# COSEWIC
# Assessment and Status Report

on the

# Mountain Plover
*Charadrius montanus*

**in Canada**


**ENDANGERED**
**2009**

**COSEWIC**
Committee on the Status
of Endangered Wildlife
in Canada

**COSEPAC**
Comité sur la situation
des espèces en péril
au Canada

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

COSEWIC. 2009. COSEWIC assessment and status report on the Mountain Plover *Charadrius montanus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 35 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

Previous report(s):

COSEWIC. 2000. COSEWIC assessment and update status report on the Mountain Plover *Charadrius montanus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 24 pp.

Wershler, C.R. 2000. Update COSEWIC status report on the Mountain Plover *Charadrius montanus* in Canada, *in* COSEWIC assessment and status report on the Mountain Plover *Charadrius montanus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-24 pp.

Wershler, C.R. 1987. COSEWIC status report on the Mountain Plover *Charadrius montanus* in Canada. Committee on the Status of Endangered Wildlife in Canada. 40 pp.

Production note:
COSEWIC would like to acknowledge Richard W. Knapton and Geoffrey Holroyd for writing the status report on the Mountain Plover *Charadrius montanus* in Canada, prepared under contract with Environment Canada, overseen and edited by Marty Leonard, Co-chair, COSEWIC Birds Species Specialist Subcommittee.

For additional copies contact:

COSEWIC Secretariat
c/o Canadian Wildlife Service
Environment Canada
Ottawa, ON
K1A 0H3

Tel.: 819-953-3215
Fax: 819-994-3684
E-mail: COSEWIC/COSEPAC@ec.gc.ca
http://www.cosewic.gc.ca

Également disponible en français sous le titre Évaluation et Rapport de situation du COSEPAC sur le Pluvier montagnard (*Charadrius montanus*) au Canada.

Cover illustration/photo:
Mountain Plover — Cliff A. Wallis @ 1981.


Catalogue CW69-14/117-2010E-PDF
ISBN 978-1-100-14988-2

Recycled paper

# COSEWIC
# Assessment Summary

**Assessment Summary–November 2009**

**Common name**
Mountain Plover

**Scientific name**
*Charadrius montanus*

**Status**
Endangered

**Reason for designation**
This species is a rare bird of the Canadian prairies which is found in Alberta and Saskatchewan. The population numbers less than 250 individuals with a maximum of 11 individuals counted in one season in Canada. The species is threatened by continuing conversion of native grasslands to croplands, agricultural practices and the management of domestic livestock. The species is of particular concern in much of its range in the United States, limiting future rescue.

**Occurrence**
Alberta, Saskatchewan

**Status history**
Designated Endangered in April 1987. Status re-examined and confirmed November 2000 and in November 2009.

# COSEWIC
# Executive Summary

## Mountain Plover
*Charadrius montanus*

### Species information

The Mountain Plover is a medium-sized shorebird, about the size of a Killdeer, but with longer legs and more erect posture. Its upperparts are generally uniformly sandy-brown and its underparts white. Breeding birds have a white forehead, black on top of the head, a distinctive black loral stripe from the black bill to the eye, and a forecrown mottled black. The breast band present in many other plovers is absent in this species. There are no known subspecies.

### Distribution

The Mountain Plover is a North American endemic. Its breeding range is in the western Great Plains, from extreme southeastern Alberta and possibly southwestern Saskatchewan, south through Montana, Wyoming, Nebraska, Colorado, Kansas, New Mexico, Oklahoma and Texas, with an isolated site in the Davis Mountains of west Texas and northern Mexico. Once a common breeder in the short-grass prairie habitat of the Great Plains, the species is now absent from most of the eastern edge of its former range in South Dakota, Nebraska, Kansas and Oklahoma. Numbers have also fallen in the heart of its breeding range in Montana, Wyoming, Colorado and New Mexico.

Mountain Plovers winter primarily from north-central California to the Mexican border, mainly in the Sacramento, San Joaquin and especially Imperial Valleys of California. The winter distribution outside California is poorly known; the lower Colorado River valley in Arizona supports a small population, and scattered flocks winter eastward to south-central and west Texas, and along the United States-Mexican border, more extensively on the Mexican side in Sonora, Tamaulipas and Chihuahua south to San Luis Potosi.

In Canada, the Mountain Plover is known only from extreme southeastern Alberta and southwestern Saskatchewan. The areas in which plovers have occurred most frequently in the last 30 years are: 1. Onefour, an 18,000 ha research station under lease from the Alberta provincial government to Agriculture and Agri-Food Canada; 2. Grasslands National Park, Saskatchewan; 3. The Wild Horse site, a ranch partly comprised of provincially leased land; 4. Milk River Natural Area, owned by the Alberta provincial government.

**Habitat**

Historically, the Mountain Plover ranged throughout the Great Plains and southwestern United States in short-grass prairie habitat dominated by herbivores such as prairie dogs, bison and pronghorns. It is a species of open, flat, xeric tablelands with sparse, low vegetation (usually less than 10 cm high) and considerable bare ground. It also nests in prairie sites with a recent disturbance event such as lightning-strike fires. Originally described as an associate of arid, short-grass prairie dominated by blue grama and buffalo grass, more recently it is considered a disturbed-prairie or a semi-desert species requiring intensive grazing by large assemblages of herbivores.

In Canada, intense winter or spring grazing by cattle is considered especially important for the creation of suitable breeding habitat. The species has also used sage brush flats, with extensive areas of bare bentonite soils, and prairie dog towns.

**Biology**

Mountain Plovers arrive on their breeding grounds in Canada in April, and nesting starts in May. Males commonly reoccupy their former territories, which they defend against intrusion by other males. Clutches of three eggs are laid in shallow depressions on the ground, which the male incubates as females lay and incubate a second clutch. If the first nest is lost before early June, the female may renest, generally within three km of the first nesting attempt. The brood moves usually one to two km from the nest in the first two to three days following hatch. Only one brood is raised per adult per season, and young are cared for by just one parent. Fledging rates are low and range from 0.26 chicks/nesting attempt to about one chick/nesting attempt. The species appears to be loosely colonial, resulting in areas of apparently suitable habitat not being occupied.

Mean longevity is about two years, although two individuals are known to have lived to at least 10 years of age. Overwinter survival rate for adults appears high. Eggs and chicks are vulnerable to a range of mammalian, avian and reptilian predators, and adults to foxes and falcons. The Mountain Plover appears to be a general opportunist of invertebrate taxa, feeding primarily on insects.

## Population sizes and trends

Current global population estimates are 10,000 to 19,000 individuals, with a decreasing population trend. Trend analyses from Breeding Bird Surveys in the United States indicate a significant 2.7% annual survey-wide decline from 1966 to 2007, with declines occurring across most of the breeding range. There are a total of 36 records of Mountain Plovers in Canada. Twenty-two nests have been found since the first nest was found in 1979. The maximum number of breeding individuals recorded in Canada within one year has been 11 and the maximum number of nests six. In several years no plovers have been reported, and indeed, they may not breed in Canada every year.

## Limiting factors and threats

Populations in the United States suffered greatly in the 1800s and early 1900s because of the uncontrolled trade in market hunting. Recent declines are attributed to the conversion of native grassland to cropland, agricultural practices, and the management of domestic livestock on both the breeding and wintering grounds. The decline of native herbivorous mammals, such as bison and prairie dogs, has led to detrimental changes in the remaining prairie ecosystems; indeed, in many of its breeding strongholds, Mountain Plovers are closely associated with prairie dog towns.

Weather extremes may play a significant role in the occurrence of Mountain Plovers in Canada; for example, 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, resulting in reduced horizontal visibility.

## Special significance of the species

The Mountain Plover holds a certain mystique among Canadian birders, who will come from across the country to see the species.

## Existing protection

The Mountain Plover is protected under the *Migratory Birds Convention Act* (1994). COSEWIC assessed this species as Endangered in November 2000 and it is designated as Schedule 1, Endangered, in Canada under the *Species at Risk Act*. It is ranked as a G2 species by The Nature Conservancy. In Alberta and Saskatchewan, the species is ranked as S1B, Endangered. In the United States, the species is listed as Near-threatened.

## COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

## COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

## COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

## DEFINITIONS (2009)

| | |
|---|---|
| Wildlife Species | A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years. |
| Extinct (X) | A wildlife species that no longer exists. |
| Extirpated (XT) | A wildlife species no longer existing in the wild in Canada, but occurring elsewhere. |
| Endangered (E) | A wildlife species facing imminent extirpation or extinction. |
| Threatened (T) | A wildlife species likely to become endangered if limiting factors are not reversed. |
| Special Concern (SC)* | A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats. |
| Not at Risk (NAR)** | A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances. |
| Data Deficient (DD)*** | A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction. |

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.

