quelques mentions additionnelles. Une réévaluation de la situation des pluviers au Canada a révélé qu'il s'agit d'une espèce périphérique qui semble n'avoir jamais niché communément ou régulièrement dans le sud de l'Alberta et de la Saskatchewan. Malgré des déclins importants dans l'aire de reproduction principale du Pluvier montagnard au Montana et au Colorado, de faibles effectifs de nicheurs continuent d'apparaître occasionnellement dans des endroits isolés au Canada, à la limite nord de l'aire de répartition de l'espèce, les fluctuations observées étant probablement liées aux conditions climatiques et à la disponibilité d'habitat sur pâturé, propice à la nidification. Il reste à mieux préciser si le Pluvier montagnard niche régulièrement au Canada. Nous recommandons que soient effectuées d'autres recherches de cet oiseau dans des milieux locaux propices à l'espèce en Alberta et en Saskatchewan.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 Introduction

The Mountain Plover (*Charadrius montanus*) was first classified as an endangered species in Canada in April 1987 (COSEWIC 2002a). It was so designated because of a perceived decline in range and abundance since the first mention of the species at or near the Canadian border along the 49th parallel by Coues in 1874 (*fide* Wershler and Wallis 1986). The classification of endangered was maintained most recently by COSEWIC following an updated status report of the Mountain Plover in 2000 (Wershler 2000). The reason for designation is given as "This species occurs in extremely low numbers in Canada; it is dependent on habitats resulting from overgrazing, which are very rare in Canada." (COSEWIC 2002b). The species was classed as D1, meaning that the species has a very small population in Canada of fewer than 250 mature individuals (COSEWIC 2002b). The COSEWIC designation does not mention that this species is at the very northern edge of its range at the US border.

Previous reports on the status of Mountain Plover in Canada have each added records of the species' occurrence. The species range in Canada has been described as a narrow band of occurrence along the US border (Wallis and Wershler 1981) rather than specific points which would be a more accurate reflection of the distribution of this sporadic breeder. In addition, the importance placed on the original records by Coues and the accuracy of his location differed between reports resulting in enhanced confidence of the plover's historical occurrence and abundance in Canada. Yet the Coues report is the basis for Mountain Plover being listed as endangered in Canada rather than a Species of Special Concern at the northern edge of its range. Previous searches for the Mountain Plover have not been consistent and have been relatively brief resulting in few records.

In this report we compile all known historical and modern records of Mountain Plovers in a comprehensive way allowing for a critical review of the species' historical and current status in Canada, we report on systematic searches conducted in 2005 and on surveys conducted in suitable habitat between 1998 and 2005, and make recommendations for future surveys.

1.0 Background

1.1 Description and Taxonomic Affinities

The Mountain Plover is a medium-sized shorebird resembling a small Killdeer (*C. vociferus*) in shape, with a uniform sandy-brown back and wings, clear white breast and whitish under parts that are washed with buff. Breeding birds have a white forehead, black on top of the head and a distinctive black loral stripe from the black bill to the eye. Non-breeding birds and juveniles lack the black markings on the head; they have a pale brown face with a paler brown supercilium, are buffier on their undersides and have a darker brown back than adults, with pale edgings giving a more scaled appearance.

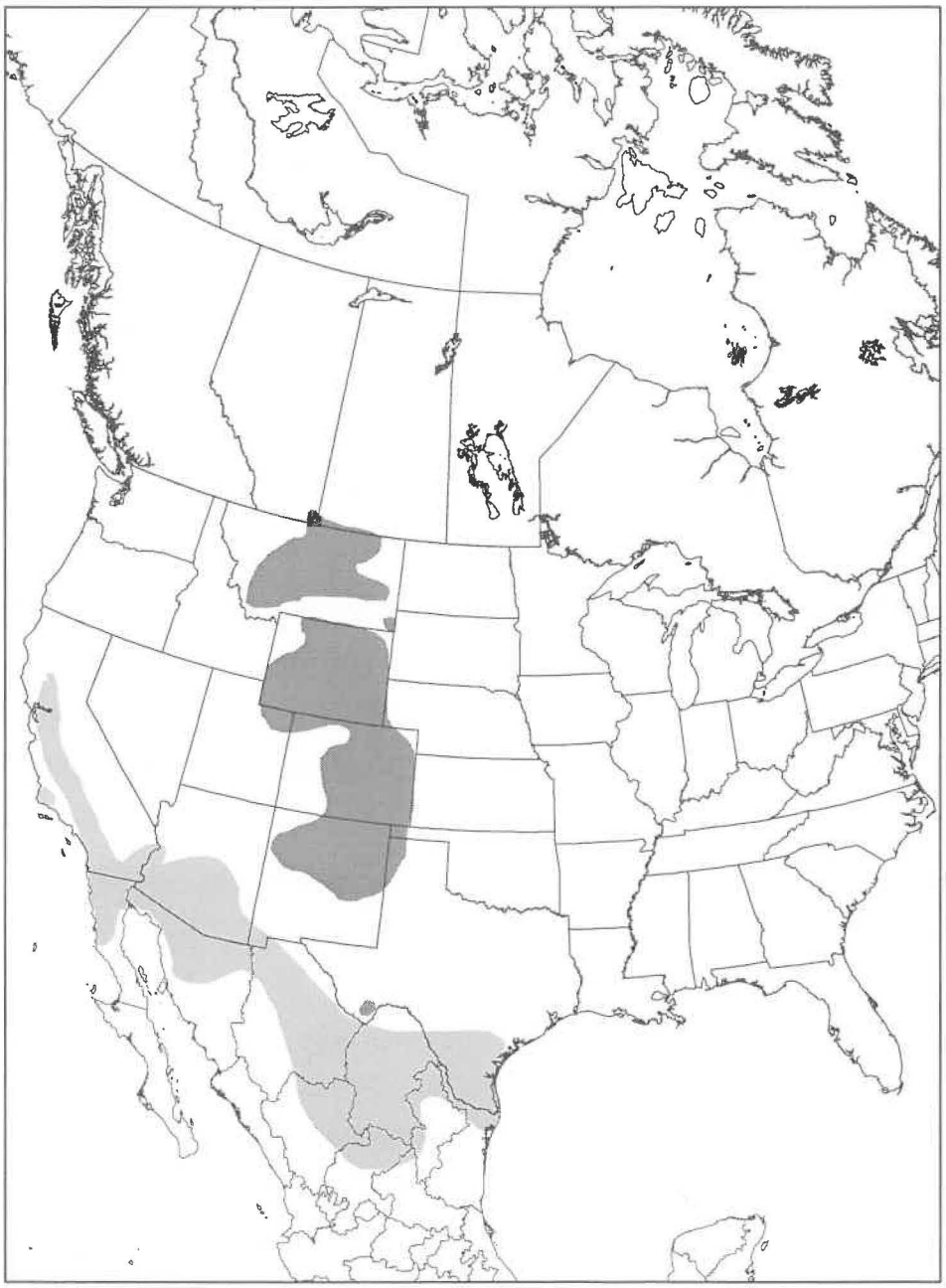
The species is generally silent (Graul 1974). Vocalizations include a rolling whistle used in advertising and courtship, anxiety calls, and a distinctive call used in agonistic and flocking situations, variously described as a low harsh *krrip* or *kip* (Knopf 1996, Wershler 2000).

The Mountain Plover has no close relatives in North America. Its closest affinities are to the Caspian Plover (*C. asiaticus*) and the Oriental Plover (*C. veredus*) of the Old World, and the three species appear to constitute a superspecies (Hayman et al 1986, AOU 1983, 1998).

1.2 Distribution

The species breeds in the western Great Plains, from southern Alberta and Saskatchewan south through Montana, Wyoming, Nebraska, Colorado, Kansas, New Mexico, Oklahoma and Texas (Knopf 1996, Knopf and Rupert 1999), and northern Mexico (Desmond and Chavez Ramirez 2002). Over 60% of the population is believed to nest in Colorado (Kuenning and Kinery 1998). The known winter range is primarily in California, now mostly in the Imperial Valley (Wunder and Knopf 2003), but the species also winters in northern Mexico, southern Arizona and southern Texas (Figure 1).

Figure 1. Current Range of the Mountain Plover (taken from Knopf 1996)



In Canada, the Mountain Plover has been recorded in southeastern Alberta and southwestern Saskatchewan. Macoun and Macoun (1909) list this species in their Catalogue of Canadian Birds but do not list it as a breeding species. Rather they state (page 211) "In June, 1895, the writer was on Frenchman river, Sask., for many miles and did not see a trace of the bird so that lat. 49° must be close to its northern limit." Bent (1929, page 269) makes the following statement "The species is unknown from Canada. During the international boundary survey, Doctor Coues found mountain plover on Frenchman Creek and obtained a specimen that is now in the British Museum. This is reported as being labeled "forty-ninth parallel," but the point of collection was probably well within the present State of Montana." Taverner (1945) listed the Mountain Plover in his 'Birds of Canada' with the following comment (page 181) "Included in this volume because of specimens said to have been taken in 1897 on the International Boundary survey near Frenchman River, Saskatchewan." The AOU (1957) does not list Canada as part of the species breeding range. Rather the species is listed as casual in Alberta and Saskatchewan. Godfrey's authoritative Birds of Canada (1966, page 134) lists the status of Mountain Plover as "Rare summer visitor to southeastern Alberta...and southwestern Saskatchewan." Salt and Salt (1977) state that the Mountain Plover breeds from Montana south, although they do review the records in Alberta up to that date. Not until Wallis and Loewen (1980) documented the first nesting record of the Mountain Plover in Canada, did any author declare that they were indeed a nesting species in Canada. Subsequent breeding records are reviewed below.

2.3 Population Trends

The North American range has contracted from earlier times, especially along its eastern edge, with a consequent reduction in total abundance. Mountain Plovers have been recorded on Breeding Bird Surveys only in the United States, where data indicate a decline rate of 3.7% per year from 1966 to 1993 (Knopf 1994, 1996), translating into a two-thirds reduction in the population in that 25 year period. In fact, the Breeding Bird Survey revealed that the decline of this species from the 1960s to the early 1990s was

larger than that of any other endemic grassland bird. Because the continental United States population of the Mountain Plover declined at over three percent per year during the 1970s, 1980s and early 1990s, the species was recommended for protection under the Endangered Species Act in the United States (Knopf 1996). The U.S. Fish and Wildlife Service recently withdrew the proposal to list the Mountain Plover as threatened throughout its range as threats to the species and its habitat were not considered as significant as previously thought and were not likely to endanger the species in the near future or throughout a significant portion of its range (USFWS 2003). However, declines continue; trend analyses from Breeding Bird Surveys up to the present indicate a 2.7% annual survey-wide decline (P=0.01, n=43) from 1966 to 2004 (Sauer et al. 2005).

Global climate change has been implicated in what appears to be a subtle northward shift in distribution of the Mountain Plover (Townsend 2002) although sample sizes are too small to be definitive. However, should such a shift occur, then further occurrences in Canada might be more frequent. Graul and Webster (1976) estimated the 1975 continental population at 214,200 - 319,220 breeding birds, with over 20,000 in Weld County, Colorado, alone. This estimate was based on population censuses in the Pawnee Grasslands, Colorado, and extrapolated across the potential range of the species. Subsequently, estimates of the Pawnee population were recalculated as 7,000 Mountain Plovers in the early 1970s, falling to 1,280 individuals in 1991, while presently the total Pawnee population is only about 78 individuals (Knopf, 2002). Graul and Webster's estimate is now regarded as inflated and off by an order of magnitude (Knopf 1996).

Estimates in the 1990s placed the total population as low as 5600 (Morrison et al. 1994, Rose and Scott 1994, 1997). This population estimate has since been adjusted upwards. Knopf (1996) provided a revised estimate for the North American population in 1995 of 8000–10 000 birds based on the number of birds found during a winter count in California in 1994 (3346, which was then doubled) plus estimated wintering populations in Texas and Mexico (1000–3000). Using more refined field methodology for population estimates in Wyoming, Plumb et al. (2005a) revised the continental population estimate to 11000 to 14000 birds.

The species' range just extends into Canada, although it was considered a rare summer visitor and breeder (Godfrey 1986). Morrison (2001) and Morrison et al. (2001) put a population estimate of 10 for Canada, with an accuracy rating of "good"[1]. Wershler (2000), whilst acknowledging that scientific survey data were lacking, states that "during the last two decades there have probably been fewer than 50 adult Mountain Plovers in Canada". Such estimates have large confidence limits and should not be taken as anything more than unsupportable guesses.

