

**Alberta Conservation Association  
2008/09 Project Summary Report**

**Project name:** *Bighorn sheep population demographics and associated habitat recommendations for the Yarrow-Castle Drainage*

**Project leader:** Mike Jokinen

**Primary ACA staff on this project (including seasonals):** Mike Jokinen

**Partnerships:**

Alberta Fish and Game Associations - Lethbridge and Fort Macleod Chapters  
Alberta Sustainable Resource Development - Fish and Wildlife Division  
Foundation for North American Wild Sheep - Alberta Chapter  
Parks Canada - Waterton Lakes National Park  
Richard Kennedy - Veterinarian  
Shell Canada Limited  
The Rocky Mountain Elk Foundation of Canada  
The Wildlife Society - Lethbridge Community College Chapter  
Willow Valley Trophy Club

**Key findings:**

- The quality of spring forage in Yarrow Canyon is likely quite good, based on the analysis of fecal pellet samples.
- Prescribed burning would likely improve forage availability and predator evasion for sheep in Yarrow Canyon.

**Abstract**

Rocky Mountain bighorn sheep (*Ovis canadensis*) are habitat specialists preferring open grassy slopes for foraging in close proximity to steep rocky areas for escape terrain. They tend to exist in small, sedentary, isolated populations with patchy distributions within subalpine and alpine habitats. Encroachment of conifers and shrubs as a result of fire suppression has impacted sheep populations by limiting available habitat and restricting movement. Bighorn sheep numbers in the Yarrow-Castle region of Alberta were significantly higher during the late 1970's when compared to recent counts. In 2002, a bighorn sheep demographic study was initiated to gain an improved understanding of factors that may limit ewe numbers in the Yarrow-Castle region. Using data from 2003 and 2005 I found ewe survival, lamb survival and reproductive output within normal ranges for bighorn sheep. With numbers fluctuating below those of the late 1970's, the region now appears to have a lower carrying capacity. To better understand food quality and in support of a pre-burn trial, I evaluated the nutritional value of spring forage using fecal analysis. Fecal nitrogen values were within a normal range for spring forage, although I did not measure forage volume nor the availability of preferred foods. This analysis has established a reference for measuring changes in fecal nitrogen values if prescribed burn

treatments are applied to this area in future. A series of well-planned prescribed burns would likely increase the availability of preferred forage while improving predator detection in the Yarrow-Castle area.

### Introduction

Forest succession and meadow in-growth in the absence of disturbance have been shown to cause a loss of open habitats (Wakelyn 1987, Shaw 2008). Bighorn sheep are particularly affected by this as they avoid habitats that restrict visibility (Holl and Bleich 1983). The loss of open areas to forest succession in the Yarrow-Castle is evident when comparing repeat photography images from 1914 with images from 2005 (Figure 1).

