

Science, uncertainty, and ethics in the Alberta wolf cull

(Population ecology 101)

By Dr. Adam T. Ford



Lambda – λ . It's a Greek letter that looks like a squiggly triangle and adorns the facades of college-town fraternity houses. Lambda is also one of the most important numbers that biologists want to know when studying animal populations. In biology parlance, lambda is the rate of population change – the number of new individuals added to or removed from the population for every current individual. When lambda is above 1, say 1.10, a population of ten individuals will be eleven next year, and twenty-six individuals by year ten. When lambda is between 0 and 1, the population is in decline. At a lambda of 0.9, a population of ten animals will decline to nine in year one, and three by year ten.

In conservation parlance, a lambda below 1 can be a red flag. It's a call to action with three important implications: (1) the recognition that something has gone wrong in our management of the landscape; (2) the need to identify the cause of population decline; (3) the need to find a solution that reverses the cause of decline.

For twelve of Alberta's sixteen herds of woodland caribou, lambda is below 1, and nearly so for the remaining herds (Hervieux et al. 2013). Since 1996, the population of many herds has declined by 30 to 90 percent with all herds showing the same downward trend in their population trajectory. The red flag has been raised – caribou are listed as 'threatened' by Alberta's Endangered Species Conservation Committee and the Committee has recommended changing the listing to the more perilous status of 'endangered'. But

two crucial questions loom over the decision-making landscape: what is the cause of these declines and what actions should be taken to stem the decline.

A common, causal thread

For many biologists, increased wolf predation is regarded as the cause of caribou declines. Apparent competition is one of the more popular hypotheses. This hypothesis suggests that landscape disturbance has benefited the primary prey of wolves – deer and moose. With an increasing amount of 'wolf food' on the landscape, wolf populations have increased. Even though caribou are not an important part of wolf diets, the overall increase in the number of wolves means the number of caribou succumbing to predation by wolves has increased. Increased predation by black bears has also been hypothesized, although little data exist to test this possibility. Another hypothesis – the functional response – argues that landscape disturbance has increased the mobility of wolves while they are hunting. As a result of increased mobility, wolves more easily encounter their prey – caribou included. Over time, this means that more wolf-caribou encounters occur, further increasing predation on declining caribou populations.

Stress is a third hypothesis. Samuel Wasser argues that landscape disturbance has increased the release of stress hormones in pregnant caribou, thereby reducing the number of new, healthy, caribou calves entering the population.

It is likely that all of these hypotheses are

correct to an extent. The common thread tying these hypotheses together is industrial development, approved by government, within the caribou range and hence should be regarded as the ultimate cause of population decline for caribou.

So, what solutions are being proposed? As readers of the *Wild Lands Advocate* will recall, imposing wildlife conservation objectives on industry has not been something the Alberta government has done very often or very meaningfully in recent years.

Schneider, Hauer, Adamowicz, and Boutin recently highlighted the relative costs and benefits of conserving woodland caribou in Alberta. Their 2010 study estimated that fully protecting all caribou ranges from new energy and forestry development would cost upwards of 100 billion dollars in lost resource revenue; restoring disturbed areas would cost several hundred million dollars. They suggested that, by comparison, a 50-year wolf control program would only cost "a few tens of millions of dollars," with an estimated caribou lambda of 1.1 as a positive outcome. They concluded that it would be 'desirable' from an economic standpoint to maintain caribou through wolf culling alone. It is hard to argue dollars-and-cents with the government, so it's not all that surprising what management actions have occurred in Alberta. Kill wolves.

Action, uncertainty, and ethics

In 2005, the government of Alberta began an experimental wolf cull in the range

of the Little Smoky (LS) caribou herd. The results of this experiment were published recently by government biologists Dave Hervieux, Dave Stepnisky, and Michelle Bacon and researchers from the University of Alberta and the University of Montana. The authors concluded: “Predator reduction by itself may be an effective short-term strategy to reduce the risk of population extirpation of an endangered species facing declines due to apparent competition.” The results of this study raise a number of questions regarding the science used to justify continued culling of Alberta’s wolves.