Environment Canada | Environnement Canada
Canadian Wildlife Service | Service canadien de la faune
Canada

The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

# COSEWIC Status Report

on the

# Mountain Plover
*Charadrius montanus*

**in Canada**

2009

## TABLE OF CONTENTS

## List of Figures



## List of Appendices

## SPECIES INFORMATION

### Name and classification

English name: Mountain Plover
French name: Pluvier montagnard

Previous name: Rocky Mountain Plover (Knopf and Wunder 2006)

Classification:
Class–Aves
Order–Charadriiformes
Suborder–Charadrii
Family–Charadriidae
Genus–*Charadrius*
Species–*Charadrius montanus*

There are no known subspecies.

The Mountain Plover was first collected in 1832 along the Sweetwater River of Wyoming by John Kirk Townsend and named by John James Audubon as the "Rocky Mountain Plover", *Charadrius montanus* J. K. Townsend 1837. The Mountain Plover is a North American endemic; it has no close relatives in North America, and its closest affinities are evidently to the Caspian (*C. asiaticus*) and Oriental (*C. veredus*) plovers of the Old World, the three species perhaps constituting a superspecies (Hayman *et al.* 1986, AOU 1998).

### Morphological description

The Mountain Plover is a medium-sized shorebird, 21.0 to 23.5 cm long and weighing from 90 to 110 g (Knopf 1996). It is about the size of a Killdeer (*C. vociferus*) but with longer legs and more erect posture. Upperparts are generally uniformly sandy-brown, extending along the sides of the neck and onto the chest. The breast band present in many other plovers is absent in this species; the forehead, throat, and breast are white, while the underwings are bright white (Knopf 1996). The bill is black, iris auburn, leg colour a dull, light brown-yellow, foot colour dark brown, and claws black (Knopf 1996).

Breeding birds have black on top of the head and a distinctive black loral stripe from the black bill to the eye. Non-breeding birds are similar to those in breeding plumage, with the loral stripe and brown forecrown. Juveniles lack the black markings on the head, have a pale brown face with a paler brown supercilium, are buffier on their undersides, and have a back that is darker brown than adults with pale edgings giving a more scaled appearance. Chicks are whitish below and pale brown above with numerous black spots on the upper head, back and wings (Knopf and Wunder 2006).

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). Otherwise, the species is generally silent (Graul 1974).

### Genetic description

Phylogenetic studies based on mitochondrial DNA (mtDNA) from several species in the genus *Charadrius* place Mountain Plover within a clade, which includes Two-banded (*C. falklandicus*), Collared (*C. collaris*) and Snowy (*C. alexandrius*) plovers in the Americas, plus Asiatic and Australasian species (Joseph *et al.* 1999). As mentioned earlier, the Mountain Plover has no close relatives in North America, and its closest affinities are to the Caspian and Oriental plovers of the Old World.

An examination of genetic variation for 20–30 individuals from each of four breeding sites in Montana and Colorado (the species' strongholds) revealed no evidence of significant population differentiation at the control region or the ATPase 6/8 region (Oyler-McChance *et al.* 2005). Nested-clade analysis revealed no relationship between haplotype phylogeny and geography among the 47 control region haplotypes. In the ATPase 6/8 region, however, one of the two clades provided information suggesting that, historically, there had been continuous range expansion. To explain the lack of detectable genetic differentiation among populations, despite their geographic isolation and fidelity to breeding locations, Oyler-McChance *et al.* (2005) speculate that there is sufficient female-mediated gene flow to homogenize gene pools among populations. Such gene flow might ensue if pair bonds are formed in mixed flocks on wintering grounds rather than on the summer breeding grounds. Further research is continuing for possible differences among microsatellites (Knopf and Wunder 2006, St. John *et al.* 2007).

### Designatable units

There are no subspecies of the Mountain Plover and no other known distinctions that would warrant consideration of designatable units below the species level. The report is, therefore, based on the species as a whole.

## DISTRIBUTION

### Global range

The Mountain Plover breeds in the western Great Plains, from extreme southeastern Alberta and possibly southwestern Saskatchewan, south through Montana, Wyoming, Nebraska, Colorado, Kansas, New Mexico, Oklahoma and Texas, with an isolated site in the Davis Mountains of west Texas (Knopf 1996, Knopf and Rupert 1999), and northern Mexico (Desmond and Chavez Ramirez 2002) (Figure 1).


Figure 1. Breeding (grey) and wintering (black) distribution of the Mountain Plover (from Ridgely *et al.* 2003)

Current distribution maps are, however, misleading because habitat within this range is limited. Breeding strongholds are confined to small areas in east-central Montana (Bergeron *et al.* 1992), the Wyoming tablelands (Oakleaf *et al.* 1992), eastern Colorado, where 60% of the entire continental population is believed to nest (Andrews and Righter 1992, Kuenning and Kinery 1998), north New Mexico (Hubbard 1978), and in the Oklahoma and Texas panhandles (Knopf and Wunder 2006). The periphery of the breeding range is defined by breeding records in Canada, Mexico, and the states of Utah, Nebraska and Kansas (Wershler and Wallis 1987, Ellison-Manning and White 2001, Fellows and Gress 1999, Gonzales Rojas *et al.* 2006). Breeding was first recorded in Mexico in Nuevo Leon in 2004 (Gonzales Rojas *et al.* 2006).

Mountain Plovers winter primarily from north-central California to the Mexican border, mainly in the Sacramento, San Joaquin and Imperial valleys of California (about 85% of the population, Knopf and Rupert 1995, Wunder and Knopf 2003); the majority of these birds now winter in the Imperial Valley (Wunder and Knopf 2003). The distribution outside the California range is poorly known. The lower Colorado River valley in Arizona supports a small wintering population (Rosenberg *et al.* 1991), and scattered flocks also regularly winter eastward to south-central and west Texas (Fennell 2002), and along the United States-Mexican border, more extensively on the Mexican side in Sonora, Tamaulipas and Chihuahua, south to San Luis Potosi (Knopf and Wunder 2006). There are possible wintering populations in Baja California (Wilbur 1987).

Once a common breeder in short-grass prairie habitat of the Great Plains, the species is now absent from most of the eastern edge of its former range in South Dakota, Nebraska, Kansas and Oklahoma. Numbers have also dropped considerably in the heart of its breeding range in Montana, Wyoming, Colorado and New Mexico, and winter numbers have been continually declining in coastal areas of California (Small 1994) to very low levels, and also indeed are declining in the Sacramento and San Joaquin Valleys (Wunder and Knopf 2003).

**Canadian range**

In Canada, the Mountain Plover has been recorded only in extreme southeastern Alberta and southwestern Saskatchewan.

**Historical records**

Coues (1874, 1878) has been cited extensively as providing evidence of the occurrence of Mountain Plovers in Canada in the 1870s (e.g., Wershler and Wallis 1987, Wershler 1989, 2000). The determination of the first occurrence of the Mountain Plover in Canada is not a mere curiosity, as such an occurrence would indicate if the species occurred here before the 1870s, but was then extirpated and is now regaining lost but original breeding areas, or if it is a relatively recent arrival from breeding grounds in Montana. It is therefore instructive to examine the reports of Elliot Coues and the Northern Boundary Commission survey in Montana Territory (1874, 1878) (see Appendix 1).

Coues was attached to the United States Northern Boundary Commission with a mandate to explore the new territories south of the 49th parallel. An examination of Coues' original report reveals that his observations and collections of this species were in fact south of the border in Montana (Appendix 1; see Knowles and Knowles' 1998 summary of historical records of Mountain Plover in Montana). Coues' collection locations translate today into south of Grasslands National Park, Saskatchewan and to south of Wild Horse-Lost River, Alberta. Subsequent treatment of the occurrence of Mountain Plovers in Canada suggests that the species was unknown in Canada until the 1940s (Raine 1892, Taverner 1927, see below). Macoun and Macoun (1909), in

their Catalogue of Canadian Birds, do not list it as a breeding species, stating (p. 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.” Mitchell (1924, in Wapple 2005) describes it as hypothetical in Saskatchewan, and Bent (1929:269) states “(T)he species is unknown from Canada. During the international boundary survey, Dr. Coues found Mountain Plover on Frenchman Creek and obtained a specimen that is now in the British Museum …. the point of collection was probably well within the present State of Montana.” Taverner (1945:181) includes the Mountain Plover in his Birds of Canada “because of specimens said to have been taken in 1897 on the International Boundary survey near Frenchman River, Saskatchewan”; no such specimens exist. The confusion may stem from the fact that the Frenchman River originates in Saskatchewan and then flows south into Montana to the Missouri River. Rand (1948) does not mention any records from southeastern Alberta and found none during his visit to the Onefour area in July 1945. Finally, Williams (1946) travelling through this general area in 1923-1926 did not find them.

