

Golden Rocky Mountain Bighorn Sheep Project – Phase 1

Wildsight Golden- April 2019

Rationale:

British Columbia is blessed with a substantial percentage (94%) of public lands totaling 88.7 million hectares (Smith et al. 2011). Despite this, wildlife struggle to maintain historic numbers and many species continue to decline. Minimum viable population (MVP) size is open to debate, especially for Rocky Mountain Bighorn Sheep (*Ovis canadensis canadensis*) which have a history of small populations. Most of the current BC populations of bighorn sheep are below the historically accepted MVP of 125 animals (Berger 1990, DeMarchi 2004, Krausman et al. 1992, Lande 1995), and bighorn sheep are a blue-listed species in BC.

Golden and Area A are fortunate to be home to a small herd of Rocky Mountain Bighorn Sheep which resides in the Kicking Horse Canyon and outskirts of Golden, BC. Evidence of sheep was found up Dart Creek (3 kms E of Golden) in the 1940s and they had been seen in the area in very small numbers until 1986, when the Golden Rod and Gun Club began a supplementation and recording program which lasted until 2015; by 2006, the herd had grown to 50 and 19 and 13 were moved in 2007 and 2009, respectively, to supplement other herds (Teske et al. 2011). Since 2009, the herd has remained below 20 animals and there are currently 12 animals based on spring surveys conducted over the last three years and recent observations (Langley, 2018).

Numerous possible factors currently limit the growth of the Golden herd. In addition to highways and rail systems, habitat fragmentation, forest succession, dense forest-replanting schedules, human habitation and recreational activity all squeeze sheep into smaller and smaller areas (Demarchi 2004). Other possible limiting factors include predation, poor food quality, disease, and inbreeding. While numerous factors are no doubt at play, this project aims to identify those most impacting the Golden herd.

Given that the herd is frequently seen from the highway, engaging vehicle passengers to record sightings could provide a large bank of sighting data useful for understanding highway mortality, future highway modifications and wildlife population tracking. Wildlife viewing is an exciting activity and the Golden bighorn sheep herd attracts and engages tourists as well as commuters. Unfortunately, few safe viewing options currently exist in the Kicking Horse Canyon though the Golden herd is often directly on the road, so easily seen. The Roadwatch Program has been successful in engaging the public in documenting wildlife (dead and alive) sightings in the Elk Valley, BC (Roadwatch 2018), and a similar concept has potential in the Golden area as various groups commute regularly including Parks Canada employees, school bus drivers, lawyers and tourists; a simple and free system exists for sharing locations using a smartphone application called “maps.me” and volunteer participation requirement will be minimal. Data of this type will be informative for future highway design, especially between Golden and Donald and its collection will engage the public in wildlife conservation (See Appendix 1: Wildlife Sightings, included at the end of this document). Learning about wildlife can lead to a greater connection with the natural world and opportunities to inform the

public and school children about wildlife ecology and protection are valuable for all involved.

Health of herd members influences herd viability and reproductive success rates (Cahn et al. 2011). Health can be measured by analysis of feces for parasite loads, stress level indicators and pregnancy (George et al. 2009, Schoenecker et al. 2004) and inbreeding. Fortunately, the Golden herd is well situated for avoidance of contact with domestic sheep from which they can catch respiratory infections (Decesare and Pletscher 2006, Poole et al. 2016) which are the greatest disease concern (Almberg et al. 2018). Cortisol levels are linked to stress responses in bighorn sheep and can also be measured from fecal samples (Miller et al. 1991, Coburn et al. 2010) to inform about general health.

Little is known about movement of Rocky Mountain Bighorn Sheep between populations in mountainous areas and the genetic relationship of the Golden population to nearby populations is not yet known. Fecal samples will inform about genetic inbreeding and connections with other herds (Whittacker et al. 2004). Male sheep are particularly prone to foray (O'Brien et al. 2014) which may serve to introduce genetic diversity into the herd but the relative isolation of the Golden herd could restrict population exchange.

Unlike most sheep herds, the Golden herd has the pressures of the TransCanada Highway #1 and the railroad, both occupying a large portion of the known current home range and heavily trafficked year round. Vehicle collisions were found to be the main source of mortality for ewes (46% of mortalities) in Colorado (Huzer 2015) and Keller and Bender (2007) found that sheep avoided habitat in proximity to vehicles. Highway accidents in the Kicking Horse Canyon are also a significant source of mortality for both the Golden herd (2 or more adult ewes were killed during summer 2018 (M. Nickle, pers. comm.)) and the Radium herd (Dibb 2011). Demarchi (2004) noted that: "roads and railways (e.g., Highway 97 in Vaseux, Canadian Pacific Railway, Highway #1 at Spences Bridge, Highway #3, and the highway from Radium through Kootenay National Park) occupy habitat, dissect migration routes, and result in direct mortality. Salt used for road maintenance can attract and hold sheep in highway corridors. In some cases, significant numbers of adults have been lost in single seasons."

Phase 4 of the Ministry of Transportation project to twin the TransCanada Highway #1 is planned to commence construction in early winter, 2020. With this work comes the opportunity to learn more about the Rocky Mountain Bighorn Sheep that reside in the Kicking Horse Canyon and how the herd will react to this major development in the midst of their home range. This is also an ideal opportunity to ensure that structures are built that allow sheep and other wildlife to continue to use the area without gaining access to the TransCanada Highway #1 (Huijser et al. 2008) as they currently do.

