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To the reader:

On October 16, 2007, government announced the Mountain Caribou Recovery Implementation Plan (MCRIP) with a goal to restore the mountain caribou population to the pre-1995 level of 2,500 animals within 20 years. This Plan was informed by science-based information from the Mountain Caribou Science Team (MCST). It has been approximately two years since government's announcement of the MCRIP. Although government has achieved several milestones, some uncertainties have emerged about the effective and efficient delivery of the MCRIP to meet government's recovery objectives and timelines. To address these uncertainties and to update the technical perspective on a variety of implementation matters, the Ministry of Environment facilitated a workshop in fall 2009 with the MCST. The outcomes of that workshop were captured in a report entitled "*A Review of Management Actions to Recover Mountain Caribou in British Columbia*".

This report presents a number of recommendations to address the challenges presented by the MCRIP across the range of mountain caribou in BC. This report has been reviewed by the MCST and by the MCRIP Director's Team. The Ministry of Environment and government will need to consider recommendations in the report and decide where and when they are appropriate for use. The recommendations will need to be balanced with other recovery objectives and incorporated into caribou recovery activities.

This report is a significant accomplishment and will guide government in moving forward with mountain caribou recovery. For more information on mountain caribou recovery in British Columbia, please visit the recovery website at:
http://www.env.gov.bc.ca/sarco/mc/index.html

If you have any questions on the attached Science Team report or Mountain Caribou recovery, please feel free to contact me (250-614-9910).

Sincerely,

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A REVIEW OF MANAGEMENT ACTIONS TO RECOVER MOUNTAIN CARIBOU IN BRITISH COLUMBIA

Prepared by
BC Ministry of Environment
Species at Risk Coordination
November 23, 2009

EXECUTIVE SUMMARY

The population of Mountain Caribou is declining in British Columbia. It has been suggested that this decline is proximally due to high mortality linked to predation in the short-term and ultimately due to fragmentation, alteration, and loss of suitable habitat over the long-term. In October 2007, the B.C. government announced the Mountain Caribou Recovery Implementation Plan (MCRIP). This plan committed government to several management actions with the goal to halt the decline of Mountain Caribou populations within seven years and to recover the population to pre-1995 levels (2500 animals) within 20 years.

The Ministry of Environment, the lead agency responsible for implementing the MCRIP, has identified some uncertainties about meeting government's objectives and timelines associated with this initiative. To gain a technical perspective on a variety of implementation issues and challenges, the Ministry reconvened the Mountain Caribou Science Team for a two-day workshop, to determine how government should move forward with this recovery effort.

Science Team members who participated in the workshop were given the opportunity to assess government's progress to date on the MCRIP. Through questions, group discussions, and prioritizing exercises, the Science Team provided the following recommendations on how government objectives and timelines associated with the MCRIP may be achieved:

Immediate aerial removal of Wolves that threaten herds with fewer than 50 animals.

1. Immediate augmentation of the South Purcell herd and all herds with fewer than 20 animals.
2. Immediate but gradual reduction of Moose densities throughout the Mountain Caribou range through adjustments to hunting regulations that allow for increases in cow Moose harvest and hunting seasons.

For government to determine the success of these management actions, the Science Team recommended continued or increased delivery of the following actions:

- Minimize forestry-related activities in core habitat;
- Enforce recreation restrictions; and
- Conduct a complete census of Mountain Caribou herds every three years (approximately one-third of the range each year).

ACKNOWLEDGEMENTS

The Ministry of Environment would like to thank government staff members Alec Dale, Gerry Kuzyk, Garth Mowat, Chris Pasztor, Darcy Peel, Chris Ritchie, and Angeline Tillmanns, and Science Team members, Harold Armleder, Ian Hatter, Trevor Kinley, Bruce McLellan, Dale Seip, John Surgenor, Greg Utzig, Steve Wilson, and Guy Woods for their knowledge and workshop participation. The Ministry of Environment would also like to thank Science Team member Wayne Wakkenin and other participants who provided useful comments and edits on earlier drafts of this report.

