Southern Selkirk Mountain Caribou Population
(Rangifer tarandus caribou)

5-Year Review
Summary and Evaluation
December 2, 2008

U.S. Fish and Wildlife Service
Upper Columbia Fish and Wildlife Office
Spokane, Washington

5-YEAR REVIEW

Species reviewed: Southern Selkirk Mountain Caribou Population (*Rangifer tarandus caribou*)

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1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office: Region 1, Portland, Oregon

Lead Field Office: Upper Columbia Fish and Wildlife Office, Spokane, WA

Cooperating Field Office: NA

Cooperating Regional Office: NA

1.2 Methodology used to complete the review:

In completing this review, the U.S. Fish and Wildlife Service (Service) utilized available commercial and scientific information regarding the Selkirk caribou population, its habitat, and factors affecting the continued existence of the population. We began the process with an April 11, 2006, Federal Register Notice of Review and a May 18, 2006, "Dear Interested Party" letter requesting information on the above topics. On March 19, 2007, we sent out a second "Dear Interested Party" letter offering a second opportunity for public input. In addition to information submitted in response to these notices, we searched files in the Service's Upper Columbia Fish and Wildlife Office, conducted literature searches for published literature, and contacted staff in other agencies for any additional new information. We met and/or had conference calls with the Service's Washington Office, Region 1 Regional Office, and Department of Interior Solicitor's Office to discuss various aspects of the review.

Information that was collected through any of the means noted above was assimilated into a draft 5-year review document. Because the Selkirk caribou population was listed prior to the Service's 1996 Distinct Population Segment (DPS) policy (61 FR 4722-4725), the document included an analysis of the Selkirk caribou population in relation to the DPS policy. We met or had conference calls with representatives of British Columbia (BC), Idaho, and Washington, as well as the Kalispel and Kootenai Tribes, to discuss the draft document and solicit any additional information that might be available. In addition, we solicited peer review of the draft 5-year review analysis from Trevor Kinley (2008), Dr. Bruce McLellan (2008), and Dr. Dale Seip (2008b).

1.3 Background:

All caribou and reindeer in the world are a single species (*Rangifer tarandus*) and are presumed able to interbreed and produce viable, fertile offspring (Committee on the Status of Endangered Wildlife in Canada (COSEWIC) 2002). Woodland caribou in Canada are classified as *Rangifer tarandus,* subspecies *caribou.* A variety of terms have

been used to refer to different caribou groupings below the subspecies level (e.g. ecotypes, subpopulations, local populations, herds, etc.). Definition of such terms is essential in distinguishing between different caribou groups, but definitions have been arbitrary and variable among authors (COSEWIC 2002, Zittlau 2004). However, the concept of ecotypes has gained acceptance. Ecotypes are described as classes of populations adapted to different landscapes or environments as expressed by their movements and feeding behavior (COSEWIC 2002). In BC and the US, there are three recognized ecotypes of woodland caribou: mountain, northern, and boreal, each differentiated by the type of habitat occupied, their movement patterns, and feeding behavior (Heard and Vagt 1998).

The northern ecotype of woodland caribou can be found in northern and western BC, where they occupy mountainous habitats having relatively lower snowfall than those areas occupied by the mountain ecotype of caribou. In the winter, northern caribou feed primarily on terrestrial lichen which they find either on high wind-blown slopes or lower elevation lodgepole pine and black spruce forests. Boreal caribou extend across Canada, including northeastern BC, where they occupy flat boreal forests. Boreal caribou tend to maintain a more dispersed distribution rather than forming discrete herds (Zittlau 2004).

The endangered southern Selkirk caribou population belongs to the mountain ecotype of woodland caribou, which are found in southeast BC, northern Idaho and northeastern Washington. Mountain caribou are unique from other members of the subspecies both in terms of their habitat and behavior. They primarily occupy high elevation (generally above 4,000 feet elevation) old growth cedar/hemlock and spruce/fir forests having high snow levels, and they feed almost exclusively on arboreal lichen during the winter. In contrast to the seasonal long-distance migrations undertaken by some caribou subspecies, mountain caribou make seasonal elevational movements in response to factors such as snow levels, food availability, and predator avoidance.

Historically, caribou were widely distributed throughout portions of the northern tier of the coterminous United States (US) from Washington to Maine, as well as throughout most of Canada. In the northwestern US, mountain caribou occurred in Washington, Idaho, Montana and perhaps Wyoming (Cringan 1957; Flinn 1956; Evans 1960; Layser 1974). In Idaho, they occurred as far south as Salmon, Idaho (Figure 1) (Service 1994). Historical caribou numbers in the northwestern US are difficult to determine with certainty because early records are comprised primarily of accounts gathered from trappers, early settlers, prospectors, and forest workers, as compiled by Flinn (1956), Layser (1974), and others. Nevertheless, these accounts indicate that caribou were plentiful in the northwestern US in the 1800s, and, more specifically, that caribou in northern Idaho, northeastern Washington, and southern BC were abundant in the late 1800s to early 1900s (Layser 1974). However, as a result of habitat loss and fragmentation, over-hunting, and predation, caribou numbers have decreased, and their range has declined by approximately 60% according to some estimates, when considering historic range within both BC and the US (Mountain Caribou Technical Advisory Committee (MCTAC) 2002). Currently, the entire global population of mountain caribou occurs within BC, Idaho, and Washington, where they are provincially "red-listed"

(considered to be threatened or endangered) by BC and listed as threatened under Canada's Species at Risk Act (SARA). The Canadian listing of caribou as threatened under SARA applies not only to mountain caribou, but to all woodland caribou in the Southern Mountains National Ecological Area in BC and Alberta. The Selkirk Mountain caribou population is listed as endangered under the US Endangered Species Act (Act) (Hatter et al. 2004; Apps and McLellan 2006).

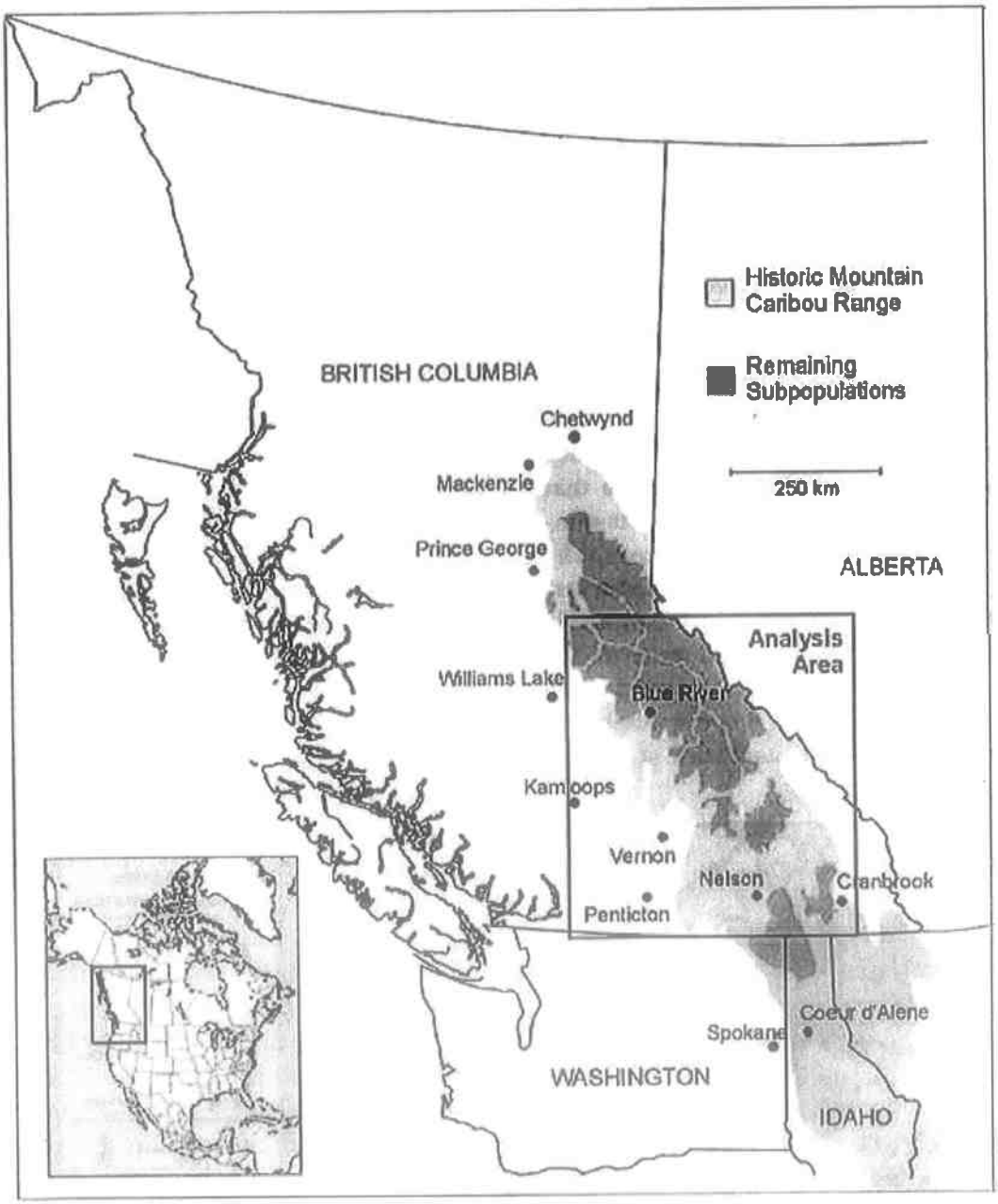

Figure 1. Historic and current range of mountain caribou in BC and the US (Apps and McLellan 2006).