It is not clear that predation was reduced by the cull. In the twelve year duration of this study, 733 wolves were killed by aerial shooting (from a helicopter) or by strychnine poisoning. An additional 108 wolves were killed by fur trappers during the cull. Few would disagree that a lot of wolves died during this study. But culling wolves leaves behind empty territories that can often be re-occupied quickly by animals dispersing from neighbouring packs. In addition, wolf packs with fewer members often produce more young than larger packs. For these reasons, the overall abundance of wolves may not decline even in the face of the cull. In a 25-year study conducted throughout Montana, Idaho, and Wyoming, wolf culling actually *increased* the number of livestock killed by wolves. Indeed, the Hervieux study reported a 50 percent *increase* in the number of wolves captured by trappers in the culling area compared to pre-culling – a result consistent with an influx of new wolves replacing those shot and poisoned. Despite the concerted effort, and success, of the Alberta government to make a deep pile of wolf carcasses, it remains unclear if there were actually fewer predation events on caribou.

It is not clear that the cull reduced the decline of caribou. These authors adopted a before-after-control-impact (BACI) study design to assess the effect of wolf culling on lambda. They monitored lambda of the LS herd before and after wolf culling,

and during the same period of time in a nearby ‘control’ herd (the Redrock-Prairie Creek herd, RPC). The logic of this BACI design is that the control herd provides a measure of ‘normal’ population change in the absence of wolf culling. Thus, if culling wolves is restoring caribou, we would expect little change in the population trajectory of the RPC ‘control’ herd and a noticeable change in growth of the LS herd coinciding with the start of the wolf cull in 2005. However, the data in the Hervieux et al. study show that lambda was increasing in the LS herd prior to wolf culling, with the largest lambda (1.1) occurring the year *before* the cull started. In the control area, where wolf predation on caribou allegedly continued unabated, there was a gradual deceleration in lambda commencing with the start of the cull. While it *may* be true that killing wolves contributed towards the improvement in caribou lambda, it is true that caribou lambda was already trending towards values above 1 prior to the cull and that lambda improved in the absence of wolf culling for the control herd.

The ethical basis for this study has been questioned. Brook, Cattet, Darimont, Paquet, and Proulx, in a scathing commentary on the Hervieux study, attacked the ethics of shooting wolves from helicopters and using strychnine baits from the animal welfare perspective – Alberta’s emergency measures to try to prevent caribou extirpation. Aerial shooting doesn’t necessarily produce a quick, humane death. Strychnine does not meet the Canadian Council on Animal Care (CCAC) criteria for acceptable methods of humanely killing animals. To Brook and colleagues, these methods undermined the ethical basis of the study itself. “Based on an apparent lack of compliance with CCAC’s guidelines,” they argued, “we believe that this controversial study should never have taken place and should not have been published by the Canadian Journal of Zoology.” Hervieux et al. responded, in part, by stating that ethics approval from an institutional animal care committee (ACC)

wasn’t needed since the cull methods they studied were part of the Government of Alberta’s existing management plan. The central, ethical argument by supporters of the wolf cull is that we have a responsibility to prevent the extinction of Alberta’s woodland caribou herds, even if that means killing wolves. Perhaps such an argument would receive wider acceptance in the conservation community if stronger evidence were presented that the wolf cull stemmed the decline of caribou.

Resolving uncertainty in management

Wolves and caribou exist in a complex food web alongside other predators, herbivores, and plants. The landscape supporting this food web is changing from both natural and human-causes, and there is a pervasive decline in woodland caribou occurring across Canada. Identifying the cause of this decline will require rigorous testing and exploration of hypotheses that may explain what factors contribute towards the trend in the caribou population. Testing these hypotheses will likely require an adaptive management framework that uses the results of well-designed field studies that measure the efficacy of current management actions to inform future action. Critical to this framework is weighing risks and benefits of management actions. After six years, it is not clear that wolf culling achieved its desired management goal. In fact, risk to caribou may have actually increased. It is past time that we adopt a more creative view of how we can coexist with caribou and wolves in an industrialized landscape. 🐾

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