INTRODUCTION

The population of Mountain Caribou is declining in British Columbia (B.C.). It has been suggested that this decline is proximally due to high mortality linked to predation and ultimately due to fragmentation, alteration, and loss of suitable habitat over the long-term. In response, the government of B.C. convened a Science Team (ST) in 2005 to provide government with technical advice and information on how to recover Mountain Caribou (see Appendix 1 for ST membership). Advice and information provided by the ST (Mountain Caribou Science Team 2006), along with input provided during consultations with more than 80 stakeholder groups, led to the BC government announcement of the Mountain Caribou Recovery Implementation Plan (MCRIP) (Figure 1) in October 2007. The MCRIP committed government to several management actions with the goal to halt the decline of Mountain Caribou within seven years and recover the population to pre-1995 levels (2500 animals) within 20 years.

The MCRIP commits government to the following management actions:

1. Protect 2.2 million hectares of Mountain Caribou range from logging and road building, capturing 95% of the Caribou's high suitability winter habitat.
2. Manage human recreational activities in Mountain Caribou habitat to minimize the disturbance and displacement of Caribou from their preferred habitat.
3. Manage predator populations of Wolves and Cougar where they are preventing the recovery of Mountain Caribou populations.
4. Manage the primary prey of predators of Mountain Caribou.
5. Increase Caribou numbers in threatened herds with animals transplanted from elsewhere to ensure that herds achieve critical mass for self-sufficiency.
6. Support adaptive management and research, and implement effective monitoring plans for habitat, recreation, and predator–prey management.
7. Institute a cross-sector progress board in spring 2008 to monitor the effectiveness of recovery actions.

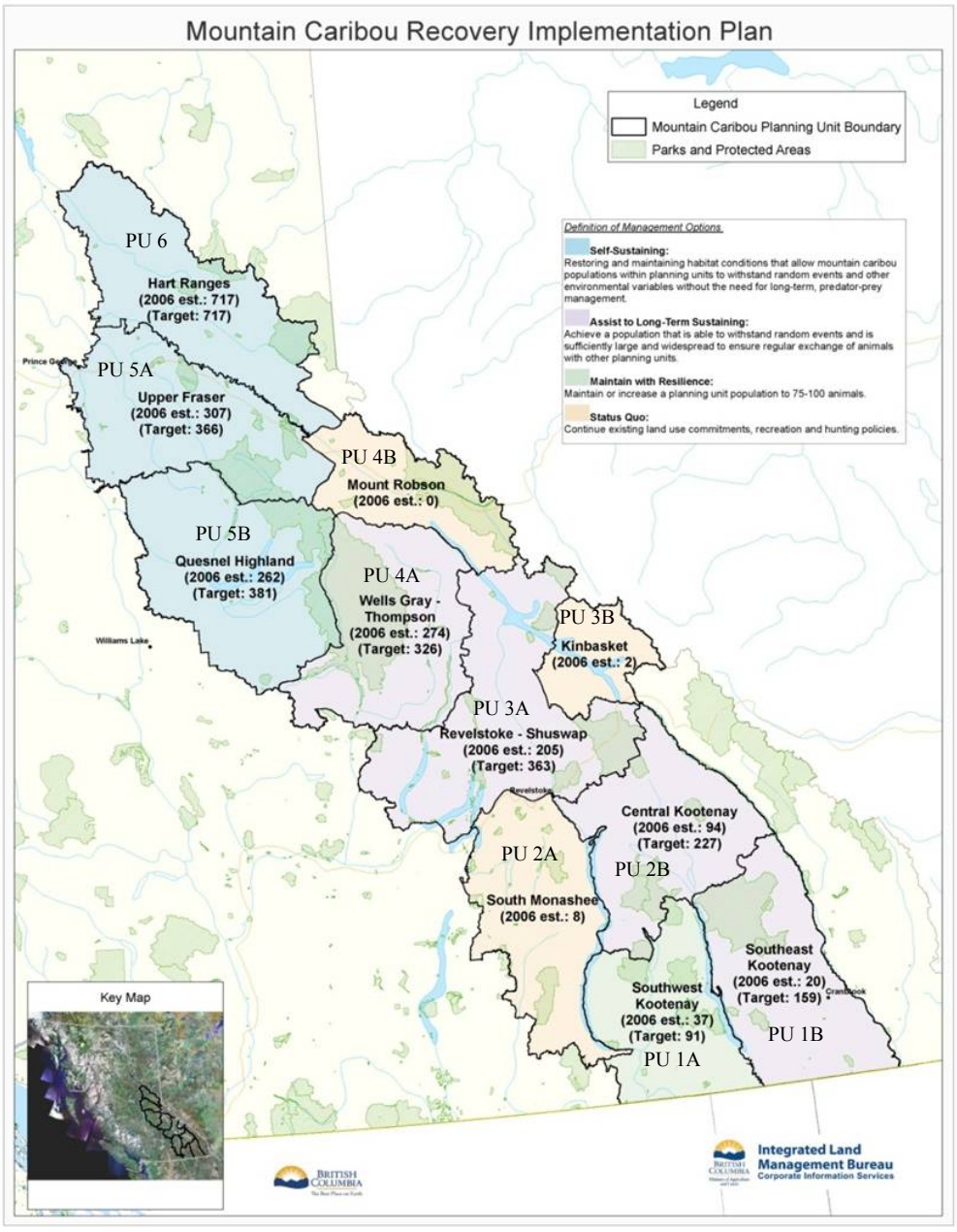
The Ministry of Environment is the lead agency for overseeing implementation of management action. However, it is a collaborative process involving cross-agency support from the Ministry of Forest and Range, Ministry of Energy, Mines and Petroleum Resources, Ministry of Tourism, Culture, and the Arts, the Integrated Land Management Bureau, and key representatives from stakeholder groups, industry, and First Nations.