Caribou listed as endangered under the Act are listed as the southern Selkirk Mountain caribou population. There are several other populations of mountain caribou that also occupy (entirely or in part) the Selkirk Mountain range in BC (e.g. Nakusp, Duncan, Columbia-South, Columbia-North). Therefore, to avoid confusion, the listed endangered Selkirk caribou population will be referred to as the South Selkirk population in the remainder of this document to be consistent with the naming convention normally used among most caribou researchers and managers (Wittmer 2004).

1.3.1 FR Notice citation announcing initiation of this review: April 11, 2006. Endangered and Threatened Wildlife and Plants: Initiation of 5-Year Reviews of 70 species in Idaho, Oregon, Washington, and Hawaii and Guam. 71 FR 18345-18348.

1.3.2 Listing history

Introduction

In 1980, the U.S. Fish and Wildlife Service (Service) received two petitions to list the South Selkirk population of caribou as endangered under the Endangered Species Act (ESA): one from the Idaho Department of Fish and Game (IDFG) and one from Dean Carrier, a U.S. Forest Service staff biologist and former chairman of the International Mountain Caribou Technical Committee (IMCTC). At that time, the population was thought to consist of only 13-20 animals (48 FR 1722-1726). The IDFG petition noted that the agency had been working on the conservation and management of the South Selkirk caribou population under the guidance of the IMCTC since 1971. The IDFG petition also stated that this "is the only known caribou population in the continental United States and with the extremely low numbers it is essential everything possible be done to prevent this species from becoming extinct in the United States." They urged immediate action on the petition to ensure the long-term survival of the caribou (IDFG 1980). Similarly, Mr. Carrier's petition urged prompt action, noting the "precarious state" of the population, the ongoing threats to habitat, and concern that the last remaining caribou population in the coterminous United States (US) would soon be extirpated (Carrier 1980).

In response to the two listing petitions and other available information, the Service emergency listed the South Selkirk caribou population in northeast Washington, northern Idaho, and southeast BC on January 14, 1983 (48 FR 1722-1726), and on June 22, 1983 (48 FR 28500-28504), published a proposed rule to list the population as endangered. The proposed rule elicited strong support from numerous individuals, organizations, and agencies, including the Washington State Department of Game (WSDG) (1983), the Canadian Wildlife Service (1983), the IMCTC (B.C. Ministry of Environment 1983), and the Governor of Idaho (1983). The WSDG strongly endorsed the proposed listing, noting that Washington had designated caribou as a State endangered species and was engaged in a cooperative agreement with the State of Idaho to study caribou to

determine how to best plan recovery efforts for the species. The Governor of Idaho wrote that "The people of Idaho consider the woodland caribou population of northern Idaho to be an important asset that, in part, represents the uniqueness of this state.....We strongly support the proposal to list the woodland caribou as endangered in the State of Idaho and will do everything we can to facilitate its recovery."

A second emergency rule was published on October 25, 1983 (48 FR 49245-49249), to extend emergency protection for the South Selkirk caribou population until a final rule could be published. Final listing of the Southern Selkirk Mountains caribou population as endangered in Idaho, Washington, and southeast British Columbia (BC) occurred on February 29, 1984 (49 FR 7390-7394).

Original Listing
FR notice: 48 FR 1722-1726
Date listed: January 14, 1983
Entity listed: Southern Selkirk Mountain caribou population in Washington, Idaho, and Southern British Columbia
Classification: Emergency listed as endangered.

Revised Listing, if applicable
FR notice: 48 FR 49245-49249
Date listed: October 25, 1983
Entity listed: Southern Selkirk Mountain caribou population in Washington, Idaho, and Southern British Columbia
Classification: Emergency listed as endangered (extension of emergency protection).

FR notice: 49 FR 7390-7394
Date listed: February 29, 1984
Entity listed: Southern Selkirk Mountain caribou population in Washington, Idaho, and Southern British Columbia
Classification: Endangered

1.3.3 Associated rulemakings: NA

1.3.4 Review History: No other reviews have been performed.

1.3.5 Species' Recovery Priority Number at start of this 5-year review: 3c

1.3.6 Current Recovery Plan or Outline
Name of plan or outline: Selkirk Mountains Woodland Caribou
Date issued: March 4, 1994
Dates of previous revisions, if applicable: April 12, 1985

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?
__X__ *Yes*
_____ *No*

2.1.2 Is the species under review listed as a DPS?
__X__ *Yes*
_____ *No*

2.1.3 Was the DPS listed prior to 1996?
__X__ *Yes*
_____ *No*

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?
_____ *Yes*
__X__ *No*

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?
__X__ *Yes*
_____ *No*

A. *Discreteness: A population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions:*

1) *It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.*

The South Selkirk mountain caribou population is part of the larger mountain caribou metapopulation that occurs in southeast BC and northwest US. Mountain caribou were recently distributed as 18 separate subpopulations, extending from the north end of the Hart Ranges in BC to the south end of the Selkirk Mountains in Idaho and Washington (Figure 2). Two of these 18 subpopulations are now thought to have been extirpated, leaving 16 subpopulations. Some of these subpopulations are contiguous while others appear to be isolated. The South Selkirk population is the southernmost population. Of the next closest populations, one (Purcells-Central) is thought to be extirpated, and the other (Purcells-South) consists of fewer than 20 animals (Service 1984; Simpson et al. 1997; Hatter 2006; MCTAC 2002; COSEWIC 2002; Wittmer 2007).

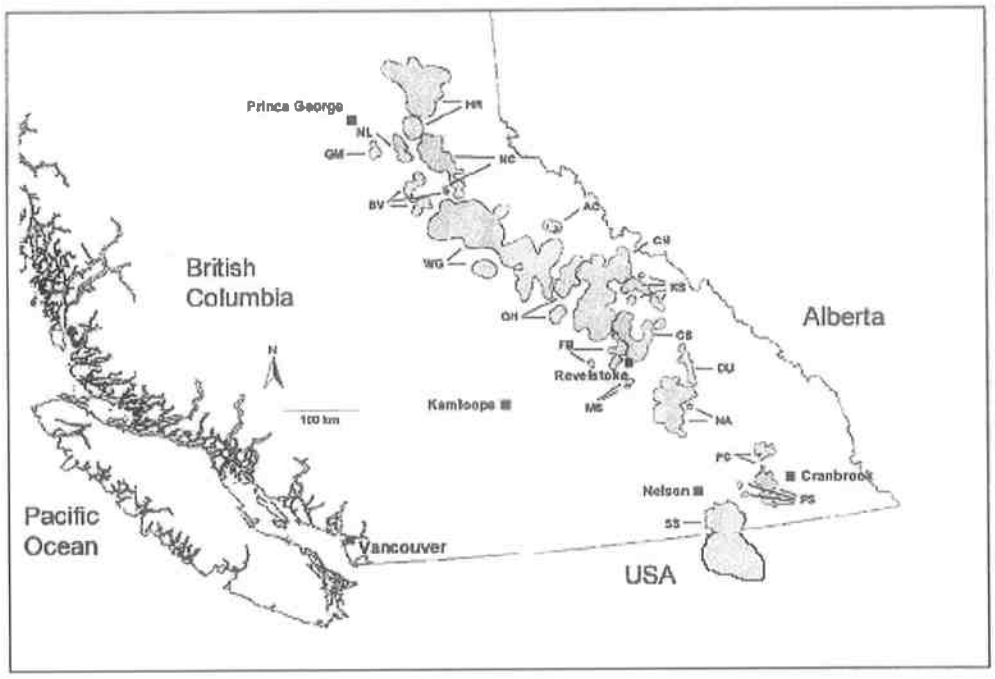

Figure 2. Mountain caribou local populations: South Selkirks (SS), Purcells-South (PS), Purcells-Central (PC), Nakusp (NA), Duncan (DU), Monashee-South (MS), Columbia-South (CS), Frisby-Boulder (FB), Columbia-North (CN), Kinbasket-South (KS), Groundhog (GH), Wells Gray (WG), Allan Creek (AC), Barkerville (BV), North Cariboo Mountain (NC), George Mountain (GM), Narrow Lake (NL), Hart Ranges (HR) (Adapted from Wittmer 2004).

Major movement barriers exist between the South Selkirk and other caribou populations. Kootenay Lake lies to the north and east. Also to the east is the Creston Valley, which is a low elevation valley heavily developed for agriculture, containing numerous roads, residential areas, and communities (MCTAC 2002). The two closest caribou subpopulations, the Purcells-South and the Nakusp, are separated from the South Selkirk subpopulation by approximately 30 and 60 miles, respectively. There has not been any documented movement of resident animals between these subpopulations, although there has been some limited exchange of transplanted animals.

