FINAL REPORT

Feasibility of Some Direct Management Options to Recover Populations of Boreal Caribou

Preliminary Operational Guidelines for Planning

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DECEMBER 15, 2016

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Prepared for BC Oil and Gas Research and Innovation Society under Agreement **BCIP-2016-01**

CITATION: Sutherland D.G., R.S. McNay, and R. Serrouya. 2016. Feasibility of Some Direct Management Options to Recover Populations of Boreal Caribou: Preliminary Guidelines for Planning. Wildlife Infometrics Inc. Report No. 560. Wildlife Infometrics Inc., Mackenzie, British Columbia, Canada.

ABSTRACT

This document has two purposes:

1. to provide some insights derived from demographic modeling and scenario analysis for informing planning of short-term recovery options for boreal caribou in northeastern British Columbia (BC). The source modeling project (Sutherland et al. 2016) was designed to explore the demographic and operational feasibility of implementing different types of management interventions targeted at recovery for small and currently declining populations of boreal caribou in this region.
2. to provide an overview of the database of outcomes generated by the model to assist practitioners to explore more specific questions they may have in the context of particular populations and situations.

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PURPOSE

The intent of this document is to provide:

1. some insights and guiding principles for planning short-term recovery options for boreal caribou in northeastern British Columbia (BC). We extracted these insights from a modeling project designed to explore the demographic and operational feasibility of implementing different types of management interventions targeted at recovery for small and currently declining populations of boreal caribou in this region.
2. an overview of the database of outcomes generated by the model to assist practitioners to explore more specific questions they may have in the context of particular populations and situations.

This is a companion document to Sutherland et al. (2016[1]) which provides a more complete technical description of the modeling process and presentation of the results. The boreal caribou populations that are the focus of this study are the five herds delineated in northeast (NE) BC: Calendar, Maxhamish, Snake-Sahtaneh, Chinchaga (B.C. portion), and West-side Ft. Nelson. Demographic data describing these populations cover the period 2012-2015. The management actions explored include: (1) management to reduce predator populations to different target densities; (2) annual protective maternal penning of females, using pens of different capacities; (3) translocation and possible penning of differing numbers of females each year into each population. Translocations could occur either from other boreal caribou populations or from captive breeding programs. All scenarios of management actions were modeled with multi-year implementation schedules, including two patterns of continuity (continuous or pulsed). The primary performance indicator used to compare outcomes among feasible options is: the change in the probability that managed populations show an increase in their population size each year (over a 10 year horizon), relative to unmanaged populations[2].

We defined feasibility criteria in terms of operational feasibility: (i) annual capacity of maternity pens and (ii) annual numbers of females available to translocate from donor sources, with different potential levels of feasibility. Costs of implementation for each feasible action or combination of actions were estimated. See Sutherland et al. 2016 for a complete description of the management scenarios, feasibility criteria, and cost structures we modeled.

[1] Sutherland D.G., R.S. McNay, and R. Serrouya. 2016. Feasibility of Some Direct Management Options to Recover Populations of Boreal Caribou: Preliminary Guidelines for Planning. Wildlife Infometrics Inc. Report No. 560. Wildlife Infometrics Inc., Mackenzie, British Columbia, Canada.

[2] Note that this is a relatively “high-bar” performance indicator, and is higher than that used by Environment Canada in the Boreal Caribou Recovery Strategy (2012).