It has been approximately two years since government's announcement of the MCRIP and, although government has achieved several milestones, such as protecting approximately 2.2

million hectares of Mountain Caribou habitat from road building and timber harvesting and closing 1.0 million hectares of Mountain Caribou habitat to snowmobile use, the Ministry of Environment has identified some uncertainties about the effective and efficient delivery of the MCRIP to meet government's recovery objectives and timelines. Thus, on September 15 and 16, 2009, the Ministry of Environment organized a workshop with ST members (see Appendix 2 for attendees) to review progress to date of the MCRIP and gain a technical perspective on a variety of implementation issues and challenges.

This report is a summary of the outcomes of that workshop. It captures the expert opinions and recommendations of ST members regarding status of the MCRIP to inform government on how to move forward with future recovery efforts.

Figure 1: Identified Mountain Caribou Recovery Area by Planning Unit (PU).



The workshop was facilitated by the Ministry of Environment over two half-days. It was structured in a way that allowed ST members to assess the MCRIP and respond with recommendations. The first afternoon was devoted to providing ST members with a government update on the status of management actions associated with the MCRIP and included an opportunity for ST members to ask questions on progress to date. Government staff then explored the possibility of future management options with the ST by providing them the following four questions:

1. Given the success of predator management actions to date, what effective actions can be implemented to reduce predation pressure and halt the decline of Caribou by 2014?

2. With the expected scope and scale of predator management in the future, what is the role of primary prey management and what are the most feasible approaches (timing, intensity, etc.) to implementation?

3. What conditions need to be met before augmenting a Mountain Caribou herd? Is there a role for penning?

4. If there is merit in closing additional areas to public snowmobile use, how would those additional areas be selected or prioritized?

Responses to these questions were summarized by the ST in small groups and the top three management actions were identified. A subsequent exercise allowed ST members to vote on the suite of management actions using two criteria:

1. What action is technically feasible to produce desired results; and

2. What action is technically feasible and is most likely to occur, given current social, economic, and political considerations.

As a final exercise on that day, the group discussed various scenarios (i.e., if one of the management levers was removed, e.g., if no predator reduction, how would the remaining management actions need to be adjusted to meet the recovery goal).