Between the late 1980s and 2004, a total of 13 caribou were documented moving from the South Selkirk subpopulation to the Purcell-South subpopulation, and a number of animals were also documented moving from the South Selkirk subpopulation to or toward the Nakusp subpopulation in the Central Selkirks. At least one animal traveled between all three populations. Most of the caribou documented moving between populations were females, and all were caribou that had been transplanted to the South Selkirks from other populations further north in BC (Kinley 2007). Some of these caribou stayed with the adjacent population less than a month, others stayed for a number of years, and a number of them died in the Purcells-South. At least three animals returned to the South Selkirk subpopulation between 1987 and 2004. In 1997, the Service radio-collared 10 resident caribou from the South Selkirk subpopulation and tracked them in addition to the caribou transplanted into the recovery area. Although a

number of these resident caribou died within a year of being collared, none of them moved outside the recovery area between 1997 and 2006.

The Service's DPS policy does not require absolute separation or reproductive isolation of a population from other members of its species. Rather, the policy allows for some limited interchange among discrete populations. In the case of the South Selkirk caribou population, the interchange of animals with adjacent populations occurred over an extended period (at least 17 years). Additionally, the individual caribou that moved between populations were all animals that had been transplanted to the South Selkirk population from other caribou populations further north (Kinley 2007). During their first year in the south Selkirk Mountains ecosystem, some of the transplanted caribou demonstrated longer range, exploratory movements atypical of normal annual movements, which could account for these interchanges (Warren 1990). No caribou from the resident population have been documented leaving the recovery area.

Based on the facts above, we conclude that the South Selkirk Mountains caribou population meets the first condition of discreteness outlined in the Service's DPS policy, i.e. marked separation from other populations of the same taxon as a consequence of physical factors. The geographic separation between the South Selkirk population and the next two closest populations (Purcells- South and Nakusp), the physical movement barriers between these populations, and the limited exchange of animals between the South Selkirk and adjacent populations demonstrate that this population is markedly separated from other populations of the same taxon as a result of physical factors.

2) *It is delimited by international governmental boundaries within which differences in (a) control of exploitation, (b) management of habitat, (c) conservation status, or (d) regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.*

This condition is not applicable in the case of the South Selkirk caribou population because the listing under ESA addresses the entire South Selkirk population, which includes a portion of BC. Therefore, the listed entity is not delimited by an international boundary.

B. *Significance: Under the DPS Policy, if a population segment is considered to be discrete, its significance can be assessed. The DPS Policy states that a species' population can be considered significant based on considerations that may include, but are not limited to:*
   - *Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon;*
   - *Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon;*
   - *Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; or*

- *Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.*

Under the significance element, the Service is to consider any available scientific evidence of the DPS' importance to the taxon to which it belongs. As noted above, the Service's DPS policy lists several examples of conditions under which a discrete population may be determined to be significant, but clearly states that the examples provided are not all inclusive and that other considerations may be used to determine the importance of a discrete population segment. The following discussion addresses considerations regarding the significance of the South Selkirk Mountains caribou population to mountain caribou as a whole.

- *Importance of the South Selkirk caribou population to the viability of mountain caribou.*

Conservation biology literature includes numerous papers addressing peripheral populations and their conservation value (e.g. Lesica and Allendorf 1995, Channell and Lomolino 2000, Fraser 2000, Araujo and Williams 2001, Kyle and Strobeck 2002, Spector 2002, Bunnell et al. 2004, Warman et al. 2004). While peripheral populations are sometimes considered to be less important than core populations, a number of authors have addressed specific considerations under which peripheral populations may be of significant conservation value. Some note the value in terms of the genetic diversity of populations at the edge of a species' range and their importance in future speciation events and the evolutionary process (Hunter and Hutchinson 1994; Lesica and Allendorf 1995; Fraser 1999). Others discuss the potential value of peripheral populations as critical refugia for those species whose range collapses from the core outward or for which extinction forces spread across the species' range like a contagion (Channell and Lomolino 2000; Bunnell et al. 2004). Some species with declining peripheral populations are also at risk throughout their range, and the continually retracting range edges further compromise the viability of the species. In such cases, protecting peripheral populations takes on more significance in helping to maintain species distribution and viability (Fraser 2000). The ecological role of peripheral populations in maintaining species richness and biodiversity at a local scale is also viewed as an important conservation value (Hunter and Hutchinson 1994; Bunnell et al. 2004). Similarly, the conservation of umbrella species and their habitats benefits a broad range of species and maximizes the representation of biodiversity within an ecosystem (Hunter and Hutchinson 1994; Fraser 2000; Bunnell et al. 2004).

A number of authors have addressed the importance of peripheral populations in contributing to the overall numbers and viability of a species. Bunnell et al. (2004) suggest that when a species is at risk over a large portion of its range, the value of conserving peripheral populations may become more important to the conservation of the species as a whole. In these circumstances, each local population becomes critically important and takes on a more significant role in contributing to distribution, numbers, and viability of the taxon as a whole. Fraser (2000) also indicated that the status of a species elsewhere should be considered before dismissing a peripheral population as unimportant. Fraser, as well as Araujo and Williams (2001), state that peripheral populations may provide valuable opportunities to

conserve species, particularly when extrinsic factors such as contagious threats (e.g. habitat degradation, expanding predator populations, etc.) and environmental change are important influences on current and future distributions.

Such is the case with mountain caribou. The current range of mountain caribou extends from the Hart Ranges north of Prince George, BC in a southeasterly direction to the Selkirk Mountains in northern Idaho and northeastern Washington. As stated previously, in the 1800s and early 1900s, mountain caribou were widely distributed and reported to be abundant throughout the northwestern US, occurring in Washington, Idaho, Montana and perhaps Wyoming (Cringan 1957; Flinn 1956; Evans 1960; Layser 1974). In Idaho, they occurred as far south as Salmon, Idaho (Service 1994). However, as a result of habitat loss and fragmentation (due to timber harvest, wildfires, and human development), over-hunting, and predation, caribou numbers and distribution have decreased significantly. Their range has declined by approximately 43% in BC,, and some estimates indicate a 60% decline when considering the combined BC and US historic distribution (MCTAC 2002). Overall numbers decreased from approximately 2,300 animals in the mid-1990s to approximately 1,939 animals in 2008 (Seip 2008a). Currently, the entire global population of mountain caribou occurs within BC, Idaho, and Washington, where they are considered to be at risk of extirpation. The decline has been particularly evident in the southern portion of the range, where the South Selkirk population is now the southernmost population of mountain caribou and the last remaining caribou population in the US. However, fragmentation is occurring at the core of the metapopulation as well as at the periphery (Wittmer 2004). The metapopulation now consists of 18 discrete, somewhat isolated subpopulations, 13 of which are declining and 10 of which consist of fewer than 50 animals (Figure 2). Two of the 18 subpopulations are thought to have been extirpated in the last 5 years.

The condition of mountain caribou exemplifies the situation characterized by Fraser (2000), Araujo and Williams (2001), and Bunnell et al. (2004), in which declines in distribution and numbers are occurring within the core of species distribution as well as at the periphery, indicating that mountain caribou are at risk throughout their range. When a species is declining throughout its range, peripheral populations cannot be summarily dismissed as unimportant to the viability of the species. As the southernmost mountain caribou population and the last remaining population within the US, the South Selkirk population takes on added significance in maintaining the shrinking range of mountain caribou, which has already decreased 60% from the historic range. Further range retraction, combined with decreasing population numbers, could have serious implications to the conservation of mountain caribou. Over the last 5-10 years, the South Selkirk population is one of the few subpopulations that has had a notable increase in abundance (McLellan 2008). Given this situation, each local population, including the South Selkirk population, takes on a more critical role in helping maintain the distribution and numbers of mountain caribou throughout their range.

In 2000, Hatter noted that the long-term value of some of the smaller, at-risk caribou local populations for maintaining a viable mountain caribou metapopulation is unknown but could be significant. In *A Strategy for the Recovery of Mountain Caribou in British Columbia,* MCTAC (2002) states, "While extirpation of small, local populations such as the South

Selkirks, South Purcells, Monashee, Central Rockies and George Mountain would only slightly reduce Mountain Caribou numbers, loss of these populations would result in a substantial reduction in the provincial distribution of Mountain Caribou. … .Maintaining these local populations, as well as "habitat linkages" or dispersal routes between local populations that constitute the geographic core of the current Mountain Caribou range may be critical to the long-term persistence of the metapopulation."

British Columbia's recovery goal for mountain caribou is to establish a viable metapopulation of 2,500-3,000 animals (MCTAC 2002). Hatter et al. (2004) stated that even if the larger local populations in the core of mountain caribou range were maintained, they would not support a viable metapopulation goal of 2,500 caribou. They stated "Thus, recovery planning must also consider the enhancement of smaller, more peripheral local populations and the possibilities for connecting these isolated populations to core populations."

Given the discussion above, it is apparent that the South Selkirk caribou population is important to the conservation of mountain caribou, which are in danger of extirpation throughout their current range. Over the last century, mountain caribou have been extirpated from up to 60% of their historic range in BC and the US. Just in the last decade, remaining mountain caribou numbers have declined precipitously, and what was once a fairly continuous distribution of mountain caribou has been fragmented into numerous smaller, more isolated local populations. The South Selkirk caribou population is the southernmost population and the last remaining caribou population in the US. As suggested by Fraser (2000) and Hatter et al. (2004), when a species is at risk throughout its range, individual populations, even peripheral populations, assume a more important role in the conservation of the species. As stated above, conserving a viable mountain caribou metapopulation will require not only the protection of the larger, more stable populations, but the protection and enhancement of the smaller, more peripheral populations as well. Therefore, the Service finds that the South Selkirk caribou population meets the significance element of the Service's DPS policy, based on its importance to the conservation of mountain caribou.