SUMMARY OF FINDINGS

1. For all declining populations[3] there is at least one, and usually more than one, feasible management action that, if implemented, results in expected improvements in population performance.
2. Which actions to implement for a given population, and the level of investment in that implementation, strongly depends on the management objective for that population. For example, implementing only one or two of the management actions, at lower annual levels of effort, can result in relative gains of between 1% and 50% in the probability of projecting annual increases in the population size over the 10 year time period we modelled. However, achieving increases of >50% in population performance requires implementation of at least two and perhaps three concurrent management actions, and larger annual levels of investment.
3. Which actions, or combination of actions that could help achieve a given management objective for populations depends on factors such the target wolf density desired for the population, the annual capacity of maternity pens, and the availability of females for annual translocations into the population, either from external “wild” populations, or from a putative captive breeding facility.
4. Implementation of predator management *by itself* is unlikely to achieve substantial increases in the probability of annual population growth over a 10 year projection period. However, predator management *in combination* with one or more other actions increases the probability of annual population growth by 10-20% over the same scenarios conducted without predator management. This suggests that predator management is an important supporting management tool.
5. Larger capacities of maternity pens are as effective as small annual translocations (all else being equal) in improving probabilities of annual population growth, and typically are cheaper to implement.
6. Translocations from captively-bred sources are the single most effective action relative to other actions (although translocations from other “wild” populations are nearly as effective) at achieving higher probabilities of annual population growth across a range of target wolf densities, although there is uncertainty around the post-translocation survival probability of translocated females. However, availability of translocated females from any source may strongly limit the applicability of this management action to only a limited number of situations.
7. Costs of management are a strong potential limiting factor of the intensity at which they can be sustained over multiple years. These costs are best assessed at the level of the individual population. Note that there are other potential logistical constraints acting regionally (e.g., availability of trained teams to carry out the different activities) that are not addressed in this modeling study.
8. Evaluation of alternate cost/benefit measures can help to identify coordinated sets of cost-effective actions for currently declining populations. However, interactions can be complex. Fine-level planning is best left to practitioners with access to much more specific contextual information than the modeling assumptions can represent.

[3] Using 2012-2015 data, in 2015 all populations except Calendar were projected to be declining. Updates to the demographic data available for 2016 made subsequent to the modeling indicates Calendar may also now be declining again.

The last two findings are an important reason why the database of outcomes is provided to BC OGRIS as a separate product, so that it can be explored by practitioners and decision-makers as a supplementary tool to help inform on-going management planning at the population level. Provided our estimates of implementation costs and operational feasibility are acceptable (and remain so), the data should integrate management objectives with modeling probabilities of achieving them, as one source of information to help on the ground planning efforts.

ACCESSING AND EXPLORING THE DATABASE OF OUTCOMES

The results of the modeling scenarios are contained in the dataset “Feasibility & Cost Data NE Boreal Herds V1.1.xlsx”, available from BC OGRIS[4]. Here we describe the contents of this dataset, with an example of how to access the data, to answer more specific questions about relative costs vs population performance benefits than given in the general findings summarized above.

Note that in the present version of the database, the criteria for operational feasibility (see Table 1: Sutherland et al. 2016) and the presently defined cost structure for each management action (Table 2: Sutherland et al. 2016) are pre-computed as part of the post-processing steps that build up this database. Therefore, should either costs or criteria change, the results will not be accurate until the preprocessing steps are re-run and the database reloaded with the updated information.

Note that to minimize the size of this database, only the “feasible” outcomes (n = xx of yy total scenarios) are included. Specifics on the feasibility criteria are also detailed in Sutherland et al. (2016).

Structure of the Database of Outcomes

In the database, provided as an Excel workbook, four worksheets are provided; these worksheets are described in brief below.

- **Notes** - outlines the purpose of the database, along with reference information.
- **Variable Dictionary** – contains brief definitions of each of the 56 variables (attributes) included in the database.
- **FeasibilityCostBenefitOutcomes** - the full database of projected outcomes (cost indicators, benefit indicators, scenario attributes) for each population and feasible scenario. See the Methods section of Sutherland et al. (2016) for a more complete explanation of how these results were modeled, and processed for analysis.

[4] Disclaimer: This database contains the results of a research project to develop a prototype modeling tool and database of outcomes. The authors and Wildlife Infometrics Ltd. make no representations or warranties regarding the outcome or the use to which these modeling data are put, and are not assuming any liabilities for any claims, losses, or damages arising out of the use of these data or of any information in this document.

- **Exploratory** - a very simple example Pivot Table based on the above outcomes data. Users of the database can adapt this basic structure for their own exploratory purposes.