The morning of the second day was devoted to developing a suite of management actions that the ST could recommend to government to ensure that recovery objectives and timelines are achieved. Small groups (3–4 ST members) were asked to fill out a template (Table 1).

Table 1. Template used to capture ST member recommendations.

	Description of management action	Where (planning units or herds)	When	How	Expected outcome
Action 1					
Action 2					
Action 3					
Action 4					

By discussing the management actions described by small groups and incorporating further discussions with the entire group, a final template was completed to capture ST recommendations for the whole group (see Appendix 3). The ST was then asked to vote on these actions to select the highest priority action. As a final activity, government staff (non-ST members) asked the ST for clarification of some prioritized management actions.

WORKSHOP OUTCOMES

Management Action – Predator Reduction

Government update

In 2007, the Ministry of Environment liberalized hunting seasons for Wolves and Cougars over the entire range of Mountain Caribou as per the MCRIP. The Ministry has also trapped and snared Wolves. However, these methods are not achieving the recommended Wolf densities to support Mountain Caribou recovery (Wilson 2009). A pilot Wolf sterilization project is also being conducted in the Quesnel Highland (Region 5), but it has yet to be determined whether this method is also meeting the desired densities (Wilson 2009).

Government question

Given the success of predator management actions to date, what effective actions can be implemented to reduce predation pressure and halt the decline of Caribou by 2014?

ST response and recommendation

The ST strongly agreed that the current management actions for Wolf reduction have not been effective and are very costly. Most ST members recommended that aerial reduction of Wolves (shooting Wolves from helicopters) would be the most direct and cost-effective method to meet

the desired Wolf densities to recover Mountain Caribou. Specifically, the ST recommended the immediate implementation of an aerial reduction program for Wolves that threaten herds with fewer than 50 animals (e.g., Narrow Lakes herd). Some ST members suggested that there may be the need to maintain some level of liberalized hunting and trapping regulation for Wolves over the long-term, but this point was not discussed further.

The ST strongly agreed that the current management action for reducing Cougars (i.e., regulations to liberalize hunting) to support Mountain Caribou recovery is effective, provided that regulations can be adjusted to increase success if required. It was also strongly recommended by the ST that where the home range of Cougars (where known) overlaps the home range of Mountain Caribou, these Cougars should be targeted for removal.

If government was only to maintain current efforts to reduce predators, the ST strongly agreed that this approach would likely result in the loss of some herds that inhabit areas south of Highway 5 and would ultimately result in government not meeting its MCRIP goal. Moreover, government would likely be pressured to seek alternative management actions for all "matrix" habitats[1] by prohibiting timber harvesting and road building and moving forward with immediate and intense prey reduction programs across the Mountain Caribou range.

Management Action – Prey Reduction

Government update

The MCRIP committed government to reducing the densities of primary prey (Moose and White-tailed Deer) to reduce the densities of their predators to support Mountain Caribou recovery. Moose–Wolf systems dominate northern areas of the Mountain Caribou range, whereas Cougar–Deer systems, including Elk, dominate the southern part of the range. The Ministry of Environment currently has two pilot Moose-reduction projects occurring in the Parsnip (Region 7) and Revelstoke (Region 4) areas to assess the operational effectiveness of reducing Moose densities to reduce Wolf densities. A prey management strategy to support Mountain Caribou recovery has not been implemented by government across the Mountain Caribou range.

Government question

With the expected scope and scale of predator management in the future, what is the role of primary prey management and what are the most feasible approaches (timing, intensity, etc.) to implementation?

[1] Matrix habitat is defined as forested habitat immediately adjacent to Caribou core habitat whose prey and predator populations have an influence on Caribou resident to the core habitat. Its extent is defined by Wolf packs that primarily reside in the matrix, but periodically forage in Caribou core habitat.