- *Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon.*

As stated previously, historically, caribou were widely distributed throughout portions of the northern tier of the coterminous US from Washington to Maine as well as throughout Canada. In the northwestern US, mountain caribou occurred in Washington, Idaho, Montana and perhaps Wyoming (Cringan 1957; Flinn 1956; Evans 1960; Layser 1974). In Idaho, they occurred as far south as Salmon, Idaho (Service 1994). However, as a result of habitat loss and fragmentation, over-hunting, and predation, woodland caribou numbers have decreased, and their range has declined by approximately 60% from their historic range in BC and the US combined (Figure 1) (COSEWIC 2002, MCTAC 2002).

The current range of the mountain caribou metapopulation extends approximately 484 miles in a northwest to southeast direction from the north end of the Hart Ranges in BC to the south end of the Selkirk Mountains in Idaho and Washington. Within this area, 18 local populations

have been identified, 2 of which are thought to have been extirpated in the last 5 years (Wittmer 2004). Some of the remaining 16 local populations are contiguous while others appear more isolated. The South Selkirk population is the southernmost mountain caribou population and the last caribou population occupying the coterminous US. This population is separated by 30-60 miles from the next closest local populations to the north and east. In terms of gaps in the range of the taxon, the extirpation of the South Selkirk population would result in an 8% reduction in the current range of mountain caribou (DeGroot 2007) and the extirpation of caribou in the US.

The Service's interpretation of the DPS policy regarding a species' range is that the policy applies to the species' current range, rather than historic range. However, it is useful and important to consider historic range loss in concert with the degree and pattern of the current, ongoing range reduction to place the existing situation in perspective. An 8% reduction in range, when considered along with the 60% loss of historic range and the current pattern of decline and fragmentation throughout the core of the mountain caribou metapopulation places the potential loss of the South Selkirk mountain caribou population in a significant light. Mountain caribou distribution has already decreased by 60% primarily as a direct or indirect result of human activities (COSEWIC 2002, MCTAC 2002). A decrease of this magnitude is substantial and could have serious implications for the long-term viability of mountain caribou. If the South Selkirk population were extirpated, resulting in an additional 8% contraction of the southern extent of a range, the metapopulation would be even more at risk. Therefore, we believe that the potential loss of the Selkirk caribou population would represent a significant gap in the range of mountain caribou.

Other considerations for determining the potential significance of a population (provided as examples in the DPS policy) were evaluated, but were deemed not applicable to the Selkirk caribou population as outlined below.

- *Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon.*

The Service's DPS policy notes that "persistence in a unique ecological setting" is an example of a condition under which a discrete population may be determined to be significant. Mountain caribou as a whole inhabit a unique ecological setting. They occupy high elevation, mountainous terrain with deep snowpacks, as compared to the areas with lower snowpacks occupied by other woodland caribou ecotypes. They make seasonal elevational movements, rather than the seasonal horizontal migrations of other woodland caribou. They feed almost exclusively on arboreal lichen during late winter, instead of terrestrial lichen as other woodland caribou do.

The South Selkirk caribou population's behavior and occupied habitat is consistent with that of other mountain caribou populations. While there are some minor variations in the topography, habitat, and habitat use throughout mountain caribou range, there are no unusual ecological features unique to this particular population that are not shared by at least one or more other local populations of mountain caribou. Therefore, the South Selkirk population does not persist in an ecological setting unusual or unique for the taxon.

- *Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range.*

The Service's DPS policy indicates that a population may be determined to be significant if it represents the only surviving natural occurrence of the taxon within its historic range. The South Selkirk mountain caribou population represents the last remaining caribou population within the coterminous US, however, it is not the only surviving occurrence of the taxon within the historic range of mountain caribou. There are 15 other local populations of mountain caribou remaining within the current range. Therefore, this condition is not met for the South Selkirk population.

- *Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.*

The Service's DPS policy indicates that a population may be determined to be significant if it differs genetically from other populations. The South Selkirk caribou population has been augmented twice over the last two decades, using animals from four different source herds. These augmentations were conducted in accordance with tasks in approved recovery plans for the population. Although limited information is available on the genetic diversity of the pre-augmented population, post-augmentation analyses show that the population contains high levels of genetic diversity (Zittlau 2004). In fact, data indicate that after augmentation, the South Selkirk population was at least as diverse as other mountain caribou populations examined.

Because the South Selkirk caribou population has been augmented in the past, the genetics of this population represents a combination of resident animals as well as animals from several different source populations. Therefore, this discrete population cannot be shown to differ markedly from other mountain caribou populations in terms of genetic characteristics.

C. Conclusion

In conclusion, the Service finds that the South Selkirk caribou population meets both the discreteness and significance elements of the DPS policy. The population is discrete because of its marked separation from other populations of the same taxon as a consequence of physical factors. The geographic separation between the South Selkirk population and the next two closest populations (South Purcells and Nakusp), the physical movement barriers between these populations, and the limited exchange of animals between the South Selkirk and adjacent populations demonstrate that this population is markedly separated from other populations of the same taxon as a result of physical factors.

We find that the population is significant because of its importance in helping protect the viability of the mountain caribou metapopulation, which is in danger of extirpation throughout its current range. Over the last century, mountain caribou have been extirpated from 60% of their historic range in BC and the US. Just in the last decade, remaining mountain caribou numbers

have declined precipitously and what was once a fairly continuous distribution of mountain caribou has been fragmented into numerous smaller, more isolated local populations. Loss of the South Selkirk caribou population would represent an additional 8% reduction in the current range of mountain caribou (whose range has already declined by 60%) and would eliminate the southernmost population and the last remaining caribou population in the coterminous US. As suggested by Fraser (2000) and Hatter et al. (2004), when a species is at risk throughout its range, individual populations, even peripheral populations, assume a more important role in the conservation of the species. As stated previously, conserving a viable mountain caribou metapopulation will require not only the protection of the larger, more stable populations, but the protection and enhancement of the smaller, more peripheral populations as well (Hatter et al. 2004). Therefore, the Service finds that the South Selkirk caribou population meets the significance element of the Service's DPS policy, based on its importance to the conservation of mountain caribou.

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

__X__ *Yes*
____ *No*

New information (within the last 10-15 years) regarding the status and trend of mountain caribou overall provides an additional perspective on the relevance of the South Selkirk population to the mountain caribou metapopulation. As discussed above, the declining status of mountain caribou throughout their range, particularly since the mid-1990s, has led to increased concern regarding the viability of the metapopulation as a whole. Mountain caribou distribution has become more fragmented, and many local populations are small and isolated from each other. With numbers and distribution decreasing, each local population, including peripheral populations like the South Selkirk population, takes on increased importance in helping maintain mountain caribou viability. Furthermore, as the southernmost mountain caribou population, the South Selkirk population has added significance in maintaining the current distribution of mountain caribou. These facts further demonstrate the significance of the South Selkirk population to mountain caribou as a whole, as outlined in the DPS policy. Finally, the conservation of the South Selkirk population continues to be threatened by ongoing as well as new emerging threats.

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

__X__ *Yes*
____ *No*

2.2.2 Adequacy of recovery criteria.

The revised recovery plan, approved in 1994, has interim recovery criteria based on the limited information available and the collective judgment of managers and biologists involved in caribou recovery efforts at that time. The interim recovery goals are to manage to result in an increasing population and to secure and manage suitable and

potential caribou habitat within the Selkirk ecosystem. The recovery plan described the ultimate goal as "a self-sustaining caribou population that is well-distributed throughout the Selkirk ecosystem," however the Service acknowledged that, at that time, data were not available to establish specific, long-term recovery goals and objectives.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

____ *Yes*
_X__ *No*

As noted above, when the recovery plan was revised, the Service acknowledged that we had insufficient data to establish specific, long-term recovery criteria. Since 1994, a great deal of information has been collected regarding caribou and their habitat, the effects of threats such as habitat fragmentation, predation and human access, and various options and approaches for recovery efforts.

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery?

__X__ *Yes*
____ *No*

The 5 listing factors are indirectly addressed in the recovery plan, although they are not specifically outlined as such.

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

1. *Maintain the 2 existing caribou herds in the Selkirk Ecosystem.*

When the South Selkirk caribou population was listed in the early 1980s, the population consisted of 25-30 individuals whose distribution centered primarily around Stagleap Provincial Park in British Columbia (BC). Between 1987 and 1990, the population was augmented with 60 additional animals from source herds farther north in BC. These animals were placed into the Idaho portion of the Selkirk Ecosystem, essentially forming a second herd within the recovery area (Service 1994). However, over the last decade, the number of caribou in Idaho has dwindled, and the bulk of the population primarily occupies habitat in the BC portion of the recovery area (Wakkinen and Johnson 2006), although there is continued movement of animals back and forth across the US/BC border.