The largest known number of breeding Mountain Plovers in Montana is found on an extensive complex of Black-tailed Prairie Dog (*Cynomys ludovicianus*) colonies in the contiguous Phillips and Blaine Counties (Knowles and Knowles 2001, Dinsmore et al. 2003). The northern boundary of these two counties is the international border between Montana and Saskatchewan but the dog colonies are 100-200 km south of the border. In Phillips County, nearly all plovers are found on active prairie dog colonies that also are grazed by cattle (Dinsmore et al 2003). Prairie dog towns occur on the Charles M. Russell National Wildlife Refuge, Fort Belknap Indian Reservation, Bureau of Land Management (BLM), State school lands, and private lands. Mountain Plovers in these two counties were estimated at about 2,000 individuals in the mid 1990s (Knopf and Miller 1994, Knowles and Knowles 1997). However, based on six years of research, Dinsmore et al. (2003) revised this figure downwards and provided a rough estimate of only 700 plovers throughout all of Phillips and Blaine Counties. Elsewhere, Mountain Plovers breed on land administered by the BLM in Valley County (Little Beaver Creek), on private land in Wheatland and Golden Valley Counties near the Little Belt and Big Snowy Mountains, and several other counties, with an estimated population of about 800 individuals (Knowles and Knowles 1998). Therefore, the best current information available indicates the Montana population is approximately 1,500 Mountain Plovers (Knowles and Knowles 1997, USDI FWS 2003, Dinsmore 2003).
Occasionally isolated breeding pairs are located, and evidently are not present the following year. Of interest is a report in Knowles and Knowles (1998) of a pair of

[1] "Good": A calculated estimate based on broad-scale mark:recapture or other systematic estimating effort resulting in estimates on which confidence limits can be placed (Morrison 2001: p. 7)

Mountain Plovers with three chicks in 1996 in Toole County, about 25 km south of Alberta in the vicinity of the Sweetgrass Hills. The habitat used by the birds was restricted to an intensively cattle-grazed grassland site occupied by Richardson's Ground Squirrels (*Spermophilus richardsonii*). There was apparently 25 km^2 of similar habitat in the general area, and pockets of similar habitat isolated by agriculture north to the Sweetgrass Hills. The birds were not found the next year. Results of a survey conducted on July 25, 1991, in which about 100 km of roads were surveyed between Havre and the Alberta border, revealed no plovers, and the author comments that "over 90% of the survey area had been disturbed by agriculture" (Knowles and Knowles 1998). Other surveys conducted in the 1990s close to the Canadian border failed to find plovers either side of the Milk River northwest of Havre, the south side of the Sweetgrass Hills west to Kevin (Knowles and Knowles 1998) and the area between the Sweetgrass Hills and the Milk River in Alberta (S. Brechtel, pers. comm. *in ibid).*

None of the known breeding locations for Mountain Plovers in Montana are adjacent to the Canadian border. The Fort Belknap Indian Reservation is located about 120 km southeast of Wildhorse, Alberta, and about 80 km south-southwest of Val Marie, Saskatchewan. The larger population of Mountain Plovers (Olson 1984) on the Charles M. Russell National Wildlife Refuge in southern Phillips County lies about 150 km south-southwest of Val Marie and 190 km southeast of Wildhorse. An area of habitat dominated by Nuttall sagebrush (*Atriplex gardenerii*) southwest of Glasgow along Little Beaver Creek in Valley County (Faunawest 1991) lies about 150 km southeast of Val Marie. The site in Toole County where the one pair of plovers was found nesting in 1996 lies about 90 km southwest of Onefour.

2.4 Habitat

Mountain Plovers inhabit flat areas with short vegetation (usually less than 10 centimeters high) and bare ground, variables that appear to be essential habitat features for occupancy by Mountain Plovers. Knopf and Miller (1994) suggest 30% bare ground as a minimum habitat requirement in Colorado, and Parrish et al. (1993) reported 72%

bare ground at nest sites in Wyoming. Nests are usually near cow manure pies (Graul 1975, Knopf and Miller 1994). Grazing animals and Black-tailed Prairie Dogs play important roles in keeping the habitat suitable for the species. Dinsmore et al. (2003) showed that Mountain Plover breeding populations closely tracked annual changes in the area occupied by Black-tailed Prairie Dogs in Phillips County, Montana, with both plovers and prairie dogs recovering from an outbreak of sylvatic plague in the mid 1990s.

Mountain Plovers prefer to nest in heavily grazed grassland, but areas with light grazing that have been burned recently can provide suitable habitat for nesting birds. Cultivated fields are also used for nesting, primarily in the southern part of the North American range. Mountain Plovers have been found nesting in spring fallow and recently planted fields (Knopf and Rupert 1999), but evidently, Mountain Plovers do not use cultivated habitats in Montana for nesting (Knowles and Knowles 1998). In Canada, Mountain Plovers have nested in grazed or recently burned areas of native mixed grassland and sagebrush/bentonite flats. One nest was found in a field of exotic Russian wild rye and native plant species that had been lightly cultivated (Wershler 2000).

Breeding habitat for Mountain Plovers in Montana is usually characterized by grasslands and shrublands consisting commonly of needle-and-thread (*Stipa*), blue grama (*Bouteloua*), June grass (*Koeleria*), Nuttall sagebrush, and prickly pear cactus (*Opuntia*). Most breeding sites are grazed by domestic livestock and/or prairie dogs. Winter or spring grazing appears to be especially important for the creation of suitable breeding habitat in Alberta (Wershler and Wallis 1986) and Montana (Knowles and Knowles 1998).

Although this species nests in the shortgrass ecoregion, it is not one of shortgrass prairie habitat. Without some intense grazing by large assemblages of herbivores, the bird does not use the prairie. In fact, the tendency for these plovers to select native habitats with substantial bare ground, coupled with former cohabitation with large herds of bison, pronghorn, elk and prairie dogs indicate that it is a disturbed prairie or semi-desert species rather than a short-grass associate (Knopf and Miller 1994, Plumb et al. 2005b). In Wyoming, Plumb et al. (2005b) located 62% of nests on elevated plateaus with a

greater bare ground component than the surrounding landscape owing to wind scour and precipitation runoff. The occurrence of Mountain Plovers on sage brush flats with extensive areas of bentonite soils in Canada (see section 3.3 below) is mirrored also across central and western Wyoming and Montana, and also in South Park, Park Co., Colorado (F. Knopf, pers. comm.). These observations further support the idea that the species is a disturbed-desert species rather than a strict associate of the short-grass prairie.

Models of Mountain Plover breeding habitat in western Wyoming further suggest that the species is a member of shrub-steppe communities (Beauvais and Smith 2003). In short-grass prairie, low and sparse vegetation is largely due to episodic drought, fire and intense grazing, such that spatiotemporal distribution of these processes is highly variable, and prairie vegetation can recover from such disturbances in a relatively short time. In contrast, patches of low and sparse vegetation in a shrub-steppe community are largely due to poor soil quality, chronically low precipitation and constant wind scour. These factors are relatively static or frequent in time and space, leading to persistent bare patches. Thus, high quality habitat for Mountain Plovers may actually be highly stable in space and time (Beauvais and Smith 2003). Consequently, sagebrush flats in Canada on bentonite soil that are relatively stable from year to year may be one habitat to be searched in future (see below under *Suggestions for Future Surveys*).

2.5 Biology

Mountain Plovers show a high degree of site fidelity (Graul 1973, Knopf 1996, Dinsmore et al. 2003). Hence, the fragmentation and loss of the species' habitat might cause remaining breeding populations to be increasingly small and isolated. Gene flow might be restricted, if adult males and females and chicks show fidelity to the same breeding ground year after year. However, Oyler-McCance et al. (2005) found no evidence of significant population differentiation in four breeding sites ranging from Montana to Colorado, indicating sufficient female-mediated gene flow to homogenize gene pools among populations. They speculated that pair bonds are likely formed in mixed flocks on wintering grounds rather than on the summer breeding grounds. These wintering pairs

may return to the males' breeding/natal ground indicating sex biased fidelity which is in contrast to the conclusion of authors quoted in the first sentence of this paragraph.

The species appears to be loosely colonial. Solitary nests are often located in isolated patches of habitat, but many nests occur in localized areas, suggesting a loose colony or at least a passive aggregation of birds (Knopf 1994, 1996). This clumping results in areas of apparently suitable habitat not being occupied. During a three-year study, Manning and White (2001) estimated that over 70% of a shrub-steppe area in Utah with appropriate nesting characteristics was not occupied, and Wunder and Knopf (2003) calculated that about 65% of an area at South Park, Colorado, originally identified as potentially suitable habitat, was unoccupied by plovers. Nesting sites typically have vegetation less than 10 cm in height, bare ground and lichen cover of 30 – 50%, and extensive areas (0.5 – 1 km diameter) of nearly level (less than 5 % slope) terrain (Knowles and Knowles 1998). These open sites allow detection of predators, especially avian predators such as Prairie Falcons (*Falco mexicanus*) (Knopf 1996).

Nesting commences in April in the United States and May in Canada. In Colorado, Mountain Plovers arrived in the second half of March, and left the breeding grounds in the last half of July and early August (Knopf and Rupert 1996). Egg laying commenced on 15 April and continued through mid June in northern Colorado (Graul 1975). The female lays a clutch of three eggs in a depression on the ground. The unusual clutch-size (3 as opposed to 4 which is standard for northern and temperate-zone shorebirds) is a function of a rapid multi-clutch mating system (Graul 1973), in which the female often leaves the male to incubate the eggs in a first clutch while she lays a second clutch which she incubates herself. Since the pair may also renest after successfully raising one brood, each pair has the potential to make up to 4 nesting attempts per year (Knopf 1996). This reproductive strategy may be a result of low adult annual survival, which favours birds with annual increased reproductive output (Dinsmore et al. 2003). Alternatively, Graul (1973) proposed that this strategy evolved in response to a fluctuating food supply on a yearly, seasonal and area-to-area basis, such that in years of ample food supply one parent is sufficient for successful rearing of young. Eggs hatch in about a month and the young become independent at about 35 days. Parents quickly remove eggshells from the

nest as chicks hatch, and the brood moves usually one to two km from the nest in the first two to three days (Knopf and Rupert 1996). The multi-clutching pattern results in a uniparental care strategy, whereby the young are cared for by just one parent. Nesting success (or fledging rates) is quite low and ranges from one chick for each nest to one chick for three nests (Knopf 1996), with success varying among years. It has been suggested that drought conditions lead to low fledging rates, probably because predation rates are higher when food is in short supply (Knopf 1996). In Colorado, the minimum habitat size for brood-rearing was estimated at least 28 ha (Knopf and Rupert 1996). Dreitz et al. (2005) determined home range for broods in three habitats in Colorado: 146.1ha. in rangeland, 131.6 ha. in agricultural fields, and 243.3 ha. in prairie dog towns.

From mid/late July to November, the birds are found in family groups or post-breeding flocks across their breeding grounds. The Mountain Plover is considered to be highly mobile and to have the potential to disperse widely in the post-breeding season. 'Late' flocks in Canada (see section 4.1 below) may be of locally hatched birds or family parties from neighbouring Montana (F. Knopf, pers.comm.).

The nearest breeding population of Mountain Plovers to Alberta and Saskatchewan is in north-central Montana, where the preferred nesting habitat is in Black-tailed Prairie Dog towns that are moderately to heavily grazed by cattle (Knowles and Knowles 1984, Olson 1984). In a study of dog towns in the late 1970s, Knowles et al. (1982) showed that horizontal visibility and bare ground were greater and total plant cover including grass cover lower inside the towns that the plovers used than on adjacent unused areas, and that plovers used only active towns larger than 3 ha located on level upland sites. Olson's (1984) study on the Charles M. Russell National Wildlife Area indicated that dog towns less than 6 ha were not used. Further investigation of prairie dog colonies in Montana revealed the average prairie dog town used by plovers to be considerably larger, at 57.5 ha (Knowles and Knowles 1984). Historically, Coues (1874) stated that "the bird nests anywhere on the dry prairie; but it have (*sic*) any preference, it is for the stretches of low loose grassy ground where the prairie dogs settle, as distinguished from the more arid and gravelly or stony prairie".

Selected prairie-dog towns at the Charles M. Russell National Wildlife Refuge in Montana yielded density estimates of 6.8 and 5.8 birds/square km in 1991 and 1992, respectively. The spring of 1995 was very wet in Montana, and densities in this area were reported at 1.3 birds/square km in that year (Knopf 1996). Recent information documented the Mountain Plover population in southern Phillips County increased from about 100 individuals in 1995, to 175 individuals in 2001 (Dinsmore 2001). In 2003, over 150 nests were found on the same study site (Dinsmore et al. 2003). This increase is likely due to the recovery of Black-tailed Prairie Dogs from a recent sylvatic plague epizootic. Mountain Plovers at the Fort Belknap Indian Reservation increased from 0 to 20 from 1993 to 1998 following an increase in Black-tailed Prairie Dogs and the introduction of bison grazing, and there may presently be as many as 100 individuals, although the change may be due to more rigorous inventory (Knowles and Knowles 2001; Dinsmore et al. 2003). Mountain Plover densities on Black-tailed Prairie Dog colonies at the Charles M. Russell National Wildlife Refuge declined by more than half from 1980 to 1996. Prairie dog numbers at Charles M. Russell National Wildlife Refuge have increased since 1996, and plover numbers have gone up slightly. Knowles and Knowles (2001) report that between 1992 and 2000 Mountain Plovers declined at their Central and Southwestern study areas, but increased slightly at their Northeastern study area. Dinsmore (2001) concluded that Mountain Plovers in southern Phillips County are entirely dependent on an active Black-tailed Prairie Dog population, and that the plover abundance at his study site will likely parallel the population trends of Black-tailed Prairie Dogs.