**Canadian records**

Thirty-six "element occurrences" (*sensu* NatureServe 2008) of Mountain Plovers have been reported in Canada (Knapton *et al.* 2006, R. Knapton pers. comm.). This total includes 12 occurrences in 12 years and a total of 22 nests since the first nest was found in 1979, and seven additional occurrences of pairs of plovers in the breeding season that probably represent failed breeding attempts. Most records fall into two distinct areas, the Lost River–Wild Horse area of extreme southeast Alberta, and the Val Marie-Grasslands National Park area in southwest Saskatchewan (Figure 2).

The first Canadian sight record was in June 1939 “two miles north of the village of Bracken” and 22 km north of the international border in Saskatchewan (Soper 1939). Currently this area is under intense cultivation and is unlikely to be suitable as nesting habitat (R. Knapton pers. obs. 2005). In June 1941, Soper collected two males from four plovers on short-grass prairie about eight km north of the International Boundary north-northeast of Wild Horse, Alberta; their behaviour indicated breeding (Soper 1941, p.137).

The area was described as flat to gently rolling, with short sparse grass, interspersed with small bare areas of clay. The significance of this particular record is that this location has produced numerous sightings of Mountain Plovers since 1941.

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 in June 1966 at Elkwater in the Cypress Hills, a habitat apparently unsuitable as a breeding location (Wallis and Wershler 1981).

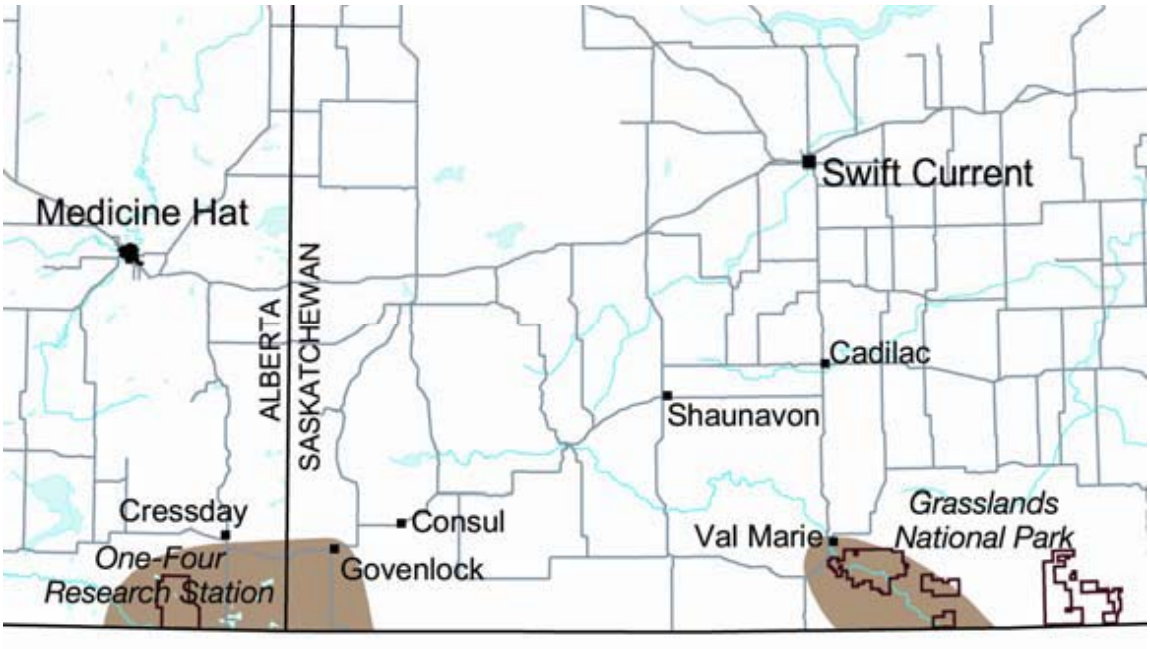


Figure 2. Breeding range of the Mountain Plover in Canada (from Environment Canada 2006).

## Alberta

Lost River–Onefour, Alberta

In September 1977, two adults and three juvenile Mountain Plovers were located together northeast of Onefour (Wallis and Werschler 1981). The first nesting records for Canada occurred in 1979 when two nests were located in the Lost River area and subsequently three adults with nine newly hatched young were observed in mid-June (Wallis and Loewen 1980). Thereafter, searches in the Lost River-Onefour area produced evidence of nesting in 1980, 1981, 1985 and 1988 with a maximum of six nests in 1981, and the presence of birds in 1982 and 1983 (Wershler and Wallis 1987). After a gap of 12 years the next record was in April 2001 (Wershler and Wallis 2001), followed by another gap of four years when adults and a nest were located in June 2005 (Knapton *et al.* 2006). No plovers were reported at Onefour in 2006 through 2008, despite considerable search effort (see below).

Wild Horse, Alberta

The Wild Horse area is located in extreme south-east Alberta in Townships 1 and 2, Range 1 and 2, about 20 km southeast of the Lost River, and the area where Soper collected his two specimens in 1941. There have been several sightings of Mountain Plovers in this area following a report in May 1986 (Wershler and Wallis 1987). Evidence of nesting was obtained in 1990, 1994, 1999, 2006 and 2007 with three nests located during both 2006 and 2007, and plovers were present in 2001, 2005 and 2008 (Wershler 2000, Wershler and Wallis 2001, Hannah 2003, Knapton *et al.* 2006, D. Heydlauf pers. comm., G. Holroyd, H. Trefry & R. Knapton pers. obs.).

Milk River, Alberta

There is a passing reference to two Mountain Plovers in July 1971, a few kilometers north of the international border about 30 km west of Wild Horse in Salt and Salt (1976). Non-breeding adults occurred along the Milk River in May 2002 (Hannah 2003). In May 2008, Cliff Wallis and Cleve Wershler found a territorial, displaying, calling pair on the west side of the Milk River Canyon on burned land in the Milk River Natural Area (C. Wallis pers. comm.). C. Wershler writes …"this observation confirms the importance of burning as a management tool for the creation and maintenance of Mountain Plover breeding habitat in Alberta"(C. Wershler pers. comm.).

Other Alberta records

A single bird was reported on April 20, 2002, in slightly rolling prairie with grass one to five cm, south of CFB Suffield, about 4 km north of Hwy 1 (BSOD, Hannah 2003).

**Saskatchewan**

Grasslands National Park, Saskatchewan

In Grasslands National Park, eight plovers were reported in September 1977 (Peart and Woods 1980), then a family group of two adults and three fledglings ("almost flying young") in 1987 (Gollop 1987a), the only known breeding record for Saskatchewan (Gollop 1987b). Subsequent records are an adult in June 1991 (Wayne Harris, in Wershler and Wallis 2001), and a single adult in May 1999 (Knapton *et al.* 2006). All these records have been associated with prairie dog colonies. No other plovers have been recorded at these colonies since 1999 despite considerable search effort (see below).

Other summer Saskatchewan records

Two records: an "undated sighting by John Shadick about 1959, south of Govenlock" (Houston *et al.* 1981) and an adult in the Breed Creek area, southwest of Mankota, in 1991 (Koes and Taylor 1991).

The Extent of Occurrence (EO) for the Mountain Plover in Canada is estimated at 3,030 $km^2$ using a minimum convex polygon (A. Filion, pers. comm.). The Index of Area of Occupancy (IAO) is estimated at 24 $km^2$ based on the maximum number of nests recorded in one season (i.e. six) multiplied by 4 $km^2$ to create a 2 X 2 grid (A. Filion, pers. comm.).

There are no known records of Mountain Plovers from other provinces or territories.

## HABITAT

### Habitat requirements

The Mountain Plover is a species of open, flat, xeric tablelands with sparse, low vegetation (usually less than 10 cm high) and bare ground, features that appear to be essential for occupancy (Knopf and Wunder 2006). The plover's elevational range extends from 640 m in eastern Montana to 3250 m in south-central Colorado (Knopf and Wunder 2006). The plover also nests in prairie sites with a recent disturbance event such as lightning-strike fires. In Canada, Mountain Plovers have nested in heavily 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). It was originally described as an associate of arid, short-grass prairie (Graul and Webster 1976) dominated by blue grama (*Bouteloua gracilis*) and buffalo grass (*Buchloe dactyloides*) with scattered clumps of cacti and forbs. However, without some intensive 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 (*Bison bison*), pronghorn (*Antilocapra americana*), elk (*Cervus elaphus*) and prairie dogs (*Cynomys spp*.), 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).