2. *Establish a herd in the western portion of the Selkirk Mountains in Washington.*

Between 1996 and 1998, the South Selkirk population was augmented with an additional 43 animals, some of which were placed in Washington and some of which were placed just north of the border in BC. Unfortunately, this augmentation effort coincided with a

high mountain lion population in the Selkirk ecosystem, and a number of the transplanted caribou are thought to have been lost to predation, although definitive data on many of these caribou mortalities is lacking (Almack 2000).

Although neither augmentation effort resulted in a long-term improvement in caribou distribution throughout the recovery area, it is generally agreed that these efforts succeeded in maintaining and enhancing the number of caribou in the population as a whole. The population is now estimated at approximately 46 animals (Wakkinen 2008). Most managers and biologists involved in caribou recovery efforts estimate that the population may have been extirpated without these augmentations.

3. *Maintain an increasing population as reflected by March aerial surveys.*

Caribou numbers in the South Selkirk population have fluctuated over the last two decades, but have shown modest increases (average 7%) over the last 5 years. Caribou numbers based on the most recent 2008 survey are the highest they have been in almost a decade (Wakkinen 2008). These increases have been largely attributed to efforts to more effectively manage the mountain lion population in the South Selkirk ecosystem.

4. *Secure and enhance at least 179,000 ha (443,000 acres) of suitable and potential caribou habitat in the Selkirks to support a self-sustaining population.*

Mountain caribou are closely tied to old growth coniferous forests of the Interior Wet-belt ecosystem of BC and the US. Their survival depends on their ability to spread out over large areas of suitable habitat where it is difficult for predators to find them. Suitable habitat is defined as old growth forests (generally 150 years old or older, although this may be variable depending on site-specific conditions) which support abundant arboreal lichens, the key winter food source of mountain caribou (Stevenson et al. 2001).

As indicated previously, the range of mountain caribou in BC and the US has declined by approximately 60%, primarily as a result of the loss, alteration, and fragmentation of old growth forests due to a combination of human and natural causes. Habitat loss and/or modification has the following effects on caribou: (1) it reduces the amount of space available for caribou, limiting the ecological carrying capacity; (2) it reduces the arboreal lichen supply, affecting the caribou's key winter food source; (3) it may affect caribou movement patterns; (4) it may affect the caribou's use of remaining fragmented habitat because suitable habitat parcels will be smaller and discontinuous; and (5) it can make caribou more susceptible to predation as available habitat is compressed and fragmented (Cichowski et al. 2004).

A primary long-term threat to mountain caribou is the ongoing loss and fragmentation of contiguous old growth forests due to timber harvesting, wildfires, and other human activities (MCTAC 2002, Cichowski et al. 2004, Wittmer et al. 2007, Apps and McLellan 2006). Mountain caribou habitat requirements for extensive stands of old growth timber place them in direct competition with most current forest management practices,

therefore, timber harvesting has been a concern in mountain caribou ranges for over 25 years (Stevenson et al. 2001). In 2002, MCTAC estimated a 38% reduction in caribou habitat suitability from historic levels. Habitat that has already been altered will require years to regenerate to suitable old growth conditions. Therefore, while the protection of such areas is imperative for long-term conservation, there will not be an immediate additional benefit for caribou (McLellan 2008).

Habitat management on lands managed by the U.S. Forest Service has improved since caribou were listed. Currently, most timber management on Federal lands within the caribou recovery area occurs in unsuitable or low quality caribou habitat with the objective of bringing the habitat into target condition more quickly (Layser 2007). However, caribou habitat on State and private lands within the US portion of the recovery area remains at risk of further degradation and fragmentation due to inadequate regulatory mechanisms to address timber management on these lands.

The BC portion of the South Selkirk recovery area is comprised of Crown lands (230,000 hectares (ha)), provincial parks (26,452 ha), and private land (55,200 ha). Timber harvest in provincial parks is prohibited. Caribou habitat on Crown lands in the BC portion of the South Selkirk recovery area is currently managed in accordance with the Kootenay-Boundary Higher Level Plan (KBHLP). There are approximately 91,000 ha of Crown lands within the South Selkirk recovery area protected as high suitability caribou habitat. Recently, the BC government proposed the protection of an additional 3,800 hectares of habitat within the timber-harvesting land base (DeGroot 2008a). Approximately 55,000 ha of the private land within the BC portion of the South Selkirk recovery area was recently purchased by the Nature Conservancy Canada (NCC), with the support of the Government of Canada, in what has been described as the largest single private conservation land acquisition in Canadian history (NCC 2008). This private land was previously owned by a timber company known as the Pluto Darkwoods Forestry Corporation, which managed a sustainable harvesting program. The NCC's goal for the Darkwoods property is sustainable ecosystem management, including the conservation of mountain caribou.

Winter recreation, primarily snowmobiling, within the recovery area is a growing threat to caribou. The numbers and distribution of recreational snowmobilers within the caribou recovery area has increased over the last 10-15 years, due in part to improved snowmobile technology and the increasing popularity of the sport. Efforts are being made to address this issue on Federal, Provincial and some private lands within the recovery area, although adequate standards are not yet in place in all areas. There are no standards addressing this issue on State and many private lands.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

The biology and life history of mountain caribou are generally well understood, although information on the reproductive rate and neonatal mortality rate of the South Selkirk population is lacking.

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

In the early 1980s, the South Selkirk caribou population was thought to number between 25 and 30 animals. Threats to the population at that time, in addition to the very low number of caribou in the population, included ongoing habitat destruction, road construction, poaching, and inadequate regulatory mechanisms. In the last 20 years, the population has been augmented twice, adding a total of 103 caribou to the population from source herds in BC. While these augmentation efforts did not result in a significant increase in caribou numbers and distribution as had been hoped, they are thought to have prevented the extirpation of the population. Currently, the population is thought to consist of approximately 46 animals and has demonstrated a gradually increasing trend (average 7%) over the last 5 years.

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

The South Selkirk caribou population has been augmented twice over the last two decades, using animals from four different source herds. These augmentations were conducted in accordance with tasks in approved recovery plans for the population. Although limited information is available on the genetic diversity of the pre-augmented population, post-augmentation analyses show that the population contains high levels of genetic diversity (Zittlau 2004). In fact, data indicate that after augmentation, the South Selkirk population was at least as diverse as other mountain caribou populations examined. Because the South Selkirk caribou population has been augmented in the past, the genetics of this population represents a combination of resident animals as well as animals from several different source populations.

2.3.1.4 Taxonomic classification or changes in nomenclature:

No change.

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

Historically, woodland caribou were widely distributed throughout most of the northern tier of the coterminous US from Washington to Maine, as well as throughout most of Canada. They occurred in New York, New Hampshire, Vermont, and Maine in the east; in Minnesota, Wisconsin, and Michigan in the Great Lakes region; and in Washington, Idaho, and Montana (and perhaps Wyoming) in the northwest (Cringan 1957; Evans 1960). Early records suggest that in the nineteenth century, caribou were plentiful and widely distributed in the mountains of northeastern Washington, northern Idaho, and northwestern Montana (Flinn 1956, Evans 1960, Layser 1974). In Idaho, they occurred as far south as Salmon, Idaho (Service 1994).

However, largely due to over-hunting and habitat destruction, as well as disease (meningeal worm) in the eastern populations, in the late 1800s and early to mid-1900's, caribou distribution and numbers declined significantly. Caribou were extirpated from New England by about 1916 and disappeared from the Great Lakes region by about 1940, although a few individuals have been observed in northeast Minnesota as recently as the early 1980s (Service 1984). Although there are still occasional sightings of caribou in northwest Montana, the only caribou population still known to regularly occupy the coterminous US is the South Selkirk Mountains caribou population.

The entire global population of mountain caribou occurs within BC and the northwest US (Idaho and Washington) (Hatter et al. 2004; Apps and McClellan 2006) where they have been extirpated from approximately 60% of their historic range (Figure 1) (MCTAC 2002). The decline in mountain caribou distribution and numbers continues today, with fragmentation occurring within the core of the population as well as at the periphery (Wittmer 2004). In the mid-1990s, there were 13 subpopulations of mountan caribou identified in this area, 7 of which were in decline. In 2004, after a more comprehensive analysis of caribou movements, it was determined that there were actually 18 discrete, somewhat isolated subpopulations identified in this area, 13 of which were declining and 10 of which consisted of fewer than 50 animals. Two of these 18 subpopulations are thought to have been extirpated in the last 5 years. Overall numbers decreased from approximately 2,300 animals in the mid-1990s to approximately 1,900 animals in 2008 (Seip 2008a). In BC, mountain caribou are "red"listed (indicating threatened or endangered status) provincially by the BC Conservation Data Center and are designated as threatened nationally under SARA (Hatter et al. 2004).

2.3.1.6 Habitat or ecosystem conditions (e.g. amount, distribution, and suitability of the habitat or ecosystem):

Caribou habitat is generally represented by a combination of two vegetation zones: the cedar/hemlock zone at lower elevations, the subalpine fir/Engelmann spruce zone at higher elevations, and the transition zone between these two vegetation zones. Depending on the time of year, caribou also use the treeless alpine tundra for foraging, loafing, vigilance, etc. (Kinley 2008). Seasonal habitats consist of early winter, late winter, spring, calving, and summer habitats.