In Montana, the species is not entirely associated with prairie dog towns. An area of habitat dominated by Nuttall sagebrush southwest of Glasgow along Little Beaver Creek in Valley County supported a population of Mountain Plovers in 1981 at a calculated high density of 16.4 plovers/mi^2 (Green 1982), although this high figure is disputed (Faunawest 1991, p. 36). This location is likely close to where Coues (1878) initially reported Mountain Plovers, and it falls into an area of bentonite soils (Green and Engle 1984, Faunawest 1991).

Nesting has not been observed in cultivated fields in Montana (Knowles and Knowles 1997). Only one Mountain Plover was located during a search of cultivated fields in 17 counties in 1995. Mountain Plovers appear to use cultivated fields in Montana only for foraging and territorial display. Shackford et al (1998) hypothesized that more frequent disturbance of fields, a shorter growing season, and more clayey soils in Montana compared to Colorado may explain this difference.

Richardson's Ground Squirrels occur within the breeding range of the Mountain Plover in Canada, but the extent to which they maintain nesting habitat is not known (Wershler 2000). Perhaps the burrowing activities of the ground squirrels could increase the amount of bare ground, a variable which is important in habitat occupancy by Mountain Plovers. The report by Knowles and Knowles (1998) of a pair of Mountain Plovers in Toole County nesting in an intensively cattle-grazed grassland site occupied by Richardson's Ground Squirrels suggests that such habitat will be occupied on occasion.

2.6 Threats

The decline in the continental population has been attributed to the conversion of native grassland to cropland, agricultural practices, management of domestic livestock, decline of native herbivores, and possibly pesticides. Early declines were probably related, at least in part, to "market" hunting (Leachman and Osmundson 1990). Loss of prairie dog colonies as nesting habitat was also given as a major cause of decline (Askins 2000). In Canada, the major threat was reported to be range management practices which discourage heavily grazed grassland and thereby restrict suitable breeding habitat. The resulting occasional isolated breeding pairs are therefore vulnerable to natural events such as weather extremes and predation. Other threats include human intrusion and continental population declines (Wershler 2000). However, some of the threats are speculative with no supporting data, particularly human disturbance and pesticides.

Weather extremes may play a significant role in the occurrence of Mountain Plovers in Canada. Fluctuations in precipitation can have adverse effects on the suitability of nesting habitat. Above average precipitation and resulting lush grass cover can render

habitat unsuitable for nesting if existing grazing intensity is insufficient to maintain short vegetation and bare ground (Wershler and Wallis 1986; U.S. Fish and Wildlife Service 1999a). At the other extreme, drought conditions have been hypothesized as contributing to low fledging rates by affecting food supply and simultaneously increasing predation pressures (Knopf 1996). While weather extremes themselves are not considered a threat to the Mountain Plover, the declining population and distribution of this species combined with its high nest site fidelity could make it more vulnerable to these natural events in the future (U.S. Fish and Wildlife Service 1999b).

Conversion of shortgrass prairie to agricultural land, primarily for winter wheat, has destroyed nesting habitat, as has planting of taller grasses in native prairie (Knopf 1996). In many areas, farms have switched to new crops in the past 25 years, including extensive areas of sunflowers and millet; these fields remain fallow until early May after plovers have begun nesting. In such situations farm equipment destroys many nests when fields are planted in May and many plovers renest there, later abandoning the nests when the crops become too tall. This shift in crops may create an ecological trap that partially explains some of the annual rate of decline since the 1960s (Knopf 1996, Knopf and Rupert 1999). However, as noted above, Mountain Plovers are not known to use cultivated land in Montana, and likely the same situation occurs in Alberta and Saskatchewan. Wintering areas in California are under extreme pressure from conversion of cultivated fields to vineyards, orchards, and urban development, the loss of grasslands, and potentially environmental contaminants (Leachman and Osmundson 1990; Knopf 1996; Knopf and Rupert 1995).

3.0 Canadian Records: A Review

Mountain Plovers have been recorded 44 times in Canada (Figure 2, Appendix 1) with some records involving more than one bird. A glance at the distribution of records indicates that there are a few outliers, but most records fall into two distinct areas, the Lost River – Wildhorse area of extreme southeast Alberta (Figure 3), and the Val Marie - Grasslands National Park area in Saskatchewan (Figure 4).

Figure 2. Distribution of records of Mountain Plovers in Canada, 1939-2005.

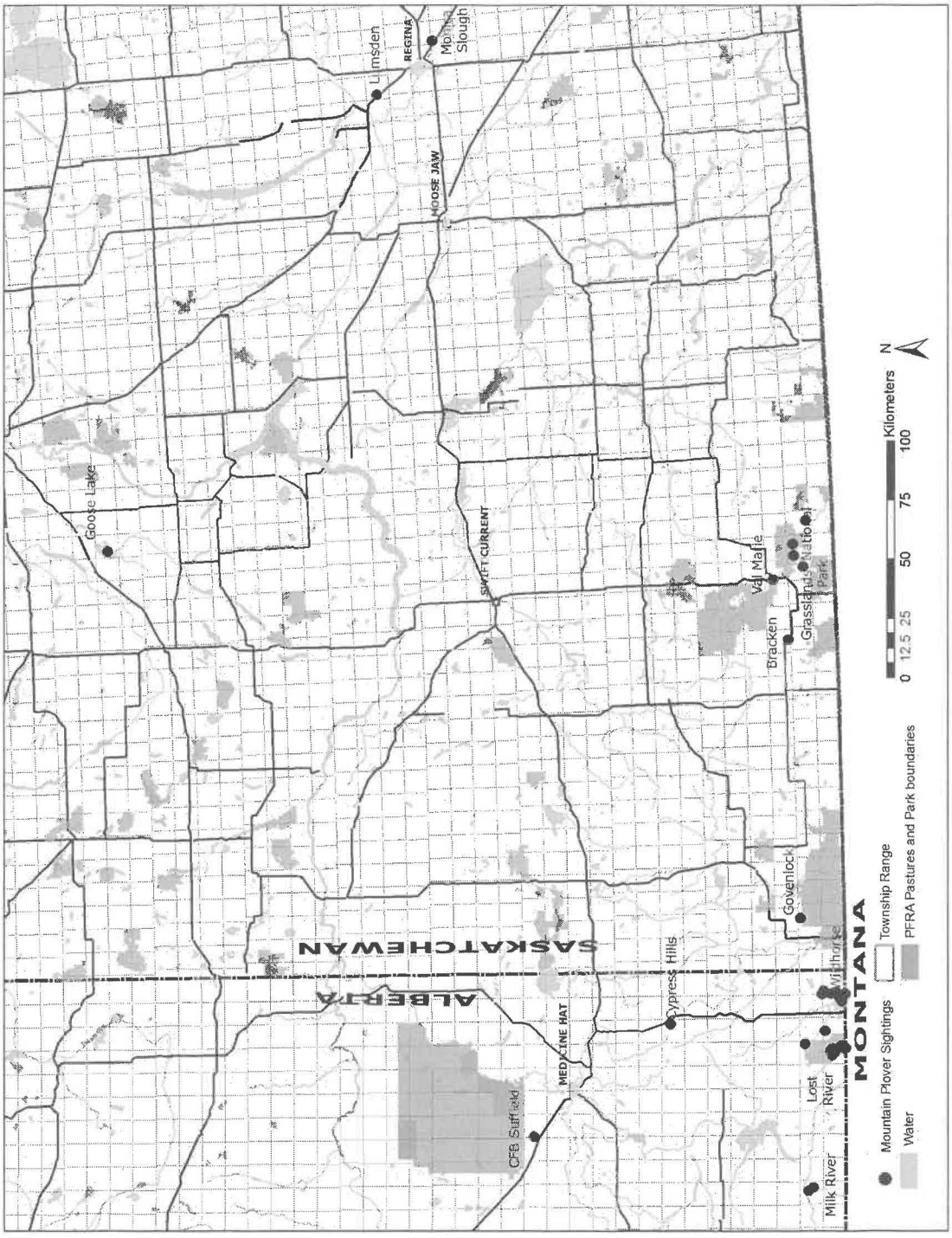


Figure 3. Distribution of records of Mountain Plovers in southeast Alberta, 1941-2005.

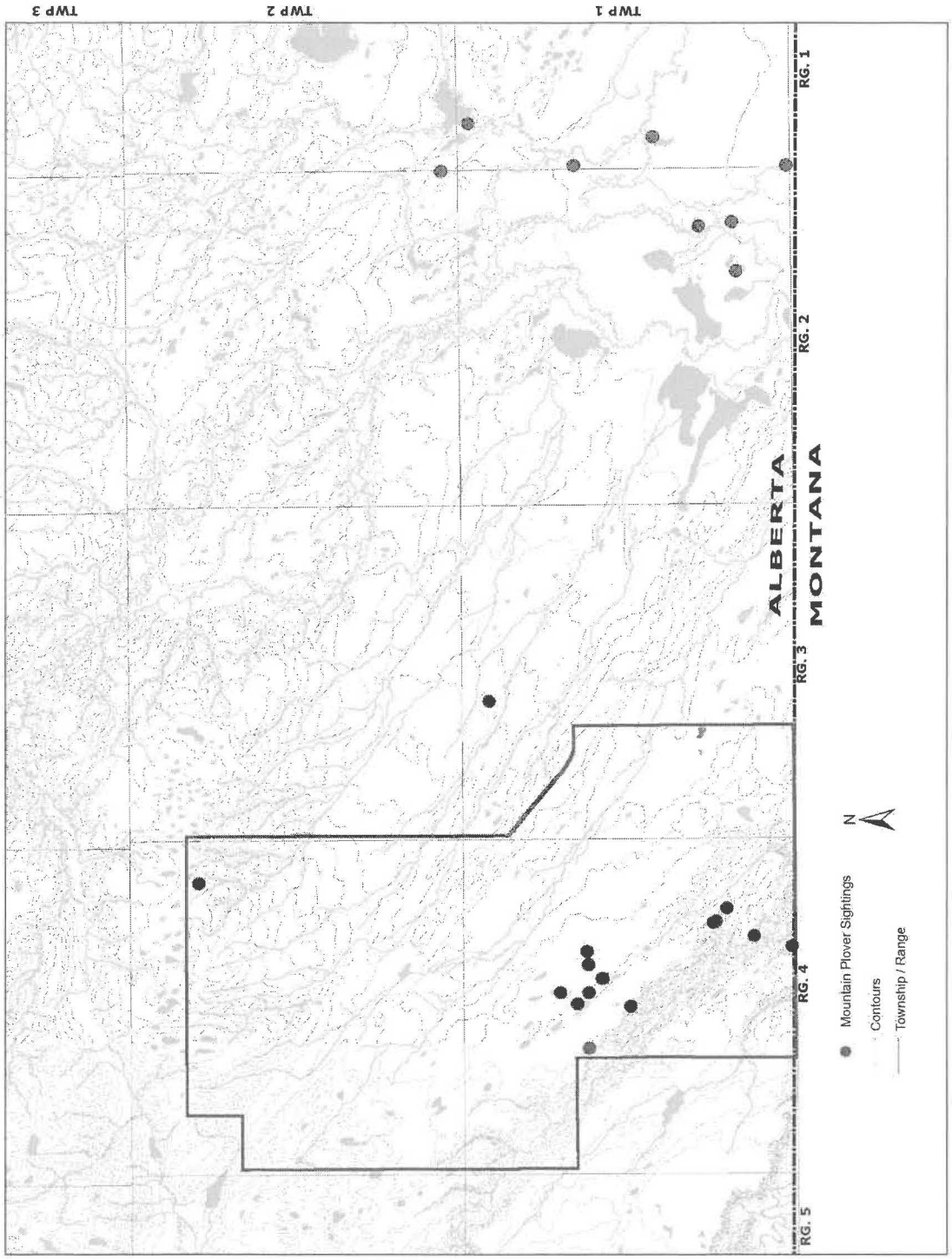
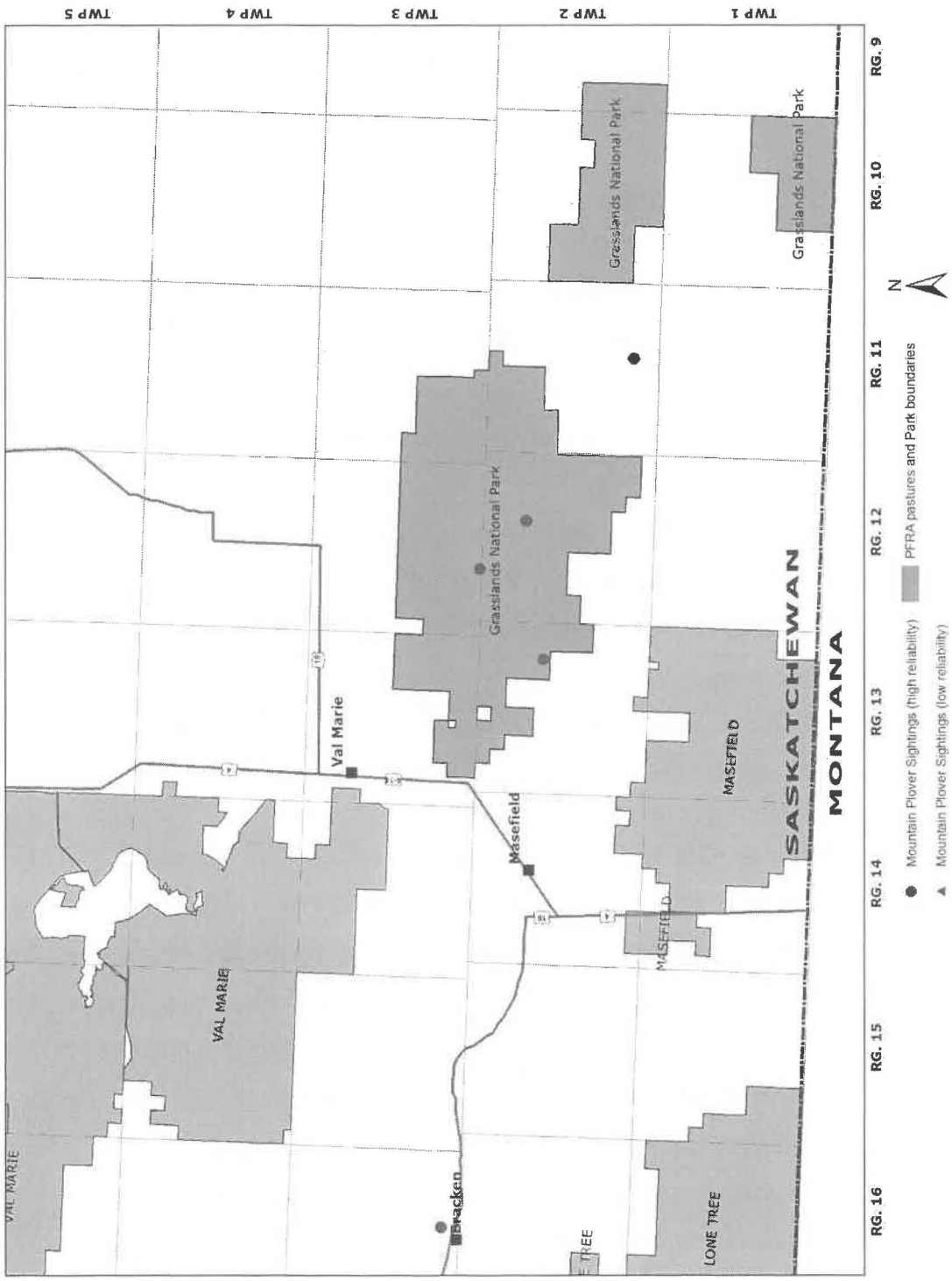