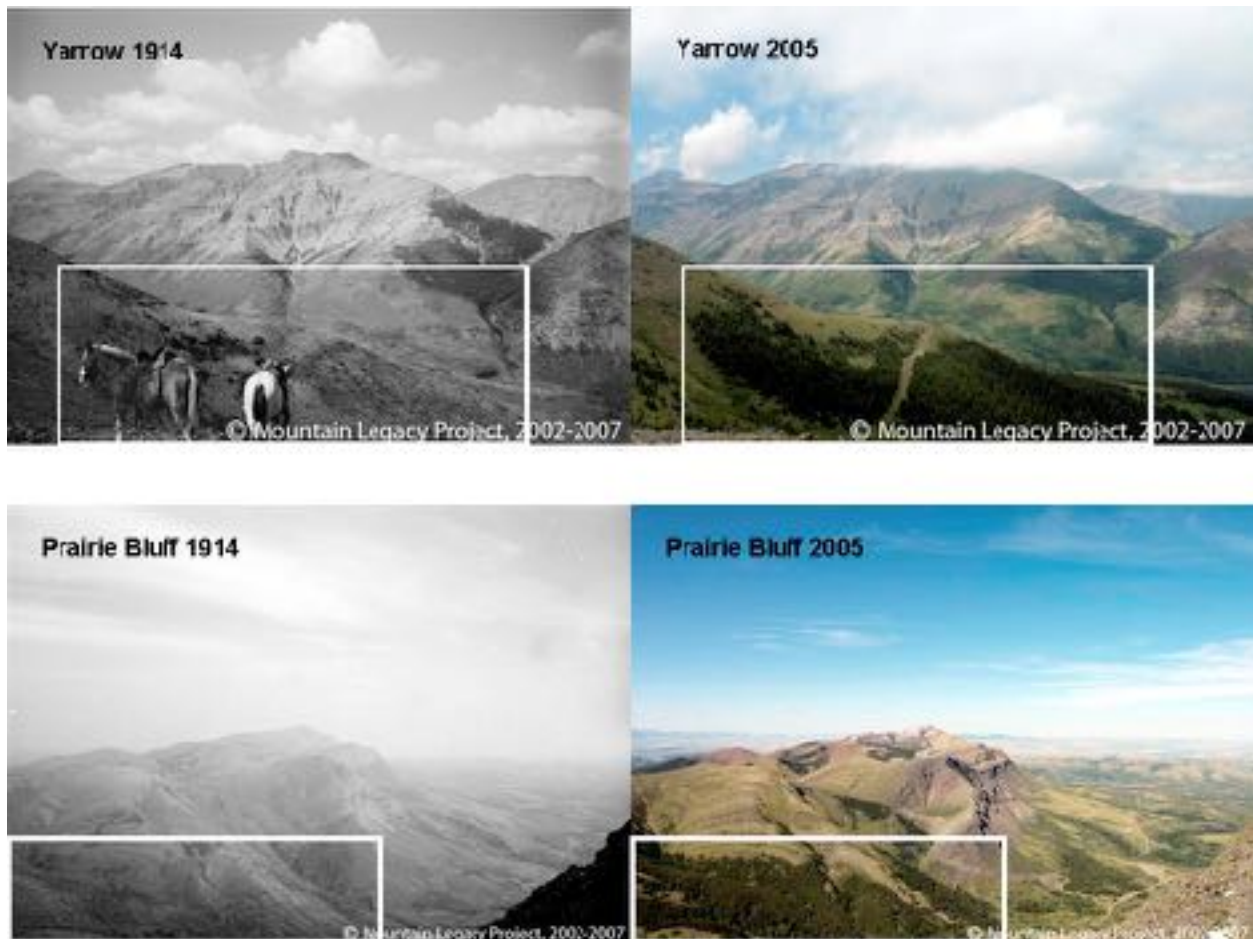


Figure 1. Repeat photography of Yarrow-Castle area, 1914 and 2005. Provided by the University of Victoria, Parks Canada, and Alberta Sustainable Resource Development (<http://mountainlegacy.uvic.ca>).

I evaluated an approach for assessing forage quality by measuring nitrogen levels in sheep pellets during green-up. During green-up, bighorn sheep gain mass while restoring their nutritional needs (Festa-Bianchet et al. 1996) which may allow their fecal pellets to be used for evaluating food quality (Blanchard et al. 2003, Kamler and Homolka 2005). I looked at pellet samples from

Yarrow Canyon (YC) to represent a trial sample of pre-burn fecal nitrogen values, while samples from Table Mountain (TM) represent a future control.

I suggest that if fire suppression has caused a long-term decline in suitable bighorn range in this area, then prescribed burning would increase forage availability, decrease predation risk and possibly increase carrying capacity over time.

### **Methods**

I observed sheep in pre-treatment and control areas and collected fresh pellets from individuals soon after defecation. Samples were air dried in paper bags, and tested by Sandberg Laboratories for total nitrogen content using the Kjeldahl procedure, and for percent ash by placing samples in a muffle furnace at 600-650°C for approximately 3 hours.

I plotted the use points of ewes (GPS collar data, N=5 in YC) onto an aerial image to visualize how individuals were occupying the pre-burn area.

### **Results**

Forty-nine pellet group samples were collected from TM (N=32) and YC (N=17) between May 16 and June 17, 2008. Fecal nitrogen values from TM averaged 2.26% (range 0.35%-4.27%) while YC values averaged 3.30% (range 2.39%-4.32%). Fecal grit (or ash) values averaged 37.0% at TM and 21.0% at YC.

Ewes in the YC area predominantly used open habitats and appeared to avoid many areas of the south facing slope where dense vegetation and closed tree canopy occurs (Figure 2).