Wershler and Wallis (2001) flew aerial surveys in May 2001 across southeastern Alberta and southwestern Saskatchewan, followed by subsequent ground truthing, to identify sites potentially suitable for occupancy by Mountain Plovers. A hundred sites were identified: of these, 30 were assessed as having high and 31 limited potential for Mountain Plover nesting habitat. 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 (*Cynomys ludovicianus*), 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 Wild Horse–Govenlock regions.

Those high potential sites with limited suitability lacked intensive grazing, the major factor restricting suitability.

In western Wyoming the species is a member of shrub-steppe communities (Beauvais and Smith 2003), where patches of low and sparse vegetation 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).

Nesting sites typically have vegetation less than 10 cm in height, 30–50% bare ground and lichen, 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). Where taller grasses dominate a landscape, the plovers are restricted to areas of excessive grazing; indeed, in Montana at many locations, breeding pairs are associated with prairie dogs and appear to be totally restricted to such areas and absent from landscapes of taller grasses and shrubs (Olson-Edge and Edge 1987). Prairie dogs create unique patches of habitat ideal for Mountain Plovers, promoting short grasses such as buffalo grass and grama grasses, and their digging creates areas of bare soil important for plover nesting. Furthermore, prairie dog towns attract many species of insects and provide greater horizontal visibility (Olson and Edge 1985). Mountain Plovers will use towns as small as 3 ha (Knowles *et al.* 1982), but on average the towns are much larger, about 50 ha (Knowles and Knowles 1984, Olson-Edge and Edge 1987). Dinsmore *et al.* (2003, 2005) and Augustine *et al.* (2008) have shown that Mountain Plover breeding populations closely track annual changes in the area occupied by black-tailed prairie dogs, with both plovers and prairie dogs recovering from outbreaks of sylvatic plague in the mid-1990s.

Winter or spring grazing by cattle appears to be especially important for the creation of suitable breeding habitat in Alberta (Wershler and Wallis 1987, Wershler 1990) and Montana (Knowles and Knowles 1997). The occurrence of Mountain Plovers on sage brush flats with extensive areas of bare bentonite soils in Canada 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.

Shackford and Leslie (2000) located Mountain Plovers on cultivated land in the Oklahoma panhandle, Kansas, Colorado, Wyoming, and Nebraska. However, Mountain Plovers were absent on cultivated fields north of southeastern Wyoming (Laramie County), and occupancy of cultivated land is apparently unknown in Montana and in Canada.

The wintering habitat of the Mountain Plover is similar to that used in the summer. Flocks can be found on coastal prairies, alkaline flats, ploughed fields and cropland.

### Habitat trends

The removal of primary native grazers–prairie dogs, bison and pronghorns–has historically altered the native grasslands and in part led to declines in many endemic grassland species (Knopf 1994). In Montana, and likely elsewhere, Mountain Plover populations certainly declined following elimination of the bison, and are still directly related to surface coverage of active prairie dog towns (Dinsmore *et al.* 2005). Extensive turning of native sod and planting of winter wheat on marginally arable lands further preclude the plovers from nesting throughout much of the western Great Plains. Also, many farmers have sown taller grasses in native prairie, and tall vegetation precludes nesting by this species, which depends on vision to detect predators (Knopf and Wunder 2006). Many farmers also now plant extensive areas to sunflowers and millet for vegetable oils and the commercial bird-seed market. Millet is also planted as a hay crop. Fields for these grains remain fallow until early May, after most Mountain Plovers have started nesting, and many nests are destroyed by farm equipment when fields are planted in May (Dreitz *et al.* 2005).

### Habitat protection/ownership

In Canada, the areas in which Mountain Plovers have occurred most frequently in the last 30 years are the following: 1. Onefour, an 18,000 ha research station under long-term lease from the Alberta provincial government to Agriculture and Agri-Food Canada, Lethbridge Research Centre; 2. Grasslands National Park owned by the federal Parks Canada Agency; 3. The Wild Horse site, a ranch partly comprised of provincially leased land; 4. Milk River Natural Area owned by the Alberta provincial government.

## BIOLOGY

### Life cycle and reproduction

Mountain Plovers arrive on their breeding grounds in small flocks from mid-March through April (Knopf and Rupert 1996). Pair bonds are maintained for the breeding season only, as 83% of males but only 40% of females return to the same territory in subsequent years. Territories in Colorado were about 16 ha, although much overlap occurred at the boundaries, and foraging is evidently frequent outside territory boundaries (Graul 1973).

During courtship, several nest scrapes are made before one is eventually chosen for a nest. Solitary nests are often located in isolated patches of habitat, but many nests can occur in localized areas, suggesting a loose colony or at least a passive aggregation of birds (Knopf 1994, 1996). Nests are on average 140 m apart. This clumped distribution results in areas of apparently suitable habitat not being occupied (e.g., 70% of shrub-steppe area in Utah, Manning and White 2001, 65% of potentially suitable habitat at South Park, Colorado, Wunder and Knopf 2003).

The nest is a shallow depression in the ground lined with a small amount of vegetation, often next to conspicuous objects such as cow manure. Eggs are well-camouflaged, dark olive with black markings (Baicich and Harrison 1997). Females typically lay a first clutch with three eggs, leave the male to incubate those eggs and then lay and incubate a second clutch. Eggs are laid at intervals of up to six days, and incubation is 28-31 days, starting when the clutch is complete. Nest survival can be higher for males than for females (0.33 for females, 0.49 for males), and chicks tended by females have higher survival rates than those tended by males (Dinsmore and Knopf 2005).

Only one brood is raised per adult per season (Graul 1973). If the first nest or brood is lost before early June, an adult may renest, generally within three km of the first nesting attempt. With renesting, each pair can potentially make up to four attempts per year to raise a brood successfully (Knopf and Wunder 2006). After hatching, the brood moves usually one to two km from the nest in the first few days (Knopf and Rupert 1996). Young are cared for by just one parent. Fledging rates are quite low and range from 0.26 chicks/nesting attempt to about one chick/nesting attempt (Knopf 1996), with success varying among years. 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 28 ha (Knopf and Rupert 1996) but other studies indicate much larger requirements (46 ha in rangeland, 131 ha in agricultural fields, and 243 ha in prairie dog towns, Dreitz *et al.* 2005).

Annual reproductive success on the Pawnee National Grassland, Colorado, was highly variable, from 26% (Knopf and Rupert 1996) to 65% (Graul 1975). The average number of eggs hatching in successful nests varied from 2.1 (McCaffery *et al.* 1984) to 2.7 (Graul 1975) per nest. There is no information on lifetime reproductive success.

Annual survival rate was calculated as 0.46–0.49 for juveniles and 0.68 for adults in Montana (Dinsmore *et al.* 2003). Mean longevity has been calculated as 1.9 ± 0.2 yr., with longevity records of at least 10 years for both a male and a female (Knopf and Wunder 2006). Overwinter survival rate appears high (0.95 from November to March, Knopf and Rupert 1995).

## Predation

Eggs are lost to predation and hail damage, while chick mortality is primarily the result of predation (Knopf and Wunder 2006). Eggs and chicks have apparently been killed by thirteen-lined (*S. tridecemlineatus*) and Wyoming ground squirrels (*S. elegans*), swift fox (*Vulpes velox*) and coyote (*Canis latrans*). Chicks have also been taken by Swainson's Hawk (*Buteo swainsonii*), Prairie Falcon, Burrowing Owl (*Athene cunicularia*), American Kestrel (*Falco sparverius*) and Loggerhead Shrike (*Lanius ludovicianus*) (Graul 1973, 1975, Miller and Knopf 1993, Knopf and Rupert 1996, Knopf and Wunder 2006). Young chicks have been killed by red ants (*Formica* sp.) and burying beetles (*Nicrophorus* sp.) in the nest cup. The bullsnake (*Pituophis melanoleucus*) was strongly suspected of taking eggs from nests covered by a mammal-proof predator exclosure.

Six predation events have been reported on adults: two birds were killed on the wintering grounds by kit foxes (*V. macrotis*; Knopf and Rupert 1995), three were found at or near raptor nests, and one radio-transmitter from an adult plover was recovered at a Prairie Falcon nest (Knopf and Wunder 2006). Swift foxes may limit Mountain Plover productivity in Colorado (Knopf and Rupert 1996), and this fox, plus badgers (*Taxidea taxus*), have likely increased in numbers with the banning of predator-poisoning programs in the 1960s and 1970s.

## Physiology

There is no information on nutrition, energetics, metabolism, or temperature regulation. Individual birds often roost in depressions such as ungulate hoof prints and plough furrows, which may provide a microhabitat that improves thermoregulation and likely helps avoid detection by nocturnal predators (Knopf and Rupert 1995). All water requirements are apparently obtained from food items; as in many species that inhabit arid environments, the species can thrive without drinking free-standing water.