ST response and recommendation

The ST recognized that the current Moose pilot projects in the Parsnip (Region 7) and Revelstoke (Region 4) areas are a step in the right direction, but ST members strongly agreed that more gradual reduction in Moose densities throughout the range of Mountain Caribou is needed immediately. Several ST members felt that this reduction should not be used across the Mountain Caribou range, but rather be more focused at local-scales (specific areas) to ensure effective management and to reduce the probability of unforeseen ecological events from a broad-scale reduction approach. In addition, several ST members recommended that the currently observed low densities of Moose in the Quesnel Highland (Region 5) and Central Selkirks (Region 4) be used as a natural experiment (pilot) to determine the effects of low Moose densities on densities of predators and Mountain Caribou.

Overall, the ST strongly agreed that adjustments to hunting regulations would be the most cost-effective measure to meet the recommended Moose densities to support Mountain Caribou recovery (Wilson 2009), but realized that areas targeted will require local support (hunters, First Nations) to achieve such a goal. Furthermore, if government does initiate a program to reduce Moose densities, the ST identified that there may be the need to reduce predators if they are not responding to reductions in prey and to prevent them from "prey switching" to Mountain Caribou.

Moose were the most important primary prey item identified by the ST for immediate reduction to support Mountain Caribou recovery. The ST suggested that although other prey items, such as White-tailed Deer (WTD), are important, the response to any reduction program through adjustments to WTD hunting regulations would likely not be observed, considering the density of WTD in the core of their range (i.e., southern valleys), and thus less effective in its role to support Mountain Caribou recovery. In this case, ST members recommended that government immediately reduce WTD densities in identified "deer invasion" areas, where deer habitat is of marginal quality and there are relatively new occupants. Areas in Revelstoke Region were identified as possible candidates for government to move forward on this recommendation.

There was little discussion regarding Elk, and ST members were undecided whether Elk reduction would be effective to support Mountain Caribou recovery. Consequently, no recommendation was provided.

The ST suggested that if government does not immediately initiate a prey management strategy to support Mountain Caribou recovery, it would be required to either maintain long-term predator reduction programs or increase forest management in matrix habitat to support reduced prey densities. Lower prey density reduces predator densities, particularly for those northern planning units PU 5A, PU 5B, and PU 6 that are associated with the MCRIP (Figure 1). Forest management in the matrix habitat was not a government commitment as per the MCRIP. However, several ST members believe that matrix habitat management was a commitment to

meet the definition of self sustaining[2], which was defined for each of the three northern planning units (Figure 1). Other ST members were unclear as to whether government ever intended to manage the matrix habitat. These conflicting views did not detract from the need for government to follow the ST recommendation and immediately take action for prey-reduction programs to support Mountain Caribou recovery.

Management Action – Augmentation/Penning

Government update

The Ministry of Environment has not implemented an augmentation program to support Mountain Caribou recovery. However, as per the MCRIP, the Itcha Ilgachuz Caribou herd (northern Caribou ecotype) was initially proposed as a potential donor population. Poor weather in 2007–2008 prevented a successful census of this herd to determine its status and suitability as a donor population. In June 2009, a successful census was completed and demonstrated that the population is approximately 2500 and stable to declining. A high number of cows and few calves were observed, which suggests that calf recruitment is at approximately 13%. It is understood that for this herd to be designated as a donor, the population will need to withstand the removal of approximately 20 animals per year for 2 to 4 years, and this removal must have local support.

Government question

What conditions need to be met before augmenting a Mountain Caribou herd? Is there a role for penning?

ST response and recommendation

The ST strongly agreed that augmentation should be a high priority for government to achieve MCRIP objectives. More specifically, ST recommended immediate augmentation of the Purcell South herd and other smaller herds of fewer than 20 animals. However, the ST indicated that there would be a low likelihood of success if predator densities in this area are not reduced concurrently. If government did not proceed with augmentation, government would need to consider extensive predator reduction programs or other management actions to prevent the loss of these herds that are more susceptible to environmental and demographic stochasticity. Even with these actions the ST believed that some herds would still become extirpated.