Early winter habitat generally consists of mature to old growth cedar/hemlock forests, the lower limits of the subalpine fir/Engelmann spruce forests, and the ecotone between these two forest types. Suitable habitats are multi-storied and have an overstory canopy cover greater than 70 percent. Early winter is a period of rapid snow accumulation and generally extends from November through January. During this timeframe, caribou seek out these more closed timber stands where they feed on a combination of arboreal lichens and shrubs until the snow pack consolidates and the caribou can move to higher elevations (USFS 2004). However, these elevational shifts can be quite variable within and between years, depending on snow levels (Kinley et al. 2007).

Late winter habitat consists of subalpine fir and Engelmann spruce forests at the upper portion of the ridge systems. Suitable habitat consists of mature to old stands of subalpine fir and Engelmann spruce that are relatively open canopied (10 to 50 percent overstory canopy) and have high levels of arboreal lichen. Arboreal lichens comprise a critical winter food source for caribou and are generally most abundant on trees that are more than 100 years old. The late winter period typically extends from the end of early winter in January until April or May, although as noted above, caribou winter movements depend to a large extent on snow levels and lichen availability. During this period, caribou feed almost exclusively on arboreal lichen which are sensitive to prolonged wetting. Therefore, the lower limit of lichen in the canopy (and consequently its availability for caribou) is related to snow levels. For instance, following several years of lower than normal snowpack, lichen may occur lower in the canopy, while after a heavy snowpack year, lichen availability will be higher in the canopy (Rominger and Oldemeyer 1990; Kinley et al. 2007).

The difference between capable habitat and suitable habitat is an important concept in a discussion of existing conditions for wildlife. The following definitions distinguish between these two terms:

- Capable habitat refers to the inherent potential of a site to produce the essential habitat requirements of a species. Vegetation on the site may not be currently suitable for a given species because of variable stand attributes such as inappropriate seral stage, cover type, or stand density. Capable habitat is based on fixed attributes

such as slope, elevation, and soil type. Capable (but currently not suitable) habitat for caribou is utilized for travel between suitable feeding sites, movement within the ecosystem, and as lower quality feeding sites.

- Suitable habitat currently has both the fixed and variable stand attributes for a given species' habitat requirements. Variable attributes change over time and may include seral stage, cover type, and overstory canopy cover (USFS 2004).

Within the South Selkirk caribou recovery area, there are over 576,000 acres of capable early winter habitat, approximately 127,700 acres (22%) of which is currently suitable early winter habitat. There are over 435,400 acres of capable late winter habitat, approximately 192,000 acres (44%) of which are currently suitable late winter habitat (USFS 2004). Habitat suitability in the recovery area has been affected by the combined effects of logging and wildfires.

The overall quantity of habitat within the recovery area is not currently considered to be limiting to caribou in terms of food because of the low number of caribou presently occupying the area. However, the patchy distribution of the habitat on the landscape likely presents other issues, such as compromising the caribou's ability to avoid predators because of the fragmented habitat. This issue will be discussed in more detail in Section 2.3.2.3 below. There are also concerns that increasing levels of winter recreation (e.g. snowmobiles, skiing) within caribou winter habitat may facilitate predator access to caribou habitat that was not easily accessible in the past. Increasing human access to caribou habitat also creates the potential for disturbance and displacement of caribou and/or can preclude caribou access to or use of suitable habitat. Additionally, a large stand replacing wildfire could change the distribution and abundance of available forage in the future.

2.3.1.7 Other: Not applicable.

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

Mountain caribou are closely tied to old growth coniferous forests of the Interior Wet-belt ecosystem of BC and the US. Their survival depends on their ability to spread out over large areas of suitable habitat where it is difficult for predators to find them. Such habitat is generally characterized as old growth forests supporting abundant arboreal lichens, the key winter

food source of mountain caribou (Stevenson et al. 2001). Other features contributing to habitat suitability, particularly in terms of predator avoidance, include open ground cover that provides optimal line-of-sight and does not impede movement.

As indicated previously, the range of mountain caribou in BC and the US has declined by approximately 60%, primarily as a result of the loss, alteration, and fragmentation of old growth forests due to a combination of human and natural causes (MCTAC 2002). Habitat loss has the following effects on caribou: (1) it reduces the amount of space available for caribou, limiting the ecological carrying capacity; (2) it reduces the arboreal lichen supply, affecting the caribou's key winter food source; (3) it may affect caribou movement patterns; (4) it may affect the caribou's use of remaining fragmented habitat because suitable habitat parcels will be smaller and discontinuous; and (5) it can make caribou more susceptible to predation as available habitat is compressed and fragmented (Cichowski et al. 2004).

A primary long-term threat to mountain caribou is the past and ongoing loss and fragmentation of contiguous old growth forests due to timber harvesting and wildfires (MCTAC 2002, Cichowski et al. 2004, Wittmer et al. 2007, Apps and McLellan 2006) and the associated effects of an altered predator-prey dynamic (discussed below). The regeneration of these altered forests into mature and old growth habitat suitable for caribou will take years, precluding a "quick fix" to address this major threat. Additionally, mountain caribou habitat requirements for extensive stands of old growth timber place them in direct competition with most current forest management practices, therefore, timber harvesting has been a concern in mountain caribou ranges for over 25 years (Stevenson et al. 2001). In 2002, MCTAC estimated a 38% reduction in caribou habitat suitability from historic levels. There has been some research on various silvicultural practices (e.g. partial cutting) and habitat enhancement techniques aimed at protecting caribou habitat while allowing some level of timber harvest at the same time (Stevenson et al. 2001). However, this approach has been abandoned in many areas, replaced with a harvest-no harvest approach due at least in part to concerns about the effects that partial cutting may have in contributing to an altered predator/prey dynamic, resulting in increased predation pressure on caribou (Kinley 2008).

Wildfires are a natural phenomenon that represent another threat to caribou habitat. Past wildfires have affected large amounts of South Selkirk caribou habitat. For instance, the 1967 Sundance, Kaniksu Mountain, and Trapper Peak fires in the Selkirk Mountains destroyed almost 80,000 acres of caribou habitat (Layser 1974). There have numerous additional wildfires over the years, and in 2006, the Kutetl fire

in West Arm Park (BC) destroyed over 20,200 acres of caribou habitat in the northern portion of the recovery area (DeGroot 2008b). Historically, caribou were able to tolerate this natural adverse impact by itself because there were other unfragmented stands of old growth forest available for displaced caribou. However, the cumulative effects of logging, road building, and wildfires have eliminated a significant amount of historic caribou habitat. The threat of wildfires within caribou habitat is ongoing. Additionally, the threat of habitat loss from wildfires is becoming more predominant as fire suppression efforts focus more on the protection of communities and infrastructure (Layser 2007).

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

Historically, over-hunting contributed to the decline of some caribou populations. However, there is no legal hunting season on mountain caribou in BC or the US, although poaching and "mistaken identity" shootings likely still occur to some extent. Based on current information, this factor is not expected to significantly affect caribou populations.

2.3.2.3 Disease or predation:

Neither disease nor parasites appear to occur with enough frequency to pose a significant population-level threat to mountain caribou. Probably the greatest health risk would be the meningeal worm (*Parelaphostrongylus tenuis*), which is a white-tailed deer parasite in eastern North America. This worm can migrate to the central nervous system of cervids such as caribou causing severe, usually fatal, neurological disease. Fortunately, this parasite has not been found in western North America to date (Cichowski et al. 2004).

Predation is also a major threat to caribou and has become the proximal cause of decline of many mountain caribou populations (Paquet 1997, Simpson et al. 1997, COSEWIC 2002, MCTAC 2002, Cichowski et al. 2004; Wittmer et al. 2005; Wittmer et al. 2007). As suggested above, the ultimate cause of increased predation pressure is thought to be related to the high degree of habitat modification and fragmentation within the ecosystem, which has led to an altered predator/prey dynamic (COSEWIC 2002, MCTAC 2002, Cichowski et al. 2004). Habitat modification and fragmentation has the following effects which could result in increased predation on caribou:

- The increase in early-seral stands throughout the ecosystem resulting from habitat modifications provides enhanced production of understory shrubs and forbs, attracting other ungulates (deer, elk, moose) to shift their distribution into landscapes previously occupied

primarily by caribou. Caribou usually occur at much lower densities than other ungulates, they have larger home ranges, and their habitat use does not normally overlap habitats used by moose, deer, and elk. Therefore, this shift in ungulate distribution and numbers can, in turn, lead to an expansion in the distribution and numbers of predators such as cougars and wolves into caribou habitat, where they opportunistically prey on caribou along with the other ungulates.

- Restricting caribou to remaining old growth habitat patches may increase the search efficiency of predators. As stated above, one of the survival strategies of mountain caribou is to maintain a sparse distribution across large expanses of contiguous old growth forest, making it more difficult for predators to find them. As these habitats become more fragmented into smaller, disconnected patches, caribou are forced to concentrate more heavily in these remaining habitat patches or forage in higher risk habitats, thereby facilitating potential predation.

- Increased road densities resulting from timber harvesting activities facilitate the movement of predators such as wolves and cougars into caribou range. Similarly, snowmobile trails may also facilitate predator access to caribou habitat.