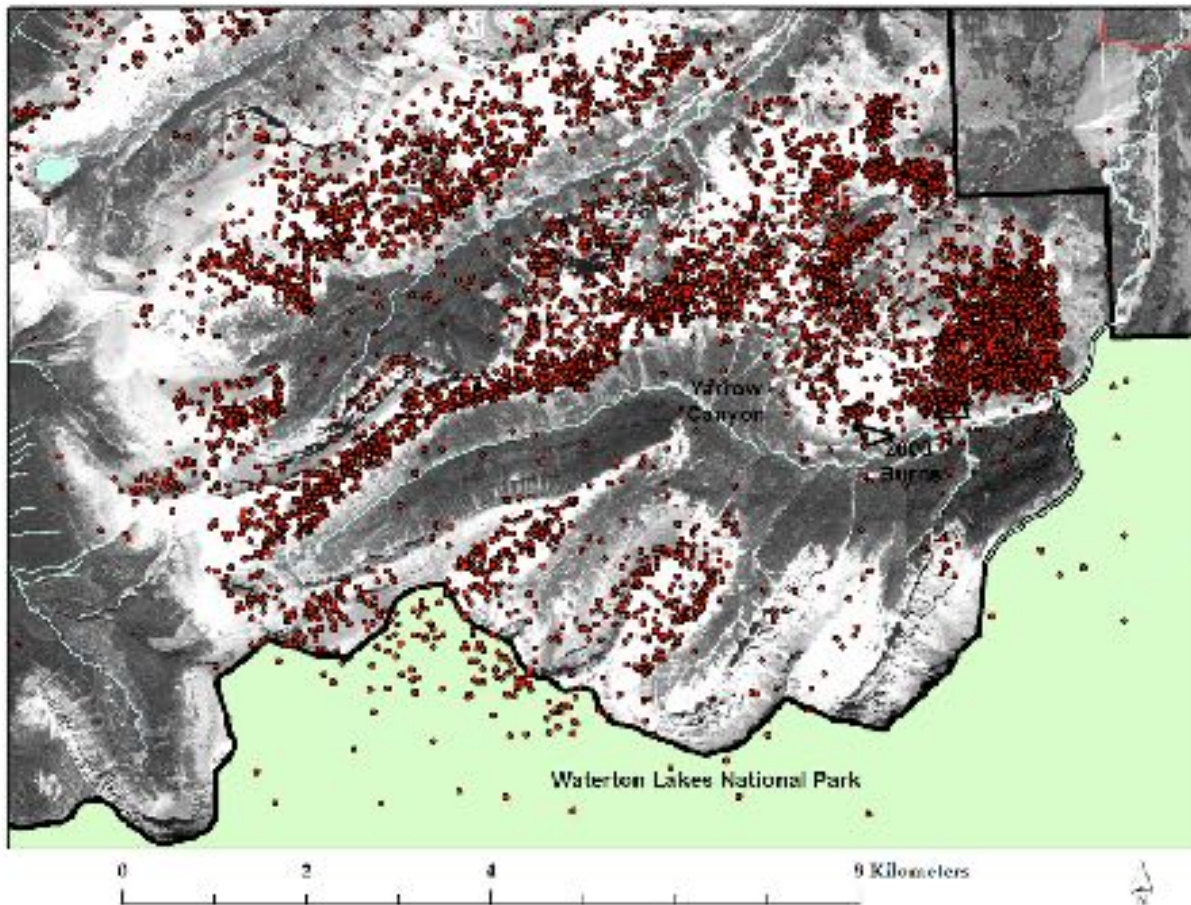


Figure 2. GPS collar location data of bighorn ewes in the Yarrow Canyon area, 2004-2005.

## Conclusions

The TM population utilized a mineral lick and this likely elevated ash levels and decreased nitrogen levels in comparison with the YC samples (Seip and Bunnell 1985). Nitrogen values from YC during mid-May appear high in comparison with TM samples, and are similar to those for mountain goats at Caw Ridge, Alberta in mid-June suggesting YC spring forage quality may be quite good (Steeve Côté personal communication). I can not be sure whether measuring fecal nitrogen would detect changes in forage value between burned vs. unburned sites at this time, although burned areas would likely have higher nitrogen values earlier on.

Evidence from other studies suggest the use of burn sites by sheep appears greatest when located on south facing slopes (Bentz and Woodard 1988), and should be large enough to attract sheep (Spowart and Hobbs 1985). Yarrow Canyon did receive two burns in 2000 but these were small in scale (<18 ha) and the GPS collared individuals did not utilize these areas with much frequency.

There are three key features of bighorn range including open areas allowing for detection of predators, nearby escape terrain, and abundant quality forage (Risenhoover et al. 1988). Assuming that prescribed burns are a viable tool for mimicking natural disturbance on sheep range (Seip and Bunnell 1985, Bentz and Woodard 1988, Ruckstuhl et al. 2000), I suggest their application near escape terrain along south facing slopes of YC would improve predator detection and forage availability in this area (Figure 3).