## Diet

The Mountain Plover appears to be a general opportunist of invertebrates, primarily insects (Knopf 1996, 1998). The type of prey consumed changes through the season, with beetles most common from late spring to midsummer and grasshoppers and ants eaten in greater quantities in late summer. Studies in Colorado showed invertebrates from 90 different taxa, with beetles (Coleoptera; 60%), grasshoppers and crickets (Orthoptera, 24.5%), and ants (Hymenoptera; 6.6%) the most important prey items (Baldwin 1971). The genus *Eleodes* (darkling beetles) composed 22% of the diet.

On their wintering grounds, plovers have been regularly observed capturing and eating grasshoppers, crickets and beetles (Storer 1941), but wintering birds have also taken centipedes (*Chilopoda* sp.) and scorpions (Scorpionida). Stomach analyses of 39 birds collected in California (Knopf 1998) revealed that Hymenoptera and Coleoptera dominated the diet on the Carrizo Plain, Lepidoptera and Hymenoptera on the Pixley National Wildlife Refuge, and Orthoptera and Coleoptera in the Imperial Valley.

**Dispersal/migration**

The Mountain Plover, like many shorebirds, is a strong flyer and may cover several hundred kilometres a day during migration. Around late July, plovers leave their breeding range for a period of post-breeding wandering around the Great Plains. Little is known about their movements at this time, although they are regularly seen around Walsh, Colorado, and on sod farms in central New Mexico. By early November, most move south or west to wintering grounds. Migrations from breeding grounds in Colorado and Wyoming are likely more east-west than north-south for those birds wintering in California. Populations may be semi-migratory in New Mexico where birds are seen in mid-winter (Ligon 1961), and non-migratory in Davis Mountains, Texas, and Nuevo Leon, Mexico.

In California, winter migrants generally arrive in the north by mid-September and in the south by mid-October (Small 1994). They arrive along the Lower Colorado River and in Texas mid-October (Fennell 2002, Rosenberg *et al.* 1991), and have been recorded November through March in Mexico (Howell and Webb 1995). There are extralimital records from Massachusetts, Virginia, Washington and Indiana (Knopf and Wunder 2006).

Most birds depart their wintering grounds in early March (Small 1994, Knopf and Rupert 1995). Spring migration proceeds relatively quickly, with the earliest observed arrivals to the breeding grounds by mid-March in the earlier warming portions of the range (New Mexico and eastern Colorado) and by mid-April in regions that are later to warm (Montana, central Colorado).

**Interspecific interactions**

Mountain Plovers have been recorded as charging and chasing thirteen-lined and Wyoming ground-squirrels (both predators), McCown's Longspurs (*Calcarius mccownii*), Horned Larks (*Eremophila alpestris*), pronghorns, and livestock in the vicinity of the nest, using the Tail-down Rush Display (Graul 1975).

Past reports indicate a degree of interspecific territoriality between Killdeer and Mountain Plovers, but this appears to be unlikely; a Mountain Plover has been seen to charge a Killdeer on one occasion on the breeding grounds (Knopf and Wunder 2006). Although interspecific nest parasitism among shorebirds is very rare, Mountain Plover nests have been parasitized by Killdeer (Jojola-Everium and Giesen 2000).

### Adaptability

See under **Threats**. In the southern part of the breeding range, the species nests in cultivated fields, which demonstrates a certain degree of adaptability (Dreitz *et al.* 2005).

## POPULATION SIZES AND TRENDS

### Search effort

Both dedicated and non-dedicated surveys have been conducted for Mountain Plover in Canada. Below follows a brief description of the various surveys that have been conducted.

Regional Dedicated and Non-dedicated Surveys

2005–2006: four to eight days/year were devoted to searching for plovers in Onefour and Wild Horse, Alberta (Knapton *et al.* 2006; G. Holroyd pers. comm.).

2002–2005: 16 days of dedicated searches for Mountain Plovers (Knapton *et al.* 2006) at Prairie Farm Rehabilitation Administration (PFRA) pastures in the Swift Current and Maple Creek Districts of Saskatchewan.

1990s: the area between the Sweetgrass Hills, Montana, and the Milk River in Alberta was searched for Mountain Plovers (S. Brechtel, *in* Knowles and Knowles 1998).

2002–2008: 100 days amounting to over 1500 person-hours, were spent researching Burrowing Owls in habitats of varying potential as Mountain Plover habitat at Onefour, Grasslands National Park (Saskatchewan), Sage Creek Community Pasture and the above PFRA pastures (Holroyd, Trefry and co-workers).

2002 - 2005: 280 point counts for owls and other bird species, including Mountain Plover, were conducted in Onefour, Grasslands National Park, and the above PFRA pastures (Holroyd, Trefry and co-workers).

1998–2008: over 150 days amounting to over 2000 person-hours were spent in high potential habitat (75% of the prairie dog colonies) in Onefour, Wild Horse, Grasslands National Park, the above PFRA pastures and Pinhorn Community Pasture (Holroyd, Trefry and co-workers).

Breeding Bird Surveys (BBS)

The Breeding Bird Survey is an annual survey conducted in mid-June since 1966 throughout Canada and the United States. Volunteers travel randomly selected roadside routes, recording all birds seen or heard at listening stations at intervals along the route (Sauer *et al.* 2008). Mountain Plover populations in the U.S. have been surveyed through the BBS. Mountain Plovers are, however, poorly sampled by such roadside surveys because they are relatively inconspicuous and, thus, easily overlooked. Trends produced through these surveys should be viewed with some caution because few routes have been consistently surveyed since the 1960s.

## Abundance

Initial estimates placed the total global population of Mountain Plovers at approximately 5,600 individuals (Morrison 1994, Rose and Scott 1997). This population estimate was adjusted upwards by Knopf (1996) to 8,000–10,000 birds based on the numbers found during a winter count in California in 1994 (3,346, which was then doubled) plus estimated wintering populations in Texas and Mexico (1,000–3,000). Using more refined field methodology for population estimates in Wyoming, Plumb *et al.* (2005a) revised the continental population estimate to 11,000 to 14,000 birds. Similarly, Knopf and Wunder (2006) have estimated the current global population at 10,000–19,000, with a decreasing population trend.

In Canada, rough estimates by Morrison (2001) and Morrison *et al.* (2001) put the population of Mountain Plovers at 10 pairs, and by Wershler (2000) at probably fewer than 50 adults. The maximum number of breeding individuals counted in a single year has been 11 and the maximum number of nests (or pairs) in a single season was six.

## Fluctuations and trends

Mountain Plovers only occur peripherally in Canada (less than 1% of the global population). The scarcity of records may indicate that it is not a regular breeder in Canada, although search effort has also not been consistent over time. Trends cannot be calculated for the species in Canada, but Figure 3 shows the occurrences and nest records from 1939 to present, which indicates an increase in records during the last 30 years. These records are, however, biased because of the increased search effort in later years.

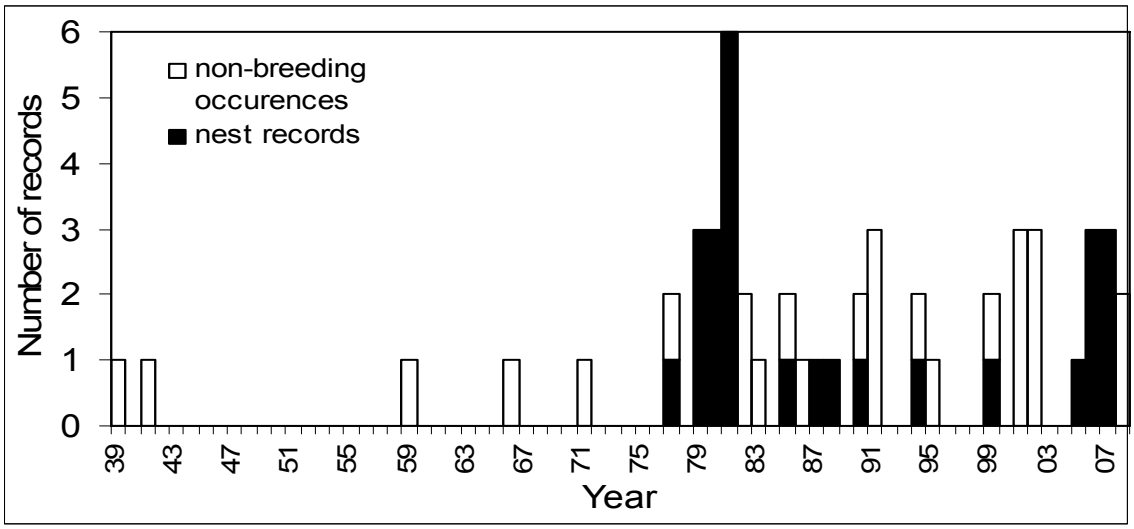


Figure 3. Number of occurrences and nest records in Canada 1939–2007.