In the South Selkirk population, 63 caribou mortalities were reported between 1987 and 2001. Of these 63 mortalities, 14 were documented as predator kills, and many of an additional 28 mortalities of unknown cause were attributed to possible predation (Wakkinen et al. 1992, Almack 2002). Many of these predation events were attributed to mountain lions. However, wolves have recently become established within the recovery area. The numbers and distribution of wolves within the recovery area are not currently well known, nor is the extent of potential impact on the caribou population, but it will likely result in an expansion of the predation threat. Wittmer et al. (2005) evaluated the role of predation in the decline of mountain caribou and found that the primary cause of mortalities in 11 of 13 caribou subpopulations was predation. He suggested that the loss of mature forests within the mountain caribou range may compromise their predator avoidance strategy.

Seip (1992) looked at the seasonal interrelationship of caribou, moose, and wolves in two areas of southeastern BC with respect to limiting factors for caribou. The two caribou populations studied were the Quesnel Lake population in the Quesnel Highlands and the Wells Gray population in Wells Gray Provincial Park, located in the Cariboo Mountains and the Shuswap Highland. Seip found that during the winter, both caribou populations occupied similar mid-to high elevation subalpine forests and parkland habitats in their respective ranges. During the summer, the

Quesnel caribou population generally used the same mid-to high elevation habitats as occupied during the winter. However, most caribou in the Wells Gray population migrated from the winter highland habitats in the western and southern portions of the park to summer ranges in the more rugged mountains in the northern and central portions of the park. Therefore, the Wells Gray population used higher elevations and more alpine habitats during the summer than the Quesnel Lake caribou population.

Seip found that both moose and wolves used lower elevation valley bottoms during the winter, keeping them spatially separated from both caribou populations during this season. However, during the summer, moose and wolves in the Quesnel Lake area moved from the valley bottoms into mid-to high elevation habitats where they tended to overlap areas also used by the Quesnel Lake caribou population. In Wells Gray Park, moose migrated during the summer to low and mid-elevation forest-wetland complexes but did not use the rugged mountainous areas occupied by the Wells Gray caribou population. Similarly, wolves tended to avoid the more mountainous terrain in Wells Gray Park.

Seip's investigation revealed that the Quesnel Lake caribou population had higher adult and calf mortalities during the summer, with wolf predation being the major cause, compared to the Wells Gray caribou population. As a result, during the 5-year study, the Wells Gray caribou population exhibited a slow increase, while the Quesnel Lake population demonstrated a decline over the same period. This led Seip to conclude that the increased overlap of moose and caribou in the same habitats has resulted in a subsequent overlap of wolves and caribou, resulting in increased predation of caribou by wolves.

Wittmer et al. (2007) examined the change in landscape composition as a factor in the decline of mountain caribou populations. They looked at the importance of several variables on adult female caribou survival at two different spatial scales: the population scale and the home range scale. They focused on adult female survival because this parameter is closely tied to rates of decline among caribou populations. Wittmer et al. found that at both spatial scales, forest age class distribution was the best predictor of adult female survival. At the population scale, adult female survival was lowest where early seral forests were more common. At the home range scale, caribou were more likely to succumb to predation where there was a relatively low proportion of old growth forest within their home range. Wittmer et al. noted that "mountain caribou are part of a complex multipredator, multiprey system where the distribution and abundance of alternative ungulate prey populations have increased in response to habitat modifications and likely climate change."

These findings are tied to the concept of "apparent competition" in which two or more prey populations share a common predator or group of predators which asymmetrically impact the prey populations (Holt 1984 *in* Wittmer et al. 2007). An increasing primary prey population (e.g. moose, deer, or elk) may lead to an increase in an associated predator population (e.g. wolves, mountain lions). If the primary prey and predator populations overlap habitat occupied by a secondary prey population (e.g. caribou), this could lead to incidental predation on the secondary prey, resulting in the decline of this population. Thus, the indirect interaction between prey populations is often referred to as apparent competition. In these situations, the asymmetrical impact on the secondary prey population can lead to its decline and/or eventual extirpation (Wittmer et al. 2007).

Similarly, Wittmer et al. (2005) found that the decline of mountain caribou populations is due to apparent competition related to habitat alterations. They indicated that the increase in early seral forests within areas occupied by caribou support higher densities of alternate prey species (such as moose) which in turn support higher predator densities, leading to increased predation on caribou. The loss of mature forests may compromise the caribou's predator avoidance strategy by limiting their ability to isolate themselves from habitat occupied by alternate prey species and their predators. Wittmer et al. (2005 and 2007) note that recovery of mountain caribou will require a multispecies perspective including ongoing predator management, reduction in primary prey populations, and restoration of mature and old growth forest habitats that are less favorable to primary prey species.

2.3.2.4 Inadequacy of existing regulatory mechanisms:

Much of the caribou habitat within the US is managed by the U.S. Forest Service (289,000 acres), although a significant amount of State and private lands (approximately 79,000 acres) occurs within caribou range as well (Service 1994). The U.S. Forest Service uses caribou habitat management guidelines to design timber sales in caribou habitat. These guidelines are intended to minimize the effects of logging on caribou and also to develop silvicultural prescriptions which may enhance habitat over the long term. Because old growth habitat represents optimal habitat for caribou and old growth management standards require retention of old growth, actual management within old growth habitats has been rare if not absent in the last 10 to15 years on Forest Service lands. Recent Forest Service management activities within caribou habitat have been designed to avoid high quality habitat and focus within habitats which are currently unsuitable, with a goal of habitat enhancement (Layser 2007). However, such efforts must be carefully designed to avoid creating habitat conditions that encourage increased use by other ungulates, such as

moose, elk, and white-tailed deer, which, in turn, can attract higher numbers of predators within caribou habitat.

Idaho Department of Lands (IDL) has significant acreage (approximately 51,000 acres) within mountain caribou range. These lands are managed primarily for timber harvest, which, as discussed above, has in the past and currently has the potential to significantly impact caribou and their habitat. The IDL recently contracted for a habitat assessment of their lands within the South Selkirk ecosystem (Kinley and Apps 2007). The results of this assessment indicated that one of the largest blocks of high priority caribou habitat in the South Selkirk ecosystem is centered on IDL property and adjacent Forest Service lands. The report stated that IDL property contributes significantly to caribou habitat within the South Selkirk ecosystem. The IDL, with financial assistance from the Service, began working on a Habitat Conservation Plan (HCP) several years ago to protect caribou and other listed species on their lands. However, development of this HCP is still in the preliminary information gathering stage and therefore has not produced protective measures for caribou and their habitat at this point.

Currently, there are no regulatory mechanisms addressing caribou habitat management/protection on private lands within the US.

As mentioned previously, approximately 91,000 ha of high suitability caribou habitat on Crown lands in BC is currently managed in accordance with the KBHLP. Additionally, the BC government recently proposed the protection of another 3,800 ha of caribou habitat within the timber-harvesting land base. Under the KBHLP, 65% of the caribou habitat is designated as "no harvest"; 30% is designated as no harvest of spruce/subalpine fir; and 5% is designated as connectivity habitat with some harvest of spruce/subalpine fir allowed. In the near future, all caribou habitat in the BC portion of the South Selkirk recovery area will be protected from forest harvesting as ungulate winter range under Government Action Regulations, part of BC's Forest and Range Practices Act (DeGroot 2008b). Also, as noted earlier, much of the private land within the BC portion of the South Selkirk recovery area (55,000 ha) was recently purchased by the NCC whose management goals include caribou conservation. Therefore, caribou habitat in BC is fairly well protected.

Relative to human access within caribou habitat, motorized winter recreation, specifically snowmobiling, represents a growing threat to caribou within the South Selkirk caribou recovery area. The U.S. Forest Service's Land and Resource Management Plans (Plans) currently include generic standards calling for motorized use restrictions when needed to protect caribou, although more specific standards addressing how, when, and where to impose such restrictions are limited (see the discussion under

"Other natural or manmade factors affecting its continued existence" below) (U.S. Forest Service 1987). Current restrictions on snowmobiling include an area closure implemented along a portion of the Selkirk crest in the mid-1990s and a Court-ordered injunction on snowmobiling in portions of the recovery area within the Idaho Panhandle National Forests (IPNF). This Court injunction remains in place until the IPNF completes a winter travel plan (Plan) for that portion of the South Selkirk recovery area within its boundaries. However, this Plan is still under development, and it is unclear what standards or limitations may be included to address the snowmobile issue. The estimated date for completion of the Plan is uncertain at this time. Within the BC portion of the South Selkirk recovery area, there is an agreement in place for snowmobile management (Kinley 2008).

2.3.2.5 Other natural or manmade factors affecting its continued existence:

A growing threat to mountain caribou is increasing human access into their habitat and the associated disturbance (Paquet 1997, Simpson and Terry 2000, Stevenson et al. 2001, COSEWIC 2002, MCTAC 2002, Cichowski et al. 2004, Seip et al. 2007). Increasing road densities in caribou habitat could facilitate poaching opportunities, movement of predators within caribou range, and road kills. For instance, a number of caribou in the South Selkirk population have been killed in collisions with motor vehicles along Trans-Canada Highway 3 at Kootenay Pass about 5 miles north of the international border. Caribou in Alberta avoided habitats near linear features and human activity such as roads, seismic lines, and drilling sites (MCTAC 2002, Cichowski et al. 2004).