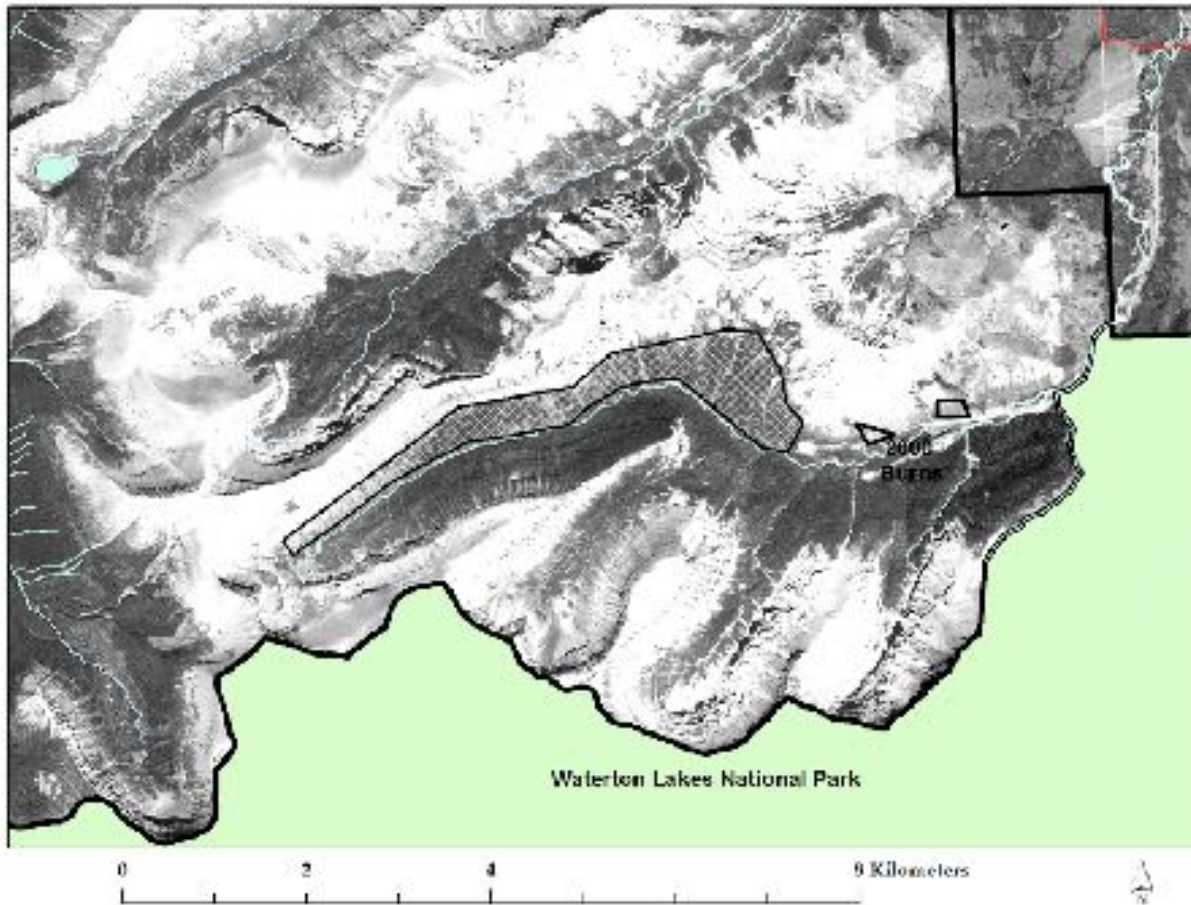


Figure 3. Crosshatch represents an area suggested for a prescribed burn on the south facing slope of Yarrow Canyon (approx. 260 ha).

Burning the proposed area of 260 ha would increase forage availability and provide additional open habitat near escape terrain in close proximity to areas already used by the sheep.

### Communications

- Paper – Evaluating survival and demography of a bighorn sheep (*Ovis Canadensis*) population. Study results will be published in 2008 Northern Wild Sheep and Goat Council Proceedings. Available online: <http://www.nwsgc.org/symposia.html>
- Presentation - Bighorn sheep survival and demography in the Yarrow-Castle Region of Alberta, 16<sup>th</sup> biennial Northern Wild Sheep and Goat Council conference, Utah, April 30<sup>th</sup>, 2008.

- Presentation - Bighorn sheep survival and demography in the Yarrow-Castle Region of Alberta, Alberta Chapter of the Wildlife Society annual conference, Edmonton, March 7<sup>th</sup>, 2009.

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