In the U.S., the BBS trends for Mountain Plovers show a significant long-term decline of 2.7%/year (P=0.00, n=48 routes) from 1966 to 2007 (Sauer *et al.* 2008).

### Rescue effect

The largest known number of breeding Mountain Plovers is found on an extensive complex of black-tailed prairie dog colonies in the contiguous Phillips and Blaine Counties of Montana (Knowles and Knowles 2001, Dinsmore *et al.* 2003) that are 100-200 km south of the Canadian border. The large population of Mountain Plovers (Olson and Edge 1985) 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 Wild Horse. At this distance, plovers would be expected to wander north on a regular basis and may, in fact, be sustaining the Canadian population. Given the overall decline in the U.S. population, rescue, although likely, may be somewhat limited.

## LIMITING FACTORS AND THREATS

### Habitat destruction

The recent decline in the continental population of Mountain Plover is attributed to habitat destruction from the conversion of native grassland to cropland, agricultural practices and the management of domestic livestock.

Changing agricultural practices on breeding grounds have contributed to the decline of this species in recent decades. Conversion of short-grass prairie to agricultural land, primarily for winter wheat, has destroyed nesting habitat (Knopf 1996).

Most of the plover's former habitat in Montana is now intensively cultivated, as is a large proportion of the land in southwest Saskatchewan ploughed for agricultural purposes (Wershler and Wallis 1987). These practices have dramatically altered the Mountain Plovers habitat, with as much as 45% of the naturally occurring blue grama and buffalo grass being destroyed (Wershler and Wallis 1987). Advances in irrigation have also increased habitat loss because additional ploughing of short-grass prairie previously unsuitable for agriculture can occur. Planting of taller grasses in native prairie also poses a threat, as the birds rely on all-round visibility to detect predators (Knopf 1996).

Changing agricultural practices on the wintering grounds also threaten Mountain Plover populations. Wintering areas in California are under extreme pressure from the 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).

Improved range management practices on existing grasslands also have had an effect. Most pastures are managed to promote the growth of taller grasses through techniques such as rotational grazing, temporary cutbacks in grazing, and improving soil moisture. Ironically, those range improvement practices create areas avoided by the Mountain Plover, a "disturbance-evolved" species.

In Canada, much of the native grassland of southwestern Saskatchewan and southeastern Alberta has effectively been reduced and fragmented, owing to cultivation of the area, with the largest remaining tracts occurring around the Lost River and Milk River in Alberta, and the Frenchman River in Saskatchewan (Wershler and Wallis 1987). Although portions of this habitat are protected, much is Crown owned and leased for grazing, and is therefore kept in a uniformly moderately grazed condition, not patchy heavy grazing which is required to maintain suitable nesting habitat (Wershler and Wallis 1987). Range management practices which discourage heavily grazed grassland also restrict suitable breeding habitat.

**Decline of native herbivores**

The decline of native herbivorous mammals, such as bison and prairie dogs, has led to detrimental changes in the remaining prairie ecosystems, though in some areas cattle have maintained the sparsely vegetated open expanses preferred by Mountain Plovers (Askins 2000, Birdlife International 2008). The bison, a former grazer of the Great Plains, is now functionally extinct and the only primary grazer that remains is the prairie dog, although prairie dogs may have declined by as much as 99 percent to their present day numbers through disease, poisoning and recreational shooting (Dinsmore 2003). In Montana, and likely elsewhere, Mountain Plover populations declined following elimination of the bison, and are still directly related to surface coverage of active black-tailed prairie dog towns (Dinsmore *et al.* 2005).

### Fire suppression

Fire suppression may also be a threat to Mountain Plover populations. Mountain Plovers are strongly attracted to burned grasslands both in spring for nesting and in fall and winter for foraging and night roost sites. Plover response to burns is often quick, with birds appearing on fields where fires are still smoldering. Experimental burning programs initiated by the U.S. Forest Service on the Pawnee National Grassland and the Comanche National Grassland (Knopf and Rupert 1995, Svingen and Giesen 1999, Augustine *et al.* 2008) have resulted in higher Mountain Plover populations and higher rates of nesting success.

### Pesticides

Studies have found organochlorine residues in Mountain Plover specimens, but no abnormalities in the behaviour of birds or in eggshell thickness were observed (Knopf 1996, 1998).

However, more research needs to be done into the potential health consequences of inhaled organophosphates as birds wintering in the Central Valley, California, spend the season within an agrochemically contaminated fog, which when inhaled may affect the birds' cholinesterase activity (Knopf 1996). Charadriiformes are thought to be especially susceptible to this type of contamination, as they have a relatively high number of airsacs (12 pairs) compared to other birds (Knopf 1996).

### Weather extremes

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. For example, 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 1987, U.S. Fish and Wildlife Service 1999a). At the other extreme, drought conditions have been hypothesized as contributing to low fledging rates by decreasing food supply and simultaneously increasing predation pressures (Knopf 1996).

Most climate change projections for the Prairies show an increase in temperature under global warming. According to the Canadian Global Climate Model, the southern Prairies could experience serious summer deficiencies in soil moisture by the end of this century. However, not all parts of the Prairies will experience the same effects, and at least one prediction is that no major change in drought frequency will occur in southern Alberta (Natural Resources Canada 2007).

### Human impacts

Mountain Plovers may be vulnerable to human and vehicular disturbance during courtship, egg laying and early chick development. The major direct human impact is farm equipment destroying nests and eggs when working spring fallow fields (Knopf and Rupert 1999b).

## SPECIAL SIGNIFICANCE OF THE SPECIES

Canada represents the northern edge of the breeding range of the Mountain Plover, and indeed this species may not breed every year within Canada. However, the species holds a certain mystique among Canadian birders so that when breeding individuals are located, birders from across the country go to great lengths to see the species.

## EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

The Mountain Plover is a non-game species, and is a migratory bird protected under the *Migratory Birds Convention Act, 1994*. COSEWIC assessed this species as Endangered in November 2000 and it was designated as Schedule 1, Endangered, in Canada under the *Species at Risk Act (SARA)* in June 2003. The Canadian Wildlife Service–Prairie and Northern Region, Environment Canada, has led the development of a recovery strategy, in cooperation and consultation with Saskatchewan Environment, Alberta Sustainable Resource Development, the Parks Canada Agency, and Agriculture and Agri-Food Canada (Environment Canada 2006).

It is ranked as a G2 species by The Nature Conservancy (G2: " Very rare; usually between five and 20 occurrences in the overall range or with many individuals in fewer occurrences; or because of some factor(s) making it vulnerable to extinction"; Knopf and Reichel 1997). In Alberta, the species is ranked as S1B, Endangered, with “four to six pairs known to breed in Alberta” (Alberta Natural Heritage Information Centre November 2006), which is clearly optimistic at best. In Saskatchewan, the Saskatchewan Conservation Data Centre lists the species as Endangered S1B.

In the United States, the Mountain Plover is a species of special interest or concern in Montana, Wyoming, Colorado and Oklahoma, extirpated in North Dakota and South Dakota, on the watch list in Kansas and threatened in Nebraska. The 2008 IUCN Red List Category (as evaluated by BirdLife International) ranks the species as Near Threatened, with the justification that it has a moderately small population with a continual decline as a consequence of habitat loss and degradation resulting from cultivation, urbanization, over-grazing, and changes in native herbivore populations. It was formerly classified as Vulnerable by the IUCN (BirdLife International 2008); however, because it is thought not to be as rare as was believed, it was downlisted to Near Threatened status in 2008 with a decreasing population trend. The Mountain Plover is still listed as a candidate species for protection under the U.S. *Endangered Species Act*. NatureServe's global conservation ranking is G2 (imperiled; at high risk of extinction due to very restricted range, very few populations (often 20 or fewer) and steep declines).