There is growing evidence that increasing levels of winter recreation activities (e.g. snowmobiling, heli-skiing, snow-cat skiing, etc.) within caribou winter range represent a significant threat to mountain caribou. Research indicates that winter recreation can increase the stress levels of caribou, displace them from suitable winter habitat, or preclude them from using such habitat (Simpson and Terry 2000, COSEWIC 2002, MCTAC 2002, Cichowski et al. 2004, Powell 2004, Seip et al. 2007). In the early 1990s, there were several instances of caribou displacement by snowmobiles in the Idaho portion of the South Selkirk caribou recovery area. In response to these events, the Idaho Panhandle National Forests implemented a snowmobile closure along the Selkirk Crest in Idaho.

Simpson and Terry (2000) evaluated several different forms of winter recreation relative to their effects on mountain caribou and found that snowmobiling represents the greatest perceived threat. Although caribou appear able to tolerate some level of motorized winter recreation within their range, the rising interest in recreational snowmobiling, combined

with better access via roads to high elevation caribou habitats and improved snowmobile technology that has produced more powerful machines that can travel through mountain caribou habitat, indicate a significant threat to some mountain caribou populations (MCTAC 2002). The deep snow, open forests, and scenic vistas make caribou late winter habitat very attractive to recreational snowmobilers. However, this habitat is also critically important to mountain caribou. Their disturbance or displacement from such habitats, especially given the current fragmented nature of mountain caribou habitat, can have severe effects on these animals.

Kinley (2003) took a two-pronged approach to looking at snowmobile-mountain caribou interactions. First, he summarized the observations and perceptions of a sample group of snowmobilers, wildlife managers and others having experience with the subject. Second, he examined late-winter caribou census data in relation to mapped snowmobile use areas in an effort to detect differences in distributional patterns. The perceptions of the sample user/manager group varied widely, likely due to differences in individuals' background, experiences, and beliefs. However, Kinley noted several key points:

- Reduced caribou activity has occurred in portions of caribou range when snowmobile use has begun or increased, although snowmobile use did not represent the sole change in land use during these periods.

- The sample group of respondents reported a combination of caribou moving out of areas being used by snowmobiles or remaining in areas of heavy snowmobile use.

- Situations in which caribou moved out of an area in response to direct encounters with snowmobiles generally occurred when the encounter was unexpected. Minor caribou responses were reported in several areas with predictable snowmobile use, suggesting some level of habituation to the activity. However, there are numerous variables which could influence such responses, making any definitive conclusions impossible.

- Predators do use snowmobile tracks to facilitate movement, particularly at lower elevations.

Kinley also looked at caribou telemetry records which indicated that caribou generally move away from snowmobile use areas, particularly where such use included extensive portions of the caribou's range.

Powell (2004) studied the effects of recreational snowmobile use on caribou in the southern Yukon and found that: (1) caribou moved away from this disturbance; (2) maternal groups responded more than did male groups, being twice as likely to flee from an approaching snowmobile and spending more time moving and being vigilant after the disturbance; (3) caribou did not display habituation or sensitization to the disturbance; and (4) wolves frequently used snowmobile trails, possibly leading to increased predation on caribou.

Seip et al. (2007) evaluated caribou and snowmobile use on 6 mountain ranges of similar habitat quality in BC over a 3 year period. They found caribou use on all 5 mountain ranges with little or no snowmobile activity and no caribou use of the sixth mountain range that had intensive snowmobile activity. Based on their evaluation, they concluded that intensive snowmobile activity had displaced caribou from suitable habitat and recommended that snowmobiling be restricted from all or most high quality caribou habitat.

Freeman (2008) investigated the stress response of mountain caribou to motorized backcountry recreation, using fecal glucocorticoids (GC) to measure the level of physiological effects. Research has shown that chronically elevated GC levels are related to a variety of physiological effects such as hypertension, poor body condition, skeletal degradation, and reduced reproductive fitness. Freeman compared the fecal GC levels of caribou exposed to snowmobile and heli-ski activity to the levels of caribou more isolated from such activities. Her findings revealed that caribou as much as 10 kilometers from snowmobile activity showed elevated fecal GCs compared to those further removed from such activity, indicating a clear physiological response of caribou to snowmobile activity within their range. However, she noted that additional research is needed to determine if GC levels can be used as an index of human impact on population health.

Another potential threat to mountain caribou is climate change. Certainly, climate change has the potential to affect the quantity, quality, and distribution of caribou habitat, both at a broad regional scale as well as at the local stand level. Some forest types are likely to expand, while others may retreat or shift. Variations in fire frequency associated with climate change can affect caribou and their habitat. Droughts, such as those occurring in the late 1800s and early to mid-1900s, can also affect caribou and their habitat (McLellan 2008). Because the annual cycle of mountain caribou is so closely tied to changing snow depths, changes in snow levels may have significant effects on caribou. As noted previously, changing snow depths can have significant effects on the availability of arboreal lichen for caribou during the winter. However, because of the uncertainty associated with climate change modeling, it is impossible to reliably

predict the potential impacts of climate change on mountain caribou at this time (Utzig 2005).

Finally, the contracting range of the South Selkirk population, the small number of animals in the population, and the limited genetic exchange between the South Selkirk population and adjacent populations threaten population viability.

Synthesis

The South Selkirk Mountains caribou population meets the discreteness and significance elements of the Service DPS policy because of its marked separation from other mountain caribou populations and its importance in helping to maintain mountain caribou viability, given the declining numbers and distribution of mountain caribou throughout their range. The primary issues that threaten the existence of the South Selkirk Mountains caribou population are the past and ongoing habitat destruction/fragmentation, predation, human access, inadequate regulatory mechanisms, the low population number, and potentially climate change. Although habitat is not currently limiting in terms of forage, the fragmented nature of the habitat has altered the predator/prey dynamic and affected the caribou's naturally evolved predator avoidance strategy. Predation, primarily by mountain lions, is considered to be the proximal threat to the caribou population. As larger, more continuous stands of mature and old growth forest within the caribou recovery area have been changed to earlier successional stages, numbers of alternate prey animals, such as moose, white-tailed deer, and elk, have increased within the higher elevation habitats previously occupied primarily by caribou. Consequently, mountain lions have followed their primary prey into caribou habitat, providing for opportunistic predation on caribou as a secondary source of prey, i.e. apparent competition. Additionally, wolves are now establishing themselves within the recovery area, adding another predation threat. The continuous threat of wildfires increases the potential for further habitat degradation. Winter recreation, particularly snowmobiling, is a growing issue within the recovery area and throughout mountain caribou range. Increasing levels of snowmobile activity and the expansion of such activity further into the backcountry have displaced caribou from key winter habitats and could preclude them from using such habitats. Currently, there are inadequate regulatory mechanisms in place to address timber management or winter recreation on some Federal, State, and private lands within the recovery area. The small size and isolation of the population itself could affect the viability of the population. Finally, climate change will likely affect mountain caribou, although specific impacts are impossible to predict at this point.

3.0 RESULTS

3.1 Recommended Classification:

____ **Downlist to Threatened**
____ **Uplist to Endangered**
____ **Delist**
____ *Extinction*

____ *Recovery*
____ *Original data for classification in error*
__X__ **No change is needed**

3.2 **New Recovery Priority Number:** Not applicable.

Brief Rationale:

3.3 **Listing and Reclassification Priority Number:** Not applicable.

Reclassification (from Threatened to Endangered) Priority Number: ____
Reclassification (from Endangered to Threatened) Priority Number: ____
Delisting (regardless of current classification) Priority Number: ____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

4.1 Work with State and private landowners to incorporate caribou habitat management guidelines into their timber management operations. The U.S. Forest Service currently incorporates caribou habitat management guidelines into the design and implementation of timber management activities within the caribou recovery area to maintain or enhance caribou habitat quality. However, similar standards or guidelines are not in place for State or private forestry activities within caribou habitat. Habitat management guidelines which avoid creating early successional habitat within or adjacent to caribou habitat would help ensure connectivity and minimize habitat for other ungulates such as moose, elk, and white-tailed deer.

4.2 Work with Federal, State and private landowners, Tribes, the BC government and the public to address the impacts of winter recreation activities within the caribou recovery area and to develop guidance that clearly reflects where such activities are and are not appropriate. The IPNF is currently developing a winter travel plan. Idaho Department of Lands is working on an HCP, which should include conditions to avoid and/or minimize the effects of winter recreation activities on State lands. Development of an effective management strategy requires the involvement of all stakeholders.

4.3 Manage predator and alternate prey populations within and adjacent to the recovery area. Work with the game management agencies of BC, Idaho, and Washington to maintain predator and prey populations within and adjacent to the caribou recovery area at relatively low levels to help minimize the predator pressure on caribou.

4.4 Continue augmentation efforts to increase the population. Work with BC, the Tribes, and the States to facilitate planning and implementation of periodic augmentation efforts to help boost caribou numbers and improve genetic variability.

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Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of SELKIRK MOUNTAINS
WOODLAND CARIBOU (*Rangifer tarandus caribou)*

Current Classification: Endangered

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_X__ No change needed

Appropriate Listing/Reclassification Priority Number, if applicable:__3c___

Review Conducted By: Upper Columbia Fish and Wildlife Office

Approve Richard V. Torgerson Date 12/5/08
Acting Project Leader, Upper Columbia Fish and Wildlife Office