Figure 4. Distribution of records of Mountain Plovers in Val Marie area of Saskatchewan, 1939-2005.



3.1 Alberta Historical Records (1874-1941)

Coues (1878) has been cited extensively as the first Canadian records of Mountain Plovers. Various authors have made varying claims and interpretations as to what Coues reported.

The following is taken from the *Northern Boundary Commission, 1873-1874 Report* (Coues 1878). The Northern Boundary Commission survey charted the United States/Canadian border from the Red River in North Dakota to the Continental Divide in Montana. Ornithologist Dr. Elliott Coues was surgeon/naturalist for the US expedition both years. In 1873, Coues confined his work to the 49th parallel between the Red and Souris Rivers in North Dakota. The following year he left from Fort Buford, at the mouth of the Yellowstone River, and traveled northwesterly towards the 49th parallel, at Frenchman River around early July 1874 (Coues 1878). The remainder of the summer he collected and observed wildlife as he traveled west along the 49th parallel up to Waterton Lake, at which point he turned southeast to Fort Benton, and then down the Missouri River. Coues' ability to observe and record aspects of natural history was unsurpassed and his observations of this region are extremely valuable.

Coues (1878 page 635) writes … "The occurrence of this bird in the Milk River Country, along the parallel of 49 N, where it (Mountain Plover) was breeding in considerable numbers …. the northernmost points at which the species has thus far been observed … it was first seen July 1 (where the Milk River joins the Missouri), and it was traced thence across the country nearly to the Sweetgrass Hills, beyond which it was lost. Its centre of abundance in this region was the vicinity of the Frenchman's River, where many specimens, both adult and young, together with a set of three eggs, were secured during the first and second weeks of July." According to Coues' diary, he reached the Frenchman River at the 49th parallel on July 4, 1874.

Coues' journey in 1874 to the 49th parallel from Fort Buford most likely did not take him straight northwest, but rather took him west to the junction of the Milk and Missouri

Rivers, arriving there on July 1, and then northwest up the Milk. Such a route would take him through present day Valley County close to Phillips County, and hence through an area in which Mountain Plovers still occur today. Coues (1878) states they were "breeding in considerable numbers" along his route up the Milk River.

All 16 specimens listed by Coues were collected in Montana (Coues 1878, page 636). The locations are listed as: "Near mouth of Milk River, Mont." on July 1; "Frenchman's River, Mont." on July 4; "Near Frenchman's River, Mont. on July 9; "Near Two Forks of Milk River" on July 13, Two Forks of Milk River on July 16, "Crossing of Milk River, Mont." on July 23. These records indicate that he was in fact not right on the border. These locations place Coues some distance from the actual border; mouth of Milk River is 100 km from border, mouth of Frenchman River is 55 km from border, Two Forks is near Malta about 50 km from the border. Since he was part of the US boundary commission team, it seems unlikely that he would have collected or even traveled in Canada. His objective was to survey the biological resources for the US government. The Canadian team had a biologist-geologist, George Mercer Dawson surveying the biological resources on the Canadian side of the border. Unfortunately Dawson (1875) does not refer to any birds that he saw during his expedition.

An anomaly is the specimen in the British Museum, cited in Macoun and Macoun's (1909, p.211) "Catalogue of the Birds of Canada", labeled "North American Boundary Commission, 49th parallel" with the date given as June 24, 1874, a date that Coues was most likely near Fort Buford at the mouth of the Yellowstone River where it joins the Missouri River (along the 48th parallel in North Dakota close to the Montana border). The date could be inaccurate, and the specimen actually refers to a collection made on July 23, 1874, along the Milk River just south of the 49th parallel.

Knowles and Knowles (1998) reviewed historical records of Mountain Plover in Montana and summarized them in tabular form. Lewis and Clark first reported a small curlew when they crossed Montana, which has been interpreted as Mountain Plover. Several subsequent explorers recorded Mountain Plovers in Montana, all in prairie dog colonies: Cooper in 1860, Coues in 1874, and Cameron 1898. Other authors do not describe the

habitat where Mountain Plovers were located. Some authors reported plovers rare in the parts of Montana where they traveled. Given the preponderance of records in prairie dog colonies, it is curious that Coues then found the plover common along the US-Canada border well away from prairie dog colonies.

Examination of Coues' original report reveals that his observations and collection of this species were in fact south of the border in Montana (Coues 1878 page 636). Subsequent treatment of the occurrence of Mountain Plovers in Canada after Coues' initial reports suggests that the species was essentially unknown in Canada for the next 50 years (Raine 1892, Taverner 1927, see section 2.2 above).

Since there are few confirmed records from this period, historical occurrence of the Mountain Plover on the Canadian prairies is doubtful. Taking these observations into account, Macoun and Macoun (1909) assert that "In June 1895, the writer [Macoun] was on Frenchman river, Sask., for many miles and did not see a trace of the bird so that lat. 49° must be close to its northern limit" (p. 211). Williams (1949) traveled through this general area in 1923-1926 and did not find them. Mitchell (1924) describes it as hypothetical in Saskatchewan, stating that while there were no records it would probably be found eventually in the extreme south (Wapple 2005). Thus Coues is the only author to report Mountain Plover along the border, he was only there for one summer, and all his specimens are listed as taken in Montana. Given that other authors were not able to find any plovers for 60 years, one could conclude that 1874 was an anomaly in terms of plover distribution, or conditions for plovers deteriorated rapidly after 1874, and that Coues was further south of the border than has been assumed.

In summary, Coues stated that he found Mountain Plovers in July 1874 along the 49th parallel from the Frenchman River to near the Sweetgrass Hills. These locations translate today from south of Grasslands National Park, Saskatchewan, to south of Wildhorse-Lost River, Alberta. However, his known specimens appear to have all been collected in Montana July 1874. For the next 60 years no plovers were recorded in Canada despite several efforts to find them.

On June 22, 1941 Soper collected two male specimens (nos. 4404 and 4405) on "the shortgrass plains in Section 33, Township 1, Range 3, west of the fourth meridian, about 6 miles north-northeast of Wildhorse, Alberta: this point is approximately 8 km (five miles) north of the International Boundary" (Soper 1941). Four birds were seen, and their behaviour indicated breeding as "they were quite agitated and, with excited calls, flew away in various directions when followed only to invariably return to the point where first observed" (Soper 1941, p. 137). However Soper did not confirm their breeding status. The area was described as flat to gently rolling, grass short and sparse, interspersed with small naked areas of clay. Typical vegetation included sagebrush (*Artemisia*), greasewood (*Sarcobatus*), cacti (*Opuntia* and *Mamillaria*) and low thickets of wild rose (*Rosa*) and snowberry (*Symphoricarpos*). Soper makes the point that the species is readily detected when facing the observer because of the white underparts, but blends well when facing away.

Rand (1948) does not mention any records from southeastern Alberta (although Soper's 1941 record had been published) and found none during his visit to the Onefour area in July 1945.

3.2 Alberta Modern Records (1966-present)

Following Soper's observations in 1941, there followed a gap of over 20 years before the next record in Alberta, a sight observation of two birds on June 12, 1966, by Cleve Wershler at Elkwater in the Cypress Hills, an unlikely habitat and certainly unsuitable as a breeding location (Wallis and Wershler 1981). Five years later, there is a passing reference to two Mountain Plovers on July 5, 1971, a few kilometers north of the international border about 30 km west of Wildhorse (Salt and Salt 1976).

On 30 September 1977, five Mountain Plovers were located northeast of OneFour, a family party of two adults plus three juveniles (Wallis and Werschler 1981). The precise location for this record was not documented, and subsequent searches in the general area during the breeding season have not revealed any nesting Mountain Plovers (Wallis and Loewen 1980; G. Holroyd, pers. comm.). Although the date appears late for a family

group of Mountain Plovers to occur at this latitude, F. Knopf (pers. comm. 2005) comments that, although fall migration begins shortly after chicks fledge, such that "oftentimes all birds have departed breeding area by early August", occasionally family groups are reported fairly late into the fall "given the identity of After-hatch year and Hatch-year birds in those 'late' flocks tells me that the observations are probably really of Mountain Plovers. It wouldn't surprise me to have a couple of records that late up there, as such also happens now and then in Montana. I've actually had mid October sightings on one occasion here in N. Colorado. Mid October is when birds begin showing up in California)."

The first nesting record for Canada occurred in 1979, when a group of Alberta Parks and Natural Areas personnel discovered a nest with three eggs on May 25 in the Lost River area (S2 TP 1 R4 W4) (Wallis and Loewen 1980). A second nest with three eggs was found on June 4-5 1979 (Wallis and Wershler 1981), and a count of 3 adults with 9 newly hatched young was made on June 14. Sightings on July 11 of four adults with 5 unfledged young could still refer to the same birds as chicks are reported to fledge 33 – 36 days after hatching (Graul 1975; Miller and Knopf 1993). Surveys of this area on July 15, July 29 and August 14 failed to observe any Mountain Plover (Wallis and Wershler 1981); presumably they had left their nesting area once the young had fledged (Knopf 1996).