# TECHNICAL SUMMARY

*Charadrius montanus*
Mountain Plover Pluvier montagnard
Range of Occurrence in Canada: Alberta, Saskatchewan

**Demographic Information**

| | |
|---|---|
| Generation time (usually average age of parents in the population; indicate if another method of estimating generation time indicated in the IUCN guidelines(2008) is being used) | 2 -3 yrs |
| Is there an [observed, inferred, or projected] continuing decline in number of mature individuals? | Unknown |
| Estimated percent of continuing decline in total number of mature individuals within [5 years or 2 generations] | |
| [Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over the last [10 years, or 3 generations]. | Unknown |
| [Projected or suspected] percent [reduction or increase] in total number of mature individuals over the next [10 years, or 3 generations]. | Unknown |
| [Observed, estimated, inferred, or suspected] percent [reduction or increase] in total number of mature individuals over any [10 years, or 3 generations] period, over a time period including both the past and the future. | Unknown |
| Are the causes of the decline clearly reversible and understood and ceased? | Not reversible, understood, not ceased |
| Are there extreme fluctuations in number of mature individuals? | No |

**Extent and Occupancy Information**

| | |
|---|---|
| Estimated extent of occurrence<br>Based on a minimum convex polygon | 3,030 km² |
| Index of area of occupancy (IAO)<br>Based on a 2 X 2 km² grid | 24 km² |
| Is the total population severely fragmented? | No |
| Number of "locations∗" | N/A |
| Is there an [observed, inferred, or projected] continuing decline in extent of occurrence? | No |
| Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy? | No |
| Is there an [observed, inferred, or projected] continuing decline in number of populations? | No |
| Is there an [observed, inferred, or projected] continuing decline in number of locations? | No |
| Is there an [observed, inferred, or projected] continuing decline in [area, extent and/or quality] of habitat? | Yes |
| Are there extreme fluctuations in number of populations? | N/A |
| Are there extreme fluctuations in number of locations∗? | N/A |
| Are there extreme fluctuations in extent of occurrence? | No |
| Are there extreme fluctuations in index of area of occupancy? | No |

∗ See definition of location.

**Number of Mature Individuals (in each population)**

| Population | N Mature Individuals |
|---|---|
| Onefour 0-11, Wildhorse 0–4 (possibly more), Grasslands National Park 0–2, Milk River Natural Area 0-2 | |
| Total: | 11–maximum recorded in one year |

**Quantitative Analysis**

| | |
|---|---|
| Probability of extinction in the wild is at least [20% within 20 years or 5 generations, or 10% within 100 years]. | Not done |

**Threats (actual or imminent, to populations or habitats)**

Habitat destruction: Continuing conversion of native grassland/short-grass prairie to cropland, agricultural practices and the management of domestic livestock.
Decline of native herbivores: High grazing intensity of native herbivores (e.g., bison and prairie dogs) necessary to maintain suitable habitat. Possibly duplicated by cattle overgrazing.
Weather extremes: Weather events such as above average precipitation can result in lush grass cover and render habitat unsuitable for nesting.
Human impacts: Nest and eggs are destroyed by farm equipment.

**Rescue Effect (immigration from outside Canada)**

| | |
|---|---|
| Status of outside population(s)? Large populations are 100–200 km south of the border in Montana. Overall, ongoing declines in the U.S. | |
| Is immigration known or possible? | Not documented–but rescue from U.S. likely sustaining Canadian population |
| Would immigrants be adapted to survive in Canada? | Yes |
| Is there sufficient habitat for immigrants in Canada? | Yes |
| Is rescue from outside populations likely? | Yes, but may be limited by declining populations |

**Current Status**

COSEWIC: Endangered (November 2009)

**Status and Reasons for Designation**

| **Status:** | **Alpha-numeric code:** |
|---|---|
| Endangered | D1 |

**Reasons for designation:**
This species is a rare bird of the Canadian prairies which is found in Alberta and Saskatchewan. The population numbers less than 250 individuals with a maximum of 11 individuals counted in one season in Canada. The species is threatened by continuing conversion of native grasslands to croplands, agricultural practices and the management of domestic livestock. The species is of particular concern in much of its range in the United States, limiting future rescue.

**Applicability of Criteria**

| |
|---|
| **Criterion A** (Decline in Total Number of Mature Individuals): Not applicable. Does not meet criterion, no information on declines. |
| **Criterion B** (Small Distribution Range and Decline or Fluctuation): Not applicable. Does not meet criterion, although small range, no information on declines and does not experience extreme fluctuations in EO, IAO, locations or number of mature individuals. |
| **Criterion C** (Small and Declining Number of Mature Individuals): Not applicable. Does not meet criterion, no information on declines. |
| **Criterion D** (Very Small or Restricted Total Population): Meets Endangered D1 because population less than 250 mature individuals. |
| **Criterion E** (Quantitative Analysis): No analysis conducted. |

## ACKNOWLEDGEMENTS AND AUTHORITIES CONSULTED

The authors wish to thank Helen Trefry who participated in field work and preparation of Knapton *et al.* (2006). This report uses the status review of Knapton *et al.* (2006) which benefited from Ian Walker, Onefour Agricultural Research Sub-station; Walter Wilms, Agriculture and Agri-Food Canada, Lethbridge; Robert Sissons and Pat Fargey, Grasslands National Park, Parks Canada Agency; Bill Bristol, PFRA, Regina; Susan Blackman, Kate Dancer, Dave Duncan, Colleen Nordlund, Ray Poulin, Al Smith and Gillian Turney, CWS, Edmonton and Saskatoon; Lonnie Bilyk, Alberta Sustainable Resource Development; Craig and Pamela Knowles, Montana; Steve Dinsmore, Montana, and Fritz Knopf, Colorado. Further authorities consulted are Ben Sawa, Saskatchewan Conservation Data Centre, Fish and Wildlife Branch, Saskatchewan Environment; Gordon Court, Fish and Wildlife Division, Government of Alberta, Alberta Environment, Edmonton; and Cleve Wershler and Cliff Wallis, Sweetgrass Consultants, Calgary. The authors also thank all these agencies and individuals for their assistance. Finally, the authors would like to thank members of the COSEWIC Bird SSC for helpful comments on the first draft of the manuscript, and Alain Filion, Scientific and Geomatics Project Officer, for assistance with figures and other aspects of the manuscript.

## INFORMATION SOURCES

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

Andrews, R. and R. Righter. 1992. Colorado birds. Denver Mus. Natur. Hist., Denver, CO. 442 pp.

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

Augustine, D. J., S. J. Dinsmore, M. B. Wunder, V. Dreitz and F. Knopf. 2008. Response of Mountain Plovers to plague-driven dynamics of Black-tailed Prairie Dog colonies. Landscape Ecology 23:689-697.

Baicich, P. J. and C. J. O. Harrison. 1997. A Guide to the nests, eggs, nestlings of North American Birds. Academic Press, New York.

Baldwin, P. H. 1971. Diet of the Mountain Plover at the Pawnee National Grassland, 1970–71. U.S. International Biological Program, Grassland Biome Prog. Rep. No. 134, Ft. Collins, CO.

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. 412 pp.

Bergeron, D., C. Jones, D. L. Genter and D. Sullivan. 1992. P. D. Skaar’s Montana bird distribution. 4th ed. Montana Nat. Heritage Prog. Spec. Publ. No. 2.

Birdlife International 2008. *Charadrius montanus*. 2008 IUCN Red List of Threatened Species.http://www.birdlife.org/datazone/species/index.html?action=SpcHTMDetails.asp&sid=3142&m=0 Retrieved 23 May 2008.

COSEWIC 2002a. Committee on the Status of Endangered Wildlife in Canada. Ottawa. http://www.cosewic.gc.ca/eng/sct0/assessment_process_e.cfm#tbl5 Retrieved 23 May 2008.

COSEWIC 2002b. COSEWIC Status Report - Mountain Plover: http://www.sararegistry.gc.ca/status/showASCII_e.cfm?ocid=212 Retrieved 23 May 2008

Coues, E. 1874. Birds of the Northwest: a hand-book of the ornithology of the region drained by the Missouri River and its tributaries. U.S. Govt. Printing Office, Washington, D.C. (Reprinted 1974 by Arno Press, New York.).

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

Dinsmore, S. J. and F. L. Knopf. 2005. Differential parental care by adult Mountain Plovers, *Charadrius montanus*. Can. Field Nat. 119:532-536.

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.

Dinsmore, S. J., G. C. White and F. L. Knopf. 2005. Mountain Plover population responses to Black-tailed Prairie Dogs in Montana. J. Wildl. Manage. 69:1546-1553.

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

Ellison-Manning, A. E. and C. M. White. 2001. Breeding biology of Mountain Plovers (*Charadrius montanus*) in the Uinta Basin. West. N. Amer. Nat. 61:223-228.

Environment Canada. 2006. Recovery Strategy for the Mountain Plover (*Charadrius montanus*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. iv + 16pp.

Fellows, S. D. and R. J. Gress. 1999. Breeding Mountain Plovers in Kansas. Kansas Ornithol. Soc. Bull. 50:29-35.

Fennell, T. 2002. Mountain Plover. A Central Texas perspective. Texas Birds 4:27-33.

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

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

Gonzalez Rojas, J. I., M. A. Cruz Nieto, O. Ballesteros Medrano and I. Ruvalcaba Ortego. 2006. First breeding record of a Mountain Plover in Nuevo Leon, Mexico. Wilson J. Ornithol. 118:81-84.

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. Wilson Bull. 86:221-229.

Graul, W. D. 1975. Breeding biology of the Mountain Plover. Wilson Bull. 87:6-31.

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

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.

Howell, S. N. G. and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford Univ. Press, Oxford, U.K.