Although not a government commitment as per the MCRIP, the use of maternal pens (soft release) was discussed. The concept is that the pens would hold transplanted (and likely some

2 Self-sustaining is defined as restoring and maintaining habitat conditions that allow Mountain Caribou populations within planning units to withstand random events and other environmental variables without the need for long-term predator–prey management.

resident) animals for a few months after capture and before being released. The rationale behind placing the captured animals in pens is to allow birthing and rearing of young in an area devoid of predators, thereby increasing the likelihood of calf survival. Several ST members indicated that the pens could be located near identified Caribou summer habitat areas to ensure a successful release. Other members suggested using existing ranch properties for a potential penning site, which would reduce the upfront construction costs and allow for easier access and monitoring. It was well understood by the ST that maternal penning is costly (materials, staff-time, maintenance, etc.), which may explain the lack of agreement by ST members on this management action. Nevertheless, the ST suggested there should be a cost-benefit analysis, to determine whether maternal penning is a viable option.

Management Action – Public Recreation

Government update

To support Mountain Caribou recovery, in February 2009 the Ministry of Environment closed approximately 1.0 million hectares of Mountain Caribou habitat to snowmobile use. In addition, the Ministry is in the process of finalizing areas identified for stewardship management agreement (SMA) with snowmobile clubs to ensure that their riding activities minimize the disturbance and displacement of Mountain Caribou. It is anticipated that the SMAs will be in place for the 2009/10 riding season. However, if an agreement is not reached by both parties, government will move forward with closing the area in question indefinitely.

Government question

If there is merit in closing additional areas to public snowmobile use, how would those additional areas be selected or prioritized?

ST response and recommendation

Most of the ST members strongly agreed that there was no immediate need for implementing further closures and/or SMAs in addition to what has already been recommended. However, the ST did suggest that if current closed areas and/or areas under SMA prove to be ineffective in their application to minimize the disturbance and displacement of Mountain Caribou, then government may need to consider further measures. This latter point was not discussed in great detail, but the ST did strongly recommend that government ensure that the appropriate resources are allocated for compliance, enforcement, and monitoring programs to determine the effectiveness of this management action. The ST indicated that the importance of this recommendation may be realized in the event of a shift in Mountain Caribou distribution outside the current closure and SMA areas. If so, government will need the appropriate data to determine

whether this is a density-dependent shift due to population growth, or a displacement caused by snowmobile use.

Other Items

During the discussions at the workshop, the ST identified several other aspects of the MCRIP that are important for government to consider. First, the ST recommended that a structured monitoring (census) program of the Mountain Caribou population be appropriately funded (~$300K) and conducted over a three-year period (e.g., one-third each year).

Second, the ST recommended that the most appropriate metric for measuring response of Mountain Caribou to government's MCRIP would be adult and calf survival, which contributes to the Mountain Caribou population size and trend.

Third, the ST identified the implications of climate change on Mountain Caribou recovery objectives. At the workshop, the topic of climate change was tagged as a parking lot issue, and in the interest of time, was not addressed in the detail and attention that a topic of this magnitude should be given. Nonetheless, within the uncertainty of what climate change will eventually be, there will likely be changes to natural disturbance regimes, resulting in changes to the location or character of vegetation communities, undoubtedly affecting Mountain Caribou population and distribution. Thus, the ST recommended that any future management actions taken to support Mountain Caribou recovery should consider how they may be affected by changes in climate.

Questions Proposed to ST Members

1. **Question:** If a Wolf aerial control program is implemented, how do we monitor the response?
   Answer: Annually, using Caribou calf and adult counts.
2. **Question:** Do we need control and treatment areas for predator management?
   Answer: No. There is too much variation for such a design.
3. **Question:** Where would we see a greater response to a Wolf aerial control program if implemented – Narrow Lakes or Columbia South?
   Answer: Adult survival would likely be the response for Columbia South, but calf recruitment for Narrow Lakes. These areas have different situations and thus different responses.
4. **Question:** What is the metric to demonstrate a response to a predator control program?
   Answer: Increased Caribou population size and trend. However, some herds are too small to demonstrate a response. There may be a need to run an experiment over a smaller area that includes several herds to allow time (5 years) for a demonstrated response that is above the expected natural variability in the population.