Searches in the Lost River-OneFour area in the following years produced the following (Wershler and Wallis 1986):

- 1980: 6 adults with three broods (number of young per brood is not recorded) on June 20 – 21.
- 1981: at least 11 adults and six nests with 3 eggs each on May 18 – 20 with a subsequent visit on June 15 locating four adults and two broods (of unspecified size).
- 1982: 6 adults on April 30 and two adults on July 4.
- 1983; two adults (no date); BSOD gives the date for this record as January 1, which is likely an error of transcription.

- 1985; two adults on April 26 followed by two adults and a nest of three eggs on May 15 (nest failed and no adults seen May 28).
- 1986; there were no records of Mountain Plover in 1986 despite intensive coordinated searches. Wershler and Wallis (1986) note that the study this year coincided with record spring rainfalls, resulting in very lush grasslands not suitable for nesting Mountain Plovers.
- 1987; no records this year, when no coordinated searches were conducted.
- 1988; surveys in 1988 failed to find any birds in the traditional nesting area, but later in the season casual searching produced a nesting pair in somewhat atypical habitat adjacent to the traditionally used habitat. Two adults were found on June 20, one adult attending or incubating at a nest, and the other incubating a nest with 3 eggs; on July 16, there were two adults and two downy young and on August 27 there were still one adult and one fledged young (Wershler 1989).

There were no records in the 1990s at OneFour. The next record was in 2001, an adult at the end of April, after April 24 by Ian Walker, station manager (in Wershler and Wallis 2001). There then followed a gap of four years until 2005 when an adult and a nest were located on 22 June 2005 by Geoff Holroyd and Helen Trefry and three adults were at the same location on 24 June by Richard Knapton (see section 3.3 below).

The Heydlauf Ranch is located in the extreme south-east corner of Alberta in Townships 1 and 2, Range 1 and 2. The sighting of an adult 10 km north of Wildhorse on May 3, 1986 (Wershler and Wallis 1986) was followed by the discovery of an adult at a nest with 3 eggs on June 14, 1990 by Alberta Fish and Wildlife staff in an area of sagebrush flats (Wershler 2000). Other reports of Mountain Plovers in 1990 were from an unspecified site northeast of Wildhorse between June 19 and July 1 (Wershler and Wallis 2001). No records were documented for the next four years until 1994 when an adult was reported on May 7 by P. Roxburgh and an adult at a nest with 3 eggs on May 12 by Tom Sadler (Wershler 2000), reported as in NE ¼, Sec 1, Tp 1, Rge 2, northwest edge of a known Sage Grouse lek (Wershler and Wallis 2001). Furthermore, the local rancher reported that the species "has always been around" (Wershler and Wallis 2001). In early

May 1999, David Heydlauf found a nest with four eggs on his ranch; the nest was reported as "down close to the border beyond the (Sage Grouse) lek area" (*fide* Joan and Malcolm MacDonald). However, a clutch of four is unusual for this species that typically lays three eggs (Knopf 1996). This was followed by two records of non-breeding adults in 2001, reported as a single on May 29 and the other of a pair also on May 29 (BSOD), although the two records are reported as being a week apart (Wershler and Wallis 2001) and one of the records might actually have been in June (Hannah 2003).

Several undocumented extra-limital records for Alberta should be noted. A single bird was reported on April 20, 2002, in slightly rolling prairie with grass 1 – 5 cm as ground cover south of CFB Suffield, about 4 km north of Hwy 1 (BSOD, Hannah 2003). Two reports of non-breeding adults were along the Milk River, on May 17, 2002, two adults about 5 km east of Hwy 880 crossing the Milk River, and one adult about 7 – 8 km southeast of Hwy 880 crossing the Milk River (BSOD). Hannah (2003) considered two of these records speculative on a reliability scale, whereas the record of two adults was considered high reliability.

3.3 Alberta 2002-2005 Surveys by Canadian Wildlife Service Personnel

Geoff Holroyd, Helen Trefry and co-workers spent a total of 74 days, amounting to about 1100 person-hours, between May and July for the four years 2002-2005 in habitats of varying potential as Mountain Plover habitat at OneFour and surrounding area whilst conducting research on Burrowing Owls. In addition, 280 point counts for owls and other bird species were conducted from 2002-2005 and Richard Knapton spent eight days searching for plovers in 2005. The only Mountain Plover records during this fieldwork was an adult and a nest on 22 June 2005 and three adults on 24 June at the same location (see below), a strong indication that Mountain Plovers were not present every year and certainly not in readily detectable numbers. Significantly, the area in which the nesting occurred was visited repeatedly over many years and seasons, with no previous detection of a Mountain Plover.

An adult Mountain Plover with a nest located on June 22 at 1830 hrs. was seen from a vehicle by Geoff Holroyd and Helen Trefry (Figure 5). The single adult was first observed about 75 m away from the vehicle and after the truck was backed up, the adult plover approached and went to its nest with 3 eggs about 15 m from the vehicle . The nesting area was a field which had been spring grazed and had many patches of bare ground interspersed among the grass vegetation (Figure 6). Although no cattle were present at the time, cow manure pieces were prevalent throughout the field and in the immediate vicinity of the nest (Figure 6). On June 24, R. Knapton observed three Mountain Plovers in the same general area, one of which was the incubating bird. A check of the nest and the area on July 5 revealed the nest to be empty and no birds were seen. No broken eggshells were obvious and the nest appeared intact.

The only other Mountain Plover record in 2005 to our knowledge was on the Heydlauf ranch. On July 2, 2005, D. Heydlauf and R. Gardner located two Mountain Plovers on sage brush flats and the birds were seen thereafter by Mr. Heydlauf until July 7. A search on July 17 by Joan and Malcolm MacDonald and Jerry Pilney and on July 22 by R. Knapton and D. Heydlauf failed to relocate the birds. The local ranchers, David and James Heydlauf commented in 2005 that the birds occur annually on their ranch (R. Knapton, pers. comm.).

Figure 5. Mountain Plover observed at Onefour on 22 June 2005 after leaving the nest. Note relatively short but dense grass cover. Photo by Geoff Holroyd.

Figure 6. Mountain Plover nest at Onefour photographed on 22 June 2005. Note cow manure in close proximity to nest. Photo by Geoff Holroyd.

3.4 Saskatchewan Historical Records (1939-1959)

The first Canadian sight record was a bird carefully described by Soper on June 5, 1939 "two miles north of the village of Bracken" in Saskatchewan (Soper 1939). The point was 22 km (14 miles) north of the international border at an altitude of about 2900 feet. Currently this area is under intense cultivation and is unlikely to be suitable as nesting habitat (R. Knapton, pers. obs. 2005).

Following Soper's record of a single bird north of Bracken in 1939, the next report in Saskatchewan was of an "undated sighting by John Shadick about 1959, south of Govenlock" (Houston et al. 1981) with no further details. This record is not mentioned in COSEWIC reports (Wershler and Wallis 1986, Wershler 2000) or in a status report of Mountain Plovers in Canada (1981).

3.5 Saskatchewan Modern Records: (1977- present)

A sighting of 8 birds on September 22, 1977, was reported just east of the monument at the main prairie dog colony (now referred to as Monument West Prairie Dog Colony) in the then proposed Grassland National Park (Peart and Woods 1980). An unusual aspect of this record is that the birds are described as being "slightly smaller size than a Horned Lark", which is either a misprint in the manuscript or a misidentification. The actual record seems late. However, although fall migration begins shortly after chicks fledge, such that "oftentimes all birds have departed breeding area by early August" (Knopf 1996), occasionally family groups are reported fairly late into the fall (F. Knopf, pers. comm., 2005 see page 25 above)."

Then a ten-year absence followed before the next record. In 1987, Wayne Harris reported one adult on May 14, 200 m off the west side of Dixon Main (Dixon Y) Prairie Dog Colony (Gollop 1987a) followed by a family group of two adults and three fledglings ("almost flying young") on the colony on July 31 seen by W. Harris, the only known breeding record for Saskatchewan (Gollop 1987b). This colony was reported as being "moderately grazed by cattle" (Wershler 2000).

There have been two subsequent records in the national park, both associated with prairie dog colonies. At Larson Prairie Dog Colony, there was an adult on June 13, 1991 (Wayne Harris, in Wershler and Wallis 2001), and at Sage Prairie Dog Colony, there was a single adult on May 21, 1999 (G. Holroyd, H. Trefry, pers. comm.).

Few reports exist in Saskatchewan outside of Grasslands National Park and the immediate surrounding area. An adult was reported by C. Bjorklund in the Breed Creek area, southwest of Mankota, on June 13, 1991 (Koes and Taylor 1991) with no further details. A group of five was reported near Monica Slough, near Richardson south of Regina, on October 1, 1990 by F. H. Brazier (Brazier 1991). An adult was reported on the east side of Goose Lake on May 18, 1991 (Leighton et al. 2002), and one on July 24, 1995, near Lumsden was "carefully described" (Koes and Taylor 1995).

3.6 Saskatchewan 1998-2005 Surveys by Canadian Wildlife Service Personnel

Geoff Holroyd and Helen Trefry spent a total of 101 days amounting to about 1600 person-hours in high potential habitat (prairie dog colonies) in Grasslands National Park and surrounding areas conducting research on Burrowing Owls from 1998 to 2005. Their 8 years of surveys included all prairie dog towns in Grasslands National Park, parts of Dixon Ranch, Masefield PFRA and Dixon Provincial Community Pasture. The total area of prairie dog towns in Grasslands National Park and vicinity was calculated to be 965 hectares in 2004 (Fargey 2005) and Burrowing Owl surveys include about 95% of the total area. Each year prairie dog colonies were surveyed for at least one to three hours each, in both May and July. The surveys comprised of visual scans from hill tops overlooking the colonies and then walking searches for birds across each colony. The only Mountain Plover seen during this fieldwork was a single adult feeding in the Sage Colony of Grasslands National Park on May 21, 1999, a strong indication that Mountain Plovers are not common.

PFRA pastures have also been surveyed as part of searches for Burrowing Owls by CWS staff and contractors for 4 years. The following pastures were searched: Swift Current District: Auverge-Wise Creek, Beaver Valley, Masefield, Val Marie, and Lone Tree

pastures; and in Maple Creek District: Battle Creek, Govenlock, Nashlyn, Reno #1 and Reno #2. Most of these pastures were visited each year from 2002 to 2005. The greatest effort was in 2002 during burrowing owl surveys and in 2005 with 16 days of dedicated searches for Mountain Plovers conducted by Richard Knapton.

4.0 Discussion

4.1 Seasonal Patterns of Occurrence

Mountain Plovers have been recorded a total of 44 times in Canada in the past 140 years. (Figure 1, Appendix 1). Records ranged from April 20 to October 1, with the majority of records occurring in May and June (Table 1). During the nesting season (April-July), 15 records are of nesting attempts, 10 are pairs and 12 are single birds and the remaining 7 records are 2 to 8 plovers in pairs or flocks with unknown breeding status or outside the breeding season. Thus 15 of the 44 sightings are known nesting records and 10 are possible nest records. The remaining 19 records are most likely non-nesting records.

Table 1. Seasonal occurrence of sightings of Mountain Plovers in Alberta and Saskatchewan.

Province	April	May	June	July	August	September	October	**Totals***
Alberta	3	11	11	6	1	1	0	33
Saskatchewan	0	2	4	2	0	1	1	11
Total:	3	13	16	8	1	2	1	43

** record #26 in Appendix dated January 1 presumed to be an unknown date*

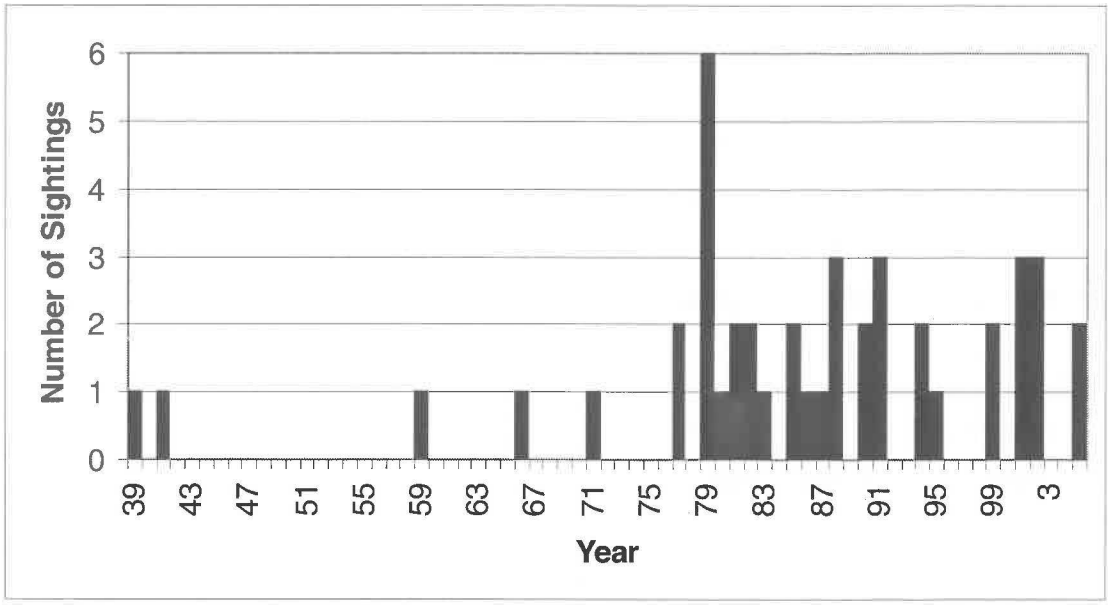
Dates that eggs were found in Canada range from May 12 to June 22, and young from 14 June to 31 July (Table 2). This broad range of dates would agree with Knopf (1996) who stated that pairs can have up to four broods, two incubated by the male and two by the female. The later dates could also represent renesting of failed pairs.