Hubbard, J. P. 1978. The breeding and seasonal status of the Mountain Plover in New Mexico. N. Mex. Ornithol. Soc. Bull. 6: 2–6.

Jojola-Elverum, S. M. and K. Giesen. 2000. Killdeer parasitizes plover nest. Wilson Bull. 112:454-456.

Joseph, L., E. P. Lessa and L. Christidis. 1999. Phylogeny and biogeography in the evolution of migration: shorebirds of the Charadrius complex. J. Biog. 26:329-343.

Knapton, R. W., 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.

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. The Academy of Natural Sciences, Philadelphia, PA & American Ornithologists Union, Washingon, DC. 16pp.

Knopf, F. L. 1998. Foods of Mountain Plovers wintering in California. Condor 100:382-384.

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. 1995. Habits and habitats of Mountain Plovers in California. Condor 97:743-751

Knopf, F. L. and J. R. Rupert. 1996. Reproduction and movements of Mountain Plovers breeding in Colorado. Wilson 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.

Knopf, F. L. and M. B. Wunder. 2006: Mountain Plover. In: Poole, A. and F. Gill (eds):The Birds of North America 211. Academy of Natural Sciences, Philadelphia, PA & American Ornithologists' Union, Washington, D.C. Online version,

Knowles, C. J. and P. R. Knowles. 1984. Additional records of Mountain Plovers using prairie dog towns in Montana. Prairie Nat. 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 Montana Dept. Fish, Wildlife, & Parks, Great Falls,Montana, and Bureau of Land Management, Billings, Montana. 22 April 1997.

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. Amer. Birds 45:1128-1130.

Kuenning, R. R. and H. E. Kingery. 1998. Mountain Plover. Pp. 170-171, in H.E. Kingery, ed. Colorado Breeding Bird Atlas. Colorado Bird Atlas Partnership and Colorado Division of Wildlife, Denver, Colorado.

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

Ligon, J. S. 1961. New Mexico birds and where to find them. Univ. of New Mexico Press, Albuquerque.

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. West. N. Amer. Nat. 61: 223-228.

McCaffery, B. J., T. A. Sordahl and P. Zahler. 1984. Behavioral ecology of the Mountain Plover in northeastern Colorado. Wader Study Group Bull. 40:18–21.

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

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

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. 64pp.

Natural Resources Canada. 2007. Climate Change Impacts and Adaptation Program: Climate change in Prairie Provinces. http://adaptation.rncan.gc.ca/posters/pr/pr_03_e.php). 23 May 2008

NatureServe. 2008. NatureServe Explorer: An online encyclopedia of life. Version 7.0. NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer. Retrieved 23 May 2008

Oakleaf, B., B. Luce, S. Ritter and A. Cerovski. 1992. Wyoming Bird and Mammal Atlas. Wyoming Game Fish Dept., Lander.

Olson, S. L. and D. Edge. 1985. Nest site selection by Mountain Plovers in Northcentral Montana. J. Range Manage. 38:280–282.

Olson-Edge, S. L. and W. D. Edge. 1987. Density and distribution of the Mountain Plover on the Charles M. Russell National Wildlife Refuge. Prairie Nat. 19:233–238.

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.

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

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 & Co., Toronto.197pp.

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

Ridgely, R. S., T. F. Allnutt, T. Brooks, D. K. McNicol, D. W. Mehlman, B. E. Young and J. R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

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

Rosenberg, K. V., R. D. Ohmart, W. C. Hunter and B. W. Anderson. 1991. Birds of the lower Colorado River valley. Univ. of Arizona Press, Tucson.

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. 2008. The North American Breeding Bird Survey, Results and Analysis 1966 - 2006. Version 2008.2. U.S.G.S. Patuxent Wildlife Research Center, Laurel, MD, http://www.mbr-pwrc.usgs.gov/bbs/

Shackford, J. S. and D. M. Leslie. 2000. Status of breeding Mountain Plovers (*Charadrius montanus*) on cultivated landscapes in western Oklahoma. Proc. Okla. Acad. Sci. 80:47-51.

Shackford, J. S., D. M. Leslie and W. D. Harden. 1998. Range-wide use of cultivated fields by Mountain Plovers during the breeding season. J. Field Ornithol. 70:114-120.

Small, A. 1994. California Birds: their Status and Distribution. Ibis Publ. Co., Vista, CA.

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

Soper, J. D. 1941. The Mountain Plover in western Canada. Can. Field Nat. 55:137.

St. John, J., R. F. Kysela and S. J. Oyler-McChance. 2007. Characterization of microsatellite loci isolated in Mountain Plover (*Charadrius montanus*). Molecular Ecology Notes 7:802-804.

Storer, E. A. 1941. Mountain Plover in Solano County, California. Condor 43:158.

Svingen, D. and K. Giesen. 1999. Mountain Plover (*Charadrius montanus*) response to prescribed burns on the Comanche National Grassland. J. Col. Field Ornithol. 33:208-212.

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. 446 pp.

U.S. Fish and Wildlife Service. 1999a. Mountain Plover survey guidelines. Fort Collins Field Office. Fort Collins, Colorado. Retrieved 22 May 2008

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. Can. Field Nat. 95:133-136.

Wapple, R. D. 2005. Historical Abundance of Seven COSEWIC Bird Species on the Canadian Prairies. Unpubl. report Can. Wildl. Serv., Edmonton, Alberta. 23 pp.

Wershler, C. R. 1989. A Management Strategy for Mountain Plovers in Alberta. Pp.169 - 171, in Holroyd, G. L., G. Burns and H. C. Smith, eds. 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. 1987. 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. A. Wallis. 2001. Mountain Plover Habitat and Population Surveys; Alberta and Saskatchewan 2001. Sweetgrass Consultants, Calgary, AB. 44 pp.

Wilbur, S. R. 1987. Birds of Baja California. Univ. of California Press, Berkeley.

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. J. Field Ornithol. 74:74-80.

## BIOGRAPHICAL SUMMARY OF REPORT WRITERS

Richard Knapton is a wildlife biologist working on endangered species with Environment Canada, a lecturer in ornithology and biology at the University of Alberta, and a tour leader and owner/director with Eagle-Eye Tours Inc. He completed an undergraduate degree at Lakehead University, a Masters degree at the University of British Columbia, a PhD at the University of Manitoba, and a post-doctoral fellowship at the University of Toronto. A field researcher for over 25 years, Richard has studied species as diverse as Bicknell's Thrush, Merlin, Burrowing Owl, Double-crested Cormorant, Eastern Meadowlark and Song, Clay-colored and White-throated Sparrows. He has authored over 70 articles on bird distribution, ecology and behaviour. He is involved in many conservation issues, including the Committee on the Status of Endangered Wildlife in Canada (Bird Specialist Species Subcommittee), the Henslow's Sparrow Recovery Plan, Birds at Risk and Important Bird Areas in Canada, and is currently on the Alberta Birds Records Committee.

Geoff Holroyd is a research scientist with the Canadian Wildlife Service, an adjunct professor in the Department of Renewable Resources, University of Alberta, and chairman of the Peregrine Falcon Recovery Team. He earned his B.A. in Biology at the University of Western Ontario, and MSc and PhD from the University of Toronto for his studies of the foraging strategies and diet of swallows. He supervised Ecological Wildlife Inventories of Banff, Jasper, Kootenay, Glacier and Mt Revelstoke National Parks, was Section Head of the Threatened Wildlife Section of the Canadian Wildlife Service, has been on several prairie recovery teams and has been president of several non-profit groups including Long Point Bird Observatory, Bow Valley Naturalists, Edmonton Natural History Club and Beaverhill Bird Observatory. He has studied wildlife in many parts of Canada and overseas including bats in South Africa, Blue Swallows in Malawi, owls in Mexico, Spain and Ecuador, and songbirds in Guatemala. He has authored and coauthored over 100 articles, booklets and one book. He has received several awards from local, provincial and national groups for his conservation efforts.

## Appendix 1. Elliot Coues and the Occurrence of Mountain Plovers in Canada

Coues (1874) noted that Mountain Plovers were common breeders on the plains north of the Milk River, and that the species favoured nesting on prairie dog towns, stating that “the bird nests anywhere on the dry prairie; but if it have any preference, it is for the stretches of low loose grassy ground where the prairie dogs settle” (Coues 1874:600). 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. Elliot Coues was surgeon/naturalist for the U.S. 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 (1878 p. 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 River. Such a route would take him through present day Valley County close to Phillips County, Montana, and hence through an area in which Mountain Plovers still occur today.

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, and place him some distance south of the actual border; for example, the mouth of Milk River is 100 km from border, the mouth of Frenchman River is 55 km from border, Two Forks is near Malta about 50 km from the border. 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.