**Table 1.** Results of three different mitigation scenarios, and one climate change scenario, for three study populations of woodland boreal caribou in NW British Columbia, Canada, under the presented BRAT framework. The target frequency is the 40% threshold of a normally distributed range of lambda values, with a standard deviation of 0.3. Bolded values represent frequencies under which each scenario has a positive effect on each study population. Italicized costs represent the most cost effective strategy for each study population.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Scenario | Study Area | Target Frequency\* | Top Event Frequency\* | Consequence Frequency\* | Cost (CDN) |
| Combined mitigations | 1 | 1.07 | 0.69 | **1.38** | $20,037 + $724,000/ year |
|  | 2 | 1.07 | 0.59 | **1.33** | $6,650 + $724,000/ year |
|  | 3 | 1.07 | 1.04 | **1.55** | $18,025 + $724,000/ year |
|  | mean | 1.07 | 0.77 | **1.38** | $14,909 + $724,000/ year |
| Mitigation 1:  Total predator control | 1 | 1.07 | 0.69 | **1.34** | ***$224,000/ year*** |
| (wolf control)1 | 2 | 1.07 | 0.59 | **1.29** | ***$224,000/ year*** |
|  | 3 | 1.07 | 1.04 | **1.52** | $224,000/ year |
|  | mean | 1.07 | 0.77 | **1.34** | $224,000/ year |
| Mitigation 2:  Maternity penning | 1 | 1.07 | 0.69 | 0.76 | $500,000/ year |
| (enclosures/exclosures)2 | 2 | 1.07 | 0.59 | 0.67 | $500,000/ year |
|  | 3 | 1.07 | 1.04 | **1.09** | ***$500,000/ year*** |
|  | mean | 1.07 | 0.77 | 0.84 | $500,000/ year |
| Mitigation 3:  Linear feature restoration | 1 | 1.07 | 0.69 | 0.69 | $20,037 |
| (density-dependant limits)3 | 2 | 1.07 | 0.59 | 0.59 | $6,650 |
|  | 3 | 1.07 | 1.04 | 1.04 | $18,025 |
|  | mean | 1.07 | 0.77 | 0.77 | $14,909 |
| Climate Change4 | 1 | 1.07 | **1.16** | **1.16** | - |
|  | 2 | 1.07 | 0.00 | 0.00 | - |
|  | 3 | 1.07 | 0.69 | 0.69 | - |
|  | mean | 1.07 | 0.61 | 0.61 | - |

\*Measured in lambda

1Cost estimates obtained from Schneider et al. 2010 - estimated as 35/km^2. Threshold estimates obtained from BC grey wolf management plan – 80% of area (as a proxy for 80% of the population) needs to be targeted to effectively reduce wolf densities.

2Maternity penning cost estimates were obtained from both Scott McNay and Robert Serroya pers. coms – both of which centered around $500,000 to $550,000 per year. I have not explicity included exclosures (i.e. herd fencing) as a scenario, as this cost is incorporated in a maternal penning cost, and maintenance of a fence is of minimal expense (S. McNay and R. Serroya pers. com).

3Cost estimates obtained from Pyper et al. 2014 as $12,500/km. An effective threshold for these populations was considered to be 70%, as this is similar reflects Environment and Climate Change Canada’s 2012 threshold of only having 35% of a local population unit having disturbance. Each of our study areas also contains 70% herd range, so the values presented here assumes 70% of seismic lines are restored within the herd range of a study area.

Density of seismic lines for the herd area within study area 1 (Chinchaga) 1 = 2.29 km/km^2

Density of seismic lines for the herd area within study area 2 (Maxhamish) = 0.76 km/km^2

Density of seismic lines for the herd area within study area 3 (Snake-Sahtahneh and Calender) = 2.06 km/km^2

4We did not attempt to calculate the costs for climate change scenarios, as this accelerating factor affects a number of barriers and threats within each study area (see Figure).

--- NOT TO BE INCLUDED IN THE MANUCRIPT But to add to the discussion if desired:

General take home/discussion points from the above table:

1. The existing BRAT outlined in Quantification questions\_FScommentsV3.docx does ultimately produce a consequence frequency the meets the lopa crit.
2. For the consequence frequency to be lopa crit met:
   * Each study population needs to have wolf control
     + This is a similar result to Johnson et al. in press
   * Study areas 1 and 2 need to have wolf control in combination with other strategies
     + This is a similar result to Johnson et al. in press
   * Study area 3 could get by with only implementing a maternal penning mitigation scenario
3. No study areas will meet a consequence frequency if only seismic line restoration is implemented as a mitigation scenario
4. Climate change has highly variable results on the total top event frequency – Study area 1 may benefit from climate change and not require any mitigation scenarios to have a consequence frequency of lopa crit met. However, on average, climate change will have a target and consequence frequency of lopa crit not met (i.e. on average caribou will become extirpated).

Cost discussion points from the above table:

1. To prevent caribou extirpation, each study area needs to be spending between $224,000 - $500,000/year on a mitigation scenario.
2. These costs need to be ascribed to at least one of two scenarios: An annual wolf cull and consistent maternal penning.
3. The cost of these values per caribou will change with herd densities (see Johnson et al. in press for estimates).