Table 2. Dates of breeding evidence in Mountain Plovers in Canada.

Breeding Evidence	May	June	July	August	September
Eggs	12,15,18,25	4,9,14,20,22			
Unfledged Young		14,15,20	11,16,31		
Fledged Young				27	30

In the past 40 years, Mountain Plovers have been recorded 44 times. The number of sightings per year appears to increase in the past 30 years with a peak between 1979 and 1992 with one to three sightings per year in all but three of those years (Figure 7). This peak may be due to the level of field work undertaken by Cottonwood Consultants in search of nesting plovers, although bird watchers also made some of these observations (Appendix 1).

Figure 7. Number of Mountain Plover sightings per year in past 70 years.



Since Mountain Plovers favour short grass habitats modified by prairie fires or heavy grazing by bison or prairie dogs (Graul and Webster 1976), it seems likely that they were more plentiful in the northern Great Plains before human settlement. Wapple (2005) noted that Coues' statement of its abundance in Montana stands out from other historical assessments. The two or three decades immediately following Coues' sightings was a unique time for the Canadian prairies in that herds of bison had just been eliminated and the rapid pace of early human settlement had greatly reduced the frequency of prairie fires. Therefore the remaining native grasslands were likely more luxuriant, at least temporarily, than in recent history resulting in a relatively unique prairie condition which would not have been beneficial for Mountain Plovers (A. R. Smith, pers. comm. *In* Wapple 2005). This situation would have reverted somewhat during the early 1900s due

to the grazing of domestic livestock by pioneer settlers but much of this species' habitat would have vanished during this time due to the cultivation of native prairie for agriculture.

Between the late 1800s and 1945, other observers such as Macoun, Taverner, Soper, Williams, and Rand were in the general area of where this species had occurred but did not find any. Possible explanations include the following: since this species habitat quality can be locally affected by climatic factors (i.e. drought vs. years with heavy rainfall) these observers may have been in these areas during years when the grass cover was too thick which precluded its presence, and given its very restricted range they may have circumvented the very limited area in which they occur (C. Wershler, pers. comm.). If Coues was correct in his assumption of its abundance in Montana in the 1870s, the decades following his findings may suggest an acute decline in this species' abundance in its highly localized range south of the Canadian border where drastic habitat changes occurred due to the removal of bison, control of wild fires and the actions of pioneer settlers. Despite the probability that it was more common in pre-settlement times, it seems unlikely that the Mountain Plover was a common species in extreme southwestern Saskatchewan and southeastern Alberta during the period of early human settlement. Species typically fluctuate somewhat on the peripheries of their ranges which may preclude its regular appearance within the Canadian portion of its range.

4.2 Extent of Canadian Range

Wershler (2000) calculated that, based solely on information from Alberta locations since 1979, the extent of occurrence in Canada was estimated at less than 20 km^2 and the present area of occupancy less than 5 km^2. He further estimated that the potential area of occurrence in Alberta, given appropriate management conditions, at less than 150 km^2. Information on site locations in Saskatchewan has not been well documented.

From aerial surveys flown on May 23, 2001 across the presumed Canadian range of the Mountain Plover, from just west of OneFour to the east side of Grasslands National Park followed by subsequent ground truthing, Wershler and Wallis (2001) identified sites

potentially suitable for occupancy by Mountain Plovers. Out of more than a hundred identified sites, a total of 61 were assessed as having potential for Mountain Plover nesting habitat, of which 30 had high and 31 limited potential. Most (73%) of the high potential sites were located in upland grasslands in southeastern Alberta and immediately adjacent Saskatchewan, with the remaining 27% associated with Black-tailed Prairie Dog colonies in Grasslands National Park. Intervening areas were considered unsuitable owing to intense cultivation. High potential habitats included well-drained level grasslands, more localized areas of level, well-drained grassland within grassland-sagebrush and lower-lying solonetzic soil areas, and prairie dog colonies. Of 17 sites with high suitability and high potential, four were in prairie dog colonies in the Val Marie area, and 13 were in the Lost River – Milk River and Wildhorse – Govenlock regions. Those high potential sites with limited suitability sites identified in 2001 lacked intensive grazing, the major factor restricting suitability. The year 2001 resulted in extreme drought conditions in much of the Alberta range; drought is reported to make habitats less productive, resulting in poor breeding success and early departure of adults from the breeding grounds.

4.3 Canadian Population Trends

With so few sightings and nest records, the population trend of Mountain Plovers is a mute point. However, the decision by COSEWIC to list this species, infers a declining trend. Thus we offer the following reassessment of the species status and trend in Canada.

Mountain Plovers only occur peripherally in Canada. The scarcity of records over the past century and half indicate that it is not a regular breeder in Canada. The lack of regular nesting immediately across the border in Montana reinforces that view. The species does nest commonly about 150 km south of the border, thus plovers can be expected to wander north on a regular basis. However the lack of regular records in Canada would indicate that Mountain Plovers are not regular breeders in Canada or the effort to find them has been inadequate. While there has been considerable field work in southern Alberta and Saskatchewan related to burrowing owls, it is possible that plover

habitats have been overlooked. In the next section we identify habitats and locations that could be searched for Mountain Plovers. The number of records in Canada appears to have increased in the past 70 years with a peak in the early 1980s (Figure 7). Few plovers have been recorded in the past decade.

5.0 Conclusions

Mountain Plovers have been recorded in Canada on 44 occasions, between April and October 1, 1939 to 2005. Coues (1878) collected specimens only in Montana. The presence of Mountain Plovers as a nesting species in Canada is based on 16 records of nests with eggs or adults with dependent young during nine years between 1979 and 2005, with suggestive evidence of breeding in other years. The frequency of records and varied search effort make it impossible to estimate population trends in the past 100 years. A large amount of time has been spent in primary habitats between 1998 and 2005 by CWS personnel. The low number of nest records implies that this species is peripheral in Canada in a very limited range. These individuals may be irregular dispersing first time breeders from the annually occupied range in Montana. It remains to be seen if the Mountain Plover becomes a regular breeder in Canada.

5.1 Suggestions for Future Surveys

1. Since Mountain Plovers have been associated with sagebrush on bare bentonite soils, such areas should be identified and surveyed. Soil maps such as AGRISID and CANSIS may be used to determine regions of bentonite soils on the land surface, and then overlaid with vegetation maps. The areas with overlapping bentonite and sagebrush should be surveyed for Mountain Plovers. The GIS exercise should be straightforward for Alberta but may not be available for Saskatchewan.
2. The Heydlauf ranch in extreme southeastern Alberta has been the location of several Mountain Plover records. In addition the landowners stated that Mountain Plovers occur there annually. Parts of the ranch have bare bentonite soil with sagebrush, a seemingly favoured habitat. Previous surveys including those in 2005 have focused more on the Onefour Agricultural Research Sub-station. The Heydlauf ranch should be surveyed more vigorously.

3. The areas identified by Wershler and Wallis (2001) should be compared to current GIS maps to determine if they have suitable soil and vegetation characteristics. It is not clear what criteria were used to select these "suitable" areas.
4. The prairie dog colonies around Grasslands National Park where cattle graze should be checked annually in combination with Burrowing Owl surveys. While some colonies have been checked annually for the past 8 years, the Dixon South and Southeast prairie dog colonies should be checked since they are used as cow-calf pastures and may be the most suitable for Mountain Plovers.
5. Prairie dog towns have been identified as the main habitat of Plovers in Montana and one of the remaining core breeding areas in that state is located 150km south of Grasslands National Park. However, Prairie Dog towns in GNP have lacked large grazers that have been associated with Mountain Plover breeding habitat elsewhere. In the spring of 2006, bison will be released into the west block of the Park where most of the dog colonies are. Continuing surveys for Burrowing Owls should include searches for Mountain Plovers after the bison release and should include all dog colonies.
6. May surveys by CWS from 1998-2005 in the prairie dog towns have been extensive but follow-up work focused on those areas where Burrowing Owls were found. Pamela and Craig Knowles, during extensive surveys for Mountain Plovers in Montana, have noticed the plovers avoid areas with lots of owls (pers. comm. 2005). More intensive walking searches should be made in June and July in flat barren areas of the dog towns that do not have owls.
7. Cow-calf pastures have not been targeted for surveys. Cow-calf pastures are typically occupied from late winter to spring and are intensively grazed until calving is complete. These pastures are often close to farmsteads so that ranchers can check on cows daily. A sample of these pastures between Onefour and Val Marie should be identified and surveyed. This habitat has not been previously identified for Mountain Plovers but fits the conditions for breeding habitat identified in the literature.
8. Playback calls of Mountain Plovers were suggested by Dave Duncan as a survey technique. The lack of Mountain Plovers precluded the opportunity to test their response to a call. American biologists could be asked to test playback calls for this

species. In addition, a CD player should be kept in each CWS vehicle to test response if a Mountain Plover is encountered.

9. Mountain Plovers in low density populations are easily missed. Because of this and their recorded ability to nest into July, surveys of key areas should be repeated in May, June and July. Many of these could be combined with associated Burrowing Owl work.

6.0 Acknowledgements

Many individuals assisted with fieldwork and report preparation. We give special thanks to Dave Duncan, CWS for initiating and funding this project and fieldwork for 2005. Ian Walker, station manager at Onefour Agricultural Research Sub-station was very helpful with accommodations, access and historical information. Walter Wilms loaned his trailer for accommodation. Robert Sissons and Pat Fargey, Grassland National Park, Parks Canada Agency provided assistance and accommodation in Val Marie. Bill Bristol facilitated access permits for PFRA pastures in Saskatchewan, pasture managers provided permission for each of the pastures that were visited, Colleen Nordlund and Susan Blackman assisted with literature search; Gillian Turney prepared the maps of plover records, Kate Dancer formatted the report, Al Smith provided a compilation of Saskatchewan records, Lonnie Bilyk provided Alberta records, and Ray Poulin provided the range map of North America in black and white. Craig and Pamela Knowles provided a copy of Coues' report. They, Steve Dinsmore and Fritz Knopf replied authoritatively and promptly to our inquiries. We thank all these agencies and individuals for their assistance.

7.0 Literature Cited

American Ornithologists' Union (AOU). 1957. Check-list of North American birds. Fifth edition. American Ornithologists' Union, Washington, DC. 691 pp.

American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. American Ornithologists' Union, Washington, DC. 829 pp.

American Ornithologists' Union. Committee on Classification and Nomenclature. 1983. Check-list of North American Birds. Sixth Edition. American Ornithologists' Union, Allen Press, Inc., Lawrence, Kansas. 877 pp.

Anonymous. 1990. Saskatchewan Birds: American Birds Report- Fall 1990. Unpubl. MS. 22 pp.

Askins, R.A. 2000. Restoring North America's Birds. Yale University Press, New Haven. 320pp.

Beauvais, G. P. and R. S. Smith. 2003. Model of breeding habitat of the Mountain Plover (*Charadrius montanus*) in western Wyoming. West. N. Amer. Nat. 63:88-96.

Bent, A.C. 1929. Life Histories of North American Shore Birds, part II. Dover Publications 1962 reprint, New York. 412pp.

Brazier, F. 1991. Mountain Plover sighting near Regina. Blue Jay 49(2):88-89

COSEWIC. 2002a. Committee on the Status of Endangered Wildlife in Canada. Ottawa. http://www.cosewic.gc.ca/eng/sct0/assessment_process_e.cfm#tbl5

COSEWIC 2002b. COSEWIC Status Report - Mountain Plover: http://www.sararegistry.gc.ca/status/showASCII_e.cfm?ocid=212

Coues, E. 1874. *Birds of the Northwest*

Coues, E. 1878. Field notes on birds observed in Dakota and Montana along the 49th parallel during the seasons of 1873 and 1874. Article XXV. Bull. U. S. Geol. and Geog. Survey No. 3: 545-661.