5. **Question:** Do we need to look at any metrics for donor herds?
   Answer: Yes. We need to monitor population size and trend over time.
6. **Question:** Because augmentation is important, do we need to take a liberal approach and look at herds across the province?
   Answer: Yes.

SUMMARY

Management Recommendations

During extensive discussions and by voting and prioritizing, the ST recommended the following three management actions that require immediate attention to ensure that government meets the recovery objectives and timelines associated with the MCRIP. The recommendations are ranked as follows (1 is the highest priority).

1. Immediate aerial removal of Wolves that threaten herds with fewer than 50 animals.
2. Immediate augmentation of the South Purcell herd and all herds with fewer than 20 animals.
3. Immediate but gradual reduction of Moose densities throughout the Mountain Caribou range through adjustments to hunting regulations that allow for increases in cow Moose harvest and hunting seasons.

For government to determine the success of these management actions, the ST recommended continued or increased delivery of several existing management activities or actions:

- Minimize forestry-related activities in core habitat;
- Enforce recreation restrictions; and
- Conduct a complete census of Mountain Caribou herds every three years (approximately one-third of the range each year).

REFERENCES

Mountain Caribou Science Team. 2006. Management options and related actions for Mountain Caribou in British Columbia. Rep. prep. for Species at Risk Coordination Office, Integr. Land Manage. Bur., Minist. Agric. and Lands, Victoria, BC.

Wilson, S.F. 2009. Recommendations for predator-prey management to benefit the recovery of Mountain Caribou in British Columbia. Rep. prep. for B.C. Minist. Environ., Victoria, BC.

APPENDIX 1: SCIENCE TEAM MEMBERSHIP

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APPENDIX 3: ST RECOMMENDATIONS

Management action	Priority areas	Criteria (justification)	Ranking for priority areas (no. = votes)	How	When	Trade-off (Caribou viability)
1. Predator control			20			
Wolf removal	Quesnel Highlands	Ongoing		Sterilization	Ongoing	Smaller herds <20 likely lost in 5 years. Population goals will not be met. PVA for percentages. Recovery less over time.
	Narrow Lakes	Herds < 50	4	Aerial removal 1-3 packs	ASAP	
	Critically imperilled herds	Immediate - emergency response	7	Aerial removal 1-3 packs	ASAP	
	Other herds	Proactive	4	Aerial removal 5-12 packs		
Cougar removal	Cougar invasion areas	Where liberalized hunting will not work, or for rogue animals	5	Direct removal		
2. Augmentation			13			
	Columbia South	<20	3	Penning	ASAP	All the above. If no escalation in predator management beyond current levels, then less likelihood of success and fewer options.
	South Purcell	<20	10	Predator removal	ASAP	

Management action	Priority areas	Criteria (justification)	Ranking for priority areas (no. = votes)	How	When	Trade-off (Caribou viability)
3. Moose Removal			11			
	Revelstoke and Parsnip, ongoing	Ongoing		Regulation change		Higher reliance on predator control
	Quesnel Highlands and Central Selkirks	Empirical studies to test theory	4	Regulation change. Hunting cow Moose. Need to develop a model for adaptive management	ASAP	
	Everywhere		7	Regulation change	Gradual reduction	
4. Monitoring population size			3			
	Everywhere			Census entire population every 3 years - $300K		Necessary for success – assumption is that this is already happening
5. Public recreation enforcement			2			
	Everywhere			Increase in political will to do it.		Necessary for success - assumption that this is happening

Management action	Priority areas	Criteria (justification)	Ranking for priority areas (no. = votes)	How	When	Trade-off (Caribou viability)
6. Core habitat -forest health			1			
	Everywhere			Minimizing exemptions to forestry activities		Necessary for success - assumption that this is happening
7. Matrix						
	Quesnel Highlands and north (PUs 5A, 5B, 6)			Land-use plan to modify objective. Define through modelling		