Dawson, G.M. 1875. Report on the Geology and Resources of the region in the Vicinity of the Forty-ninth Parallel from the lake of the works to the Rocky Mountains with lists of plants and animals collected and notes on the fossils. British North American Boundary Commission, Dawson Brothers, Montreal.

Desmond, M. J. and F. Chavez Ramirez. 2002. Nest documentation confirms the presence of a breeding population of Mountain Plover *Charadrius montanus* in north-east Mexico. Cotinga 17:17-19.

Dinsmore, S. J. 2001. Population biology of Mountain Plovers in southern Phillips County, Montana. Unpubl. Ph.D. Thesis, Colorado State Univ., Ft. Collins, CO. 99 p.

Dinsmore, S. J. 2003. Mountain Plover: a technical conservation assessment. USDA Forest Service, Rocky Mountain Region 43 pp

Dinsmore, S. J., G. C. White., and F. L. Knopf. 2003. Annual survival and population estimates of Mountain Plovers in southern Phillips County, Montana. Ecological Applications 13:1013-1026.

Dreitz, V.J., M.B. Wunder, and F.L. Knopf. 2005. Movements and home ranges of Mountain Plovers raising broods in three Colorado landsacapes. Wils. Bull. 117:128-132.

Fargey,P., D. Gummer, T. Everest, S. McAdam, J. Tuckwell, and P.S. Miller (eds.). 2005. International Black-footed Ferret Recovery Workshop: Final Report. IUCN/SSC

Conservation Breedign Specialist Group, Apple Valley, MN.

Faunwest 1991. Status and breeding distribution of the Mountain Plover in Montana. FaunaWest Wildlife Consultants. Report to USDI Bureau of Land Management. FaunaWest Wildlife Consultants, Boulder, MT, 44pp.

Godfrey, Earl W. 1966. Birds of Canada. National Museums of Canada, Bulletin 203, Ottawa, Ontario, Canada. 428 p.

Godfrey, Earl W. 1986. Birds of Canada. National Museums of Canada, Ottawa, Ontario, Canada. Revised Edition, 595 p.

Gollop, J.B. 1987a. Prairie Provinces Region. Amer. Birds 41:448-450.

Gollop, J.B. 1987b. Prairie Provinces Region. Amer. Birds 41:1451-1453.

Graul, W.D. 1973. Adaptive aspects of the Mountain Plover social system. Living Bird 12:69-94.

Graul, W.D. 1974. Vocalizations of the Mountain Plover. The Wilson Bulletin 86:221-229.

Graul, W.D. 1975. Breeding biology of the Mountain Plover. Wilson Bulletin 87(1):6-31.

Graul, W. D. and L. E. Webster. 1976. Breeding status of the Mountain Plover. Condor 78:265-267.

Green, B. 1982. Wildlife monitoring report, Valley County studies, 1980-81 and 1981-82.Pp. 26-73. *in* Federal Bentonite Annual report to Montana State Lands.

Green, B., and B. Engle. 1984. Wildlife monitoring report, Valley County studies, 1983-4.Pp. 29-67. *in* Federal Bentonite Annual report to Montana State Lands.

Hannah, K. 2003. Status of the Mountain Plover (*Charadrius montanus*) in Alberta. Alberta Wildlife Status Report No. 50.

Hayman, P. J. Marchant and T. Prater. 1986. Shorebirds: an identification guide to the waders of the world. Houghton Mifflin, Boston. 412 pp.

Houston, C.S., M.I. Houston and J.B. Gollop. 1981. Saskatchewan bird species - hypothetical and rejected. Blue Jay 39: 196-201.

Knopf, F. L. 1994. Avian assemblages on altered grasslands. Studies in Avian Biology 15:247-257.

Knopf, F. L. 1996. Mountain Plover (*Charadrius montanus*). In: A. Poole and F. Gill, (eds.), The Birds of North America, No. 211. Philadelphia: The Academy of Natural Sciences; Washington D.C.: The American Ornithologists Union. 16 pp.

Knopf, F. L., and B. J. Miller. 1994. Charadrius montanus--montane, grassland, or bare-ground bird? Auk 111:504-6.

Knopf, F. L, and J. R. Rupert. 1996. Reproduction and movements of Mountain Plovers breeding in Colorado. Wils. Bull. 108:28-35.

Knopf, F. L, and J. R. Rupert. 1999. Use of cultivated fields by breeding Mountain Plovers. Studies in Avian Biology 19:81-86.

Knowles, C.J., and P.R. Knowles. 1984. Additional records of Mountain Plovers using prairie dog towns in Montana. Prairie Naturalist 16:183-186.

Knowles, C. J. and P.R. Knowles. 1997. Mountain Plover Numbers, Reproduction, and Habitat Use in Montana: A Summary of Six Survey Years. FaunaWest Wildlife Consultants. Prepared for the Montana Department of Fish, Wildlife, & Parks, Great Falls, Montana, and the Bureau of Land Management, Billings, Montana. 22 April 1997.

Knowles, C. J. and P.R. Knowles. 1984. Additional records of Mountain Plovers using Prairie Dog towns in Montana. Prairie Nat. 16 (4): 183-186

Knowles, C. J. and P.R. Knowles. 1998. The historic and current status of the mountain plover in Montana. Bureau of Land Management, Billings, Montana. 43 pp.

Knowles, C. J. and P.R. Knowles. 2001. The 2000 Montana Mountain Plover survey results. Bureau of Land Management, Billings, Montana. 31 pp

Knowles, C. J., C. J. Stoner and S. P. Gieb. 1982. Selective use of Black-tailed Prairie Dog towns by Mountain Plovers. Condor 84:71-74.

Koes, R. F., and P. Taylor. 1991. Prairie Provinces Region. American Birds 45:1128-1130.

Koes, R. F., and P. Taylor. 1995. Prairie Provinces Region. American Birds 49:941-943.

Kuenning, R.R. and H.E. Kingery. 1998. Mountain Plover. Pages 170-171 *in* H.E. Kingery, ed. Colorado breeding bird atlas. Colorado Bird Atlas Partnership and Colroado Division of Wildlife, Denver, Colorado.

Leachman, B. and B. Osmundson. 1990. Status of the Mountain Plover, a literature review. US Fish and Wildlife Service, Fish and Wildlife Enhancement, Golden CO. 84 pp.

Leighton,A. L., J. Hay, C. S. Houston, J. F. Roy and S. Shadick (eds). 2002. Birds of the Saskatoon Area. Sask. Nat. Hist. Soc. Spec. Publ. 23, Regina.

Macoun, J. and J. M. Macoun. 1909. Catalogue of Canadian birds. Canada Dept. Mines, Geological Survey Branch, Ottawa. 761 pp.

Manning, A. E. E. and C. M. White. 2001. Breeding biology of Mountain Plovers (Charadrius montanus) in the Uinta Basin. Western North American Naturalist 61(2): 223-228.

Miller, B. J., and F. L. Knopf. 1993. Growth and survival of Mountain Plovers. J. Field Ornith. 64:500-506.

Mitchell, H. H. 1924. Catalogue of the birds of Saskatchewan. Canadian Field-Naturalist 38: 101-118

Montana Bird Distribution Online Database. 2001. Helena, Montana, USA. April-September 2003.

Morrison, R.I.G. 1994. Shorebird population status and trends in Canada. Bird Trends 3:3-5.

Morrison, R.I.G. 2001. Estimates of shorebird populations in North America. Bird Trends 8:5-9.

Morrison, R.I.G., R.E.Gill, Jr., B.A.Harrington, S. Skagen, G.W.Page, C.L. Gratto-Trevor, and S.M. Haig. 2001. Estimates of shorebird populations in North America. Occasional Paper 104, Canadian Wildlife Service, Ottawa. Pp 64.

Olson, S.L. 1984. Density and distribution, nest site selection, and activity of the Mountain Plover on the Charles M. Russell National Wildlife Refuge. M.S. thesis. University of Montana, Missoula. 62 pp.

Oyler-McChance, S.J., J. St. John, F.L.Knopf and T.W. Quinn. 2005. Population genetic analysis of Mountain Plover using mitochondrial DNA sequence data. Condor 107:353-362.

Parrish, T.L., S.H. Anderson, and W.F. Oelklaus. 1993. Mountain Plover habitat selection in the Powder River Basin, Wyoming. Prairie Naturalist 25:219-226.

Peart, B. and J. G. Woods. 1980. Mountain Plover observation near Val Marie, Saskatchewan. Blue Jay 38:41.

Peterson, A. T. 2002. Subtle recent distributional shifts in Great Plains bird species. Southwest. Nat.48:289-292.

Plumb, R. E., F. L. Knopf and S. H. Anderson. 2005a. Minimum population size of Mountain Plovers breeding in Wisconsin. Wilson Bull. 117:15-22

Plumb, R. E., S. H. Anderson and F. L. Knopf. 2005b. Habitat and nesting biology of Mountain Plovers in Wyoming. West. N. Amer. Natur. 65:223-228.

Raine, W. 1892. Bird-nesting in northwest Canada. Hunter, Rose and Co., Toronto. 197 pp.

Rand, A. L. 1948. Birds of southern Alberta. Nat. Mus. Canada Bull. No. 111.

Rose, P.M. and D.A. Scott. 1997. Waterfowl population estimates. 2nd edition. Wetlands International, Wageningen, Netherlands. 106 pp.

Salt, W. R. and J. R. Salt. 1976. The Birds of Alberta. Hurtig Publishers, Edmonton, AB

Sauer, J. R., J. E. Hines, and J. Fallon. 2005. *The North American Breeding Bird Survey, Results and Analysis 1966 - 2004. Version 2005.2.* USGS Patuxent Wildlife Research Center, *Laurel, MD,* http://www.mbr-pwrc.usgs.gov/bbs/

Shackford, J., D.M. Leslie, Jr., and W.D. Harden. 1998. Range-wide use of cultivated fields by Mountain Plovers during the breeding season. Journal of Field Ornithology 70(1):114-120.

Soper, J. D. 1939. The Mountain Plover in Saskatchewan. Wilson Bulletin 51: 184

Soper, J. D. 1941. The Mountain Plover in western Canada. Canadian Field-Naturalist 55: 137

Taverner, P. A. 1927. Some recent Canadian records. Auk 44: 217-228.

Taverner, P. A. 1945. Birds of Canada. Musson Book Co., Toronto and National Museum of Canada, Ottawa. 446pp.

USDI Fish and Wildlife Service. 1999a. Mountain Plover survey guidelines. Fort Collins Field Office. Fort Collins, Colorado.

USDI Fish and Wildlife Service. 1999b. Proposal to list the Mountain Plover as a threatened species. Federal Register 64(30): 7587-7601. Available from: http://www.r6.fws.gov/mtnplover/factsheet.htm.

USDI Fish and Wildlife Service. 2003. Endangered and Threatened Wildlife and Plants: withdrawal of the proposed rule to list the Mountain Plover as endangered. Federal Register: September 9, 2003 (Volume 68, Number 174) Page 53083-53101

http://a257.g.akamaitech.net/7/257/2422/14mar20010800/edocket.access.gpo.gov/2003/03-22860.htm

Wallis, C. A., and V. Loewen. 1980. First nesting record of the Mountain Plover in Canada. Alberta Nat. 10:63-64.

Wallis, C.A., and C.R. Wershler. 1981. Status and breeding of Mountain Plovers (CHARADRIUS MONTANUS) in Canada. Canadian Field-Naturalist 95:133-136.

Wapple, R.D. 2005. Historical Abundance of Seven COSEWIC Bird Species on the Canadian Prairies. Unpublished report for Canadian Wildlife Service, Edmonton, Alberta. 23 pp.

Wershler, C.R. 1989. A Management Strategy for Mountain Plovers in Alberta. Pages 169-171 in Holroyd, G.L., and G. Burns, and H.C. Smith, editors. Proceedings of the Second Endangered Species and Prairie Conservation Workshop. Provincial Museum of Alberta Natural History Occasional Paper No. 15. Natural History Section Provincial Museum of Alberta, Edmonton, Alberta.

Wershler, C.R. 1990. A Management Plan for the Mountain Plover in Alberta. Sweetgrass Consultants, Calgary, AB. 25 pp. Report prepared for World Wildlife Fund Canada and Alberta Forestry, Lands and Wildlife.

Wershler, C.R. 2000. Update COSEWIC Status Report on Mountain Plover (Charadrius montanus) in Canada. Committee on the Status of Endangered Wildlife in Canada. 31 pp.

Wershler, C. R. and C. A. Wallis. 1986. Status report on the Mountain Plover (Charadrius montanus) in Canada. Committee on the Status of Endangered Wildlife in Canada. 34 pp.

Wershler, C.R. and C. Wallis. 2001. Mountain Plover Habitat and population surveys; Alberta and Saskatchewan 2001. Sweetgrass Consultants, Calgary, AB. 44 pp.

Williams, M.Y. 1946. Notes on the Vertebrates of the Southern Plains of Canada, 1923-1926. Can.Field-Nat. 60:47-60

Wunder, M.B, and F. L. Knopf. 2003. The Imperial Valley of California is critical to wintering Mountain Plovers. Journal of Field Ornithology 74(1): 74-80.

Geographical Survey Vol. IV. U.S. Govt. Print. Off., Washington.

http://www.cosewic.gc.ca/eng/sct1/searchdetail_e.cfm?id=27&StartRow=1&boxStatus=All&boxTaxonomic=All&location=All&change=All&board=All&commonName=Mountain%20Plover&scienceName=&returnFlag=0&Page=1

http://www.speciesatrisk.gc.ca/search/speciesDetails_e.cfm?SpeciesID=27

http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Charadrius+montanus

http://www.biologicaldiversity.org/swcbd/activist/ESA/plover.html

http://www.nhp.nris.state.mt.us/mbd/.

8.0 Appendix 1. List of all Mountain Plover records in Canada.

Most recent records are listed first. List of shortforms: AB=Alberta, SK=Saskatchewan, AHY=After Hatch Year (adult), HY=Hatch Year (young), U=Unknown, M=Male, F=Female, BSOD=Biodiversity Species Observation Database of Alberta Fish and Wildlife Division.

	LOCATION	PROV	LAT./LONG.	DATE	NO. MOPL OBS	AGE/ SEX	COMMENTS	OBSERVER(S)	DATA SOURCE AND REFERENCE
1	Wildhorse	AB	49.023230 110.162460	2-7/07/05	2		On Heydlauf Ranch	D. HEYDLAUF, R. GARDNER	
2	Onefour- near Cow Camp	AB	49.053932 110.451654	22/06/05	1	AHY	Nest with 3 eggs; checked nest on 07/05/2005-empty, no bird seen, nest intact, no eggshells	G. HOLROYD, H. TREFRY, R. KNAPTON	CWS, H. TREFRY-FIELD NOTES
2b	Onefour- near Cow Camp	AB	49.053932 110.451654	24/06/05	3		Observed 2 MOPL feeding and same MOPL on nest as above.	R. KNAPTON	CWS, R. KNAPTON – FIELD NOTES
3	Milk River: ~5 km east of where Highway 880 crosses over Milk River	AB	49.142175 111.266254	17/05/02	2	AHY	The coordinates for this record may actually belong to record 4, and vice versa as it is not specified in BSOD which coordinate set belongs to which observation	B. MCWILLIAMS	BSOD PANCANADIAN PETROLEUM LAIT GRASSLAND BIRD SURVEY HABITAT SAMPLING
4	Milk River: ~7-8 km southeast of where Highway 880 crosses over Milk River	AB	49.125209 111.246193	17/05/02	1	AHY	The coordinates for this record may actually belong to record 3, and vice versa as it is not specified in BSOD which coordinate set belongs to which observation	B. MCWILLIAMS	BSOD PANCANADIAN PETROLEUM LAIT GRASSLAND BIRD SURVEY HABITAT SAMPLING
5	Northwest of Medicine Hat, southeast of CFB Suffield; ~4 km north of Highway 1	AB	50.185808 110.95428	20/04/02	1	AHY	single bird observed in slightly rolling prairie with grass 1-5 cm as ground cover, considered transient	B. MCWILLIAMS	BSOD CITY OF MEDICINE HAT WILDLIFE SURVEYS

	LOCATION	PROV	LAT./LONG.	DATE	NO. MOPL OBS	AGE/ SEX	COMMENTS	OBSERVER(S)	DATA SOURCE AND REFERENCE
6	Northeast of Wildhorse	AB	49.035147 110.126988	19/06/01	1	AHY	Wershler's report says this adult was found in May; heavily grazed grassland within scattered patches of high sagebrush	DAVID HEYDLAUF-LESSEE	BSOD, WERSHLER 2001
7	South of Onefour	AB	49.056423 110.472678	29/05/01	1	AHY	Wershler's report says this adult was found in late April	IAN WALKER-ONEFOUR SUB-STATION MANAGER	BSOD, WERSHLER 2001
8	Northeast of Wildhorse	AB	49.083344 110.120803	29/05/01	2	PAIR		DAVID HEYDLAUF-LESSEE	BSOD, WERSHLER 2001
9	Northeast of Wildhorse	AB	49.013545 110.180579	early in month/05/ 99	U	U	nest	LOCAL RANCHER-PER JOAN & MALCOLM MACDONALD	WERSHLER 2000.
10	Grasslands National Park	SK	49.174700 107.5692	21/05/99	1	AHY	Single bird feeding in Sage Prairie Dog town	HELEN TREFRY GEOFF HOLROYD	CWS, H. TREFRY-FIELD NOTE
11	Lumsden	SK	50.620000 104.749970	24/07/95	1	AHY?/U		M.POLLOCK, C.POLLOCK	KOES AND TAYLOR 1995
12	Northeast of Wildhorse	AB	49.00000 110.138709	12/5/1994	1	AHY/U	nest (3 eggs)	T. SADLER (PERS. COMM.)	WERSHLER 2000.
13	Northeast of Wildhorse	AB	49.01444 110.161117	7/5/1994	1	AHY/U		P. ROXBURGH (PERS. COMM.)	WERSHLER 2000
14	Breed Creek area, Southwest of Mankota	SK	49.100000 107.400000	13/06/91	1	AHY/U		C.BJORKLUND	KOES AND TAYLOR 1991
15	Southeast of Val Marie	SK	49.233000 107.733000	13/06/91	1	AHY/U		W.C. HARRIS (PERS. COMM.)	WERSHLER 2000.
16	East side of Goose Lake	SK	51.750000 107..383000	18/05/91	1	AHY/U		C.BLENKIN, L.WOODING	LEIGHTON ET AL. 2002.
17	Monica Slough	SK	50 22.986 104 26.972	1990	5	U/U		F.H.BRAZIER	ANONYMOUS 1990.

	LOCATION	PROV	LAT./LONG.	DATE	NO. MOPL OBS	AGE/ SEX	COMMENTS	OBSERVER(S)	DATA SOURCE AND REFERENCE
18	Northeast of Wildhorse	AB	49.055819 110.137896	14/06/90	1	AHY/U	nest (3 eggs)-Bird on nest with eggs seen in area of sagebrush flats	ALBERTA FISH AND WILDLIFE STAFF	BSOD, WERSHLER 2000.
19	Lost River	AB	49.053513 110.457048	27/08/88	2	1AHY/U; 1HY	fledged young	C.R.WERSHLER	BSOD, WERSHLER 1990
20	Lost River	AB	49.049894 110.462672	16/07/88	4	2AHY/U; 2HY	downy or recently fledged young observed	B. STORMS (PERS. COMM.)	BSOD, WERSHLER 1990
21	Lost River	AB	49.060842 110.468156	20/06/88	2	AHY/U	nest (3 eggs)	W. SMITH	BSOD, WERSHLER 1990
22a	Southeast of Val Marie	SK	49.233000 107.733000	31/07/87	5	AHY/M,F ; 3-L/U	pair with "almost flying young" in a prairie dog colony	W.C.HARRIS	GOLLOP 1987B.
22b	Southeast of Val Marie	SK	49.233000 107.733000	14/07/87	1	AHY/U	Same as above nest	W.C.HARRIS	GOLLOP 1987A.
23	10 km north of Wildhorse	AB	49.090557 110.139783	3/5/1986	1	AHY/U		A. WISELEY (PERS. COMM.)	BSOD, WERSHLER AND WALLIS 1986.
24	Lost River	AB	49.053513 110.457048	15/05/85	2	AHY/U	nest (3 eggs): rechecked on May 28, 1985-no adult found and nest was empty	C. WALLIS AND C.R. WERSHLER	BSOD WERSHLER, C.R. AND C.A. WALLIS. 1986.
25	Lost River	AB	49.050000 110.46267	26/04/85	2	AHY/U		C. WALLIS AND C.R. WERSHLER	WERSHLER AND WALLIS 1986.
26	Lost River	AB	49.049894 110.462672	1/1/1983	2	AHY/U	at least 2 adults observed	A. WISLEY (PERS. COMM.)	BSOD, WERSHLER AND WALLIS 1986.
27	Lost River	AB	49.000000 110.450000	4/7/1982	2	AHY/U		UNKN	AMERICAN BIRDS 1982

	LOCATION	PROV	LAT./LONG.	DATE	NO. MOPL OBS	AGE/ SEX	COMMENTS	OBSERVER(S)	DATA SOURCE AND REFERENCE
28	Lost River	AB	49.053513 110.468158	30/04/82	6	AHY/U	not flocked	C. WALLIS AND C.R. WERSHLER	BSOD, WERSHLER AND WALLIS 1986.
29	Lost River	AB	49.053515 110.490378	15/06/81	4	AHY/U	at least 2 apparent broods	C. WALLIS AND C.R. WERSHLER	BSOD, WERSHLER AND WALLIS. 1986.
30	Lost River	AB	49.053513 110.457048	18-20/05/81	11	AHY/U	at least 11 adults; 6 nests (3 eggs each); habitat was heavily grazed sandy mixed grassland on level topography, used as winter pasture	C. WALLIS AND C.R. WERSHLER	BSOD, WERSHLER AND WALLIS 1986.
31	Lost River	AB	49.053513 110.457048	20-21/06/80	6	AHY/U	Occupied nest- adult seen attending nest or incubating; at least 3 apparent broods	C. WALLIS AND C.R. WERSHLER	BSOD, WERSHLER AND WALLIS 1986.
32	Lost River	AB	49.020000 110.440000	14/07/79	3	AHY/U		W. SMITH	WALLIS AND WERSHLER 1981.
33	Lost River	AB	49.020000 110.440000	11/7/1979	9	4AHY/U; 5HY/U	5 unfledged young	C. WALLIS AND C.R. WERSHLER	WALLIS AND WERSHLER 1981.
34	Lost River	AB	49.020758 110.440449	9-10/06/79	4	3AHY/U; HY/U	2 nests (3 eggs each); newly hatched young	R. WERSHLER	BSOD, WALLIS AND WERSHLER 1981..
35	Lost River	AB	49.017137 110.434815	4-5/06/79	4	AHY/U	nest (3 eggs)	C.R.WERSHLER	BSOD, WALLIS AND WERSHLER 1981.
36	Lost River	AB	49.020000 110.440000	14/06/79	12	3AHY/U; 9HY/U	3 broods each with 3 newly hatched young	C. WALLIS AND C.R. WERSHLER	WALLIS AND WERSHLER 1981.
37	Lost River: S2 TP1 R4 W4	AB	49.009903 110.445945	25/05/79	2	AHY/U	at least 2 birds seen; nest found with 3 eggs	V. LOEWEN AND C. WALLIS	BSOD WALLIS AND LOEWEN 1980.
38	Northeast of Onefour, north of Lost River	AB	49.155551 110.423688	30/09/77	5	2AHY/U; 3HY/U	Pair with brood observed; area of level grassland within shallow badlands and solonetzic soil	W. SMITH AND C. WALLIS	BSOD WALLIS AND WERSHLER 1981.
39	Southeast of Val Marie	SK	49.233000 107.733000	22/09/77	8	U	Small flock seen in prairie dog town.	B.PEART, J.G.WOODS	PEART AND WOODS 1980.

	LOCATION	PROV	LAT./LONG.	DATE	NO. MOPL OBS	AGE/ SEX	COMMENTS	OBSERVER(S)	DATA SOURCE AND REFERENCE
40	30 km west of Wildhorse and a few km north of international boundary	AB	49.042638 110.473792	5/7/1971	2	AHY/U		W.R. SALT, J.R. SALT	BSOD SALT AND SALT 1976
41	Elkwater-Cypress Hills Provincial Park	AB	49.665771 110.303984	12/6/1966	2	AHY/U	not thought to be breeding-unsuitable habitat-observed in flight (non-migratory) over Elkwater.	C.R.WERSHLER	BSOD WALLIS AND WERSHLER 1981.
42	South of Govenlock	SK	49.167971 109.698435	20/06/59	3			J.SHADICK	HOUSTON, C.S. ET AL. 1981 AND A. SMITH (pers. comm.)
43	Wildhorse Area: S33 T1 R3 W4	AB	49.079019 110.351422	22/06/41	4	2AHY/M, 2AHY/U	suspected nesting; 2 males collected	J.D. SOPER	BSOD, SOPER 1941.
44	2-3km north of Bracken	SK	49.183000 108.083000	5/6/1939	1	AHY/U		J.D. SOPER	SOPER 1939.