Based on diet analysis from feces plus habitat quality and use analysis, improving habitat quality, particularly winter range, could provide life-sustaining resources for the Golden herd (Demarchi 2004, Dibb 2011). Many sheep populations have distinct home ranges for winter and summer plus specific lambing sites to which they show high fidelity (Festa-Bianchet 1986, Poole 2013). The Golden herd uses a small area intensively as they use the same general area in both spring and winter; more data is needed to better define seasonal home range areas as well as to identify lambing sites. Infrared technology has proven useful in detecting wildlife (Blackwell et al. 2006, Cilulko et al. 2013) and the Kicking Horse Canyon would be a worthwhile location in which to test this technology.

Work done by the Ministry of Transportation in 2009 identified sheep lambing sites and more recent sightings concur with the 2009 finding. Sheep exhibit very high site fidelity to lambing sites (Festa-Bianchet 1986, Geist 1970, Poole et al. 2016, Shackleton et al. 1999) such that minimizing disturbance during lambing season (last 2 weeks of May- 1st week of June) becomes especially important. Other bighorn sheep have shown a preference for relatively flat spaces within rugged terrain, areas that were close to perennial streams, south and west facing slopes, and against anthropogenic disturbance (Smith et al. 2015).

Possible areas for habitat restoration have been identified (Klafki and Pezderic 2005) and several Ministry of Transport studies have identified suitable habitat in the canyon; further work is needed to determine the best approach and location for habitat improvements. Success has been achieved with restored areas adjacent to existing home ranges and modelling tools can be used to predict the most suitable locations for enhanced sheep habitat (Dibb 2011). Enhanced habitat could keep sheep away from the highway corridor and thereby reduce chances of highway mortality.

Objectives:

1. Engage highway user groups and tourist to share wildlife sighting along Hwy 1 between the 5 mile bridge, Donald and Radium and increase local knowledge and engagement with bighorn sheep and other local wildlife.
2. Develop baseline herd health data from fecal analysis based on degree of inbreeding, stress hormone levels, pregnancy status, parasite loads and diet quality.
3. Determine the extent of genetic interchange between Golden herd and other area herds, for which genetic data already exists.
4. Evaluate lambing success.
5. Identify seasonal ranges and critical habitats (including lambing areas).
6. Assess current range quality and use levels and characterize habitat features.
7. Determine most effective habitat enhancement sites.

Study Area:

The study area extends from the eastern outskirts of Golden, BC, east along the TransCanada Highway for 7 kms, south of the highway to the Kicking Horse River and north of the highway for 500m. The area is primarily classified as Kootenay Dry Mild Interior Douglas-fir Variant (IDFdm2) which is located along valley bottoms and lower slopes of the Rocky Mountain Trench south of the Blaeberry River, and valley bottoms of major tributary valleys such as the Spillimacheen, Kootenay, Finlay, St. Mary, and Wigwam (Braumandl & Curran 1992). The TransCanada Highway #1 bisects the length of the study area.

Methods:

Community members who regularly commute East or West on the TransCanada Hwy #1 , as well as tourists and other interested community members, will be approached and asked to observe and document wildlife (alive and dead) sightings on the highway. They will be provided with instructions for location and details sharing and asked to email location data and details for data entry and analysis (See Appendix 1: Wildlife Sightings, included at the end of this document). Educational sessions about Rocky Mountain Bighorn Sheep will be offered at schools and to the public. Community members, and especially youth, will be have opportunities and be encouraged to learn about ungulates in our area.

Fecal samples will be collected, frozen and delivered to labs at U of Alberta, U of Calgary, the Toronto Zoo and U of Washington for analysis. Samples will only be collected if they have been seen to have been excreted by a bighorn sheep or are surrounded by bighorn sheep tracks as bighorn sheep pellets can resemble those of mule deer (*Odocoileus hemionus*). Bighorn sheep fecal material will be analyzed for genetic variability and individual signature, parasite load (Flanagan 2009), glucocorticoid metabolites (Miller et al. 1991, Coburn et. al. 2010), pregnancy status (Schoenecker et al. 2004) and diet quality.

Genetic information will be compared to similar data from herds in Alberta and BC to establish relatedness. Lambing success will be determined from frequent observations made in late May and early June. Fecal data re. pregnancy status will be compared to actual success to determine success rates.

Data collected since 2016 suggests a fairly small home range along both sides of Hwy1. Regular trips through the study area will continue to document bighorn sheep locations as well as activity and composition of the herd. An infrared spotting scope will also be used to assist in locating sheep. Lambing areas will be determined through daily observations from the highway without disturbing sheep. Location data will be entered into ArcGIS and will be especially important during lambing season and for herd size and composition estimates.

Range condition and habitat use will be assessed by transect sampling (Wagner and Peek 2006) and habitat analysis will be completed of random sites within home ranges, random sites from the larger area and lambing sites using GIS data following similar methodology used to qualify moose calving sites (Langley and Pletscher 1993). The following variables will be statistically analyzed to identify key features of sheep home ranges and of lambing sites: elevation (m), slope (degrees), aspect, solar radiation index, distance to nearest escape terrain (m), distance to nearest water (m), distance to nearest road (m), distance to nearest xeric grass or shrubland (m), distance to nearest open canopy forest (m), distance to nearest closed canopy forest (m).

Habitat restoration options will be assessed and areas away from the highway will be considered. Maps of suitable habitat, created for the Ministry of Transportation, suggest best places for consideration along with other GIS layers. Discussions with current land managers, woodlot managers and private landholders will lead to recommendations regarding the best areas to restore and restoration will be proposed as part of highway construction, if possible.

Appendix 1-Wildife Sightings

Wildlife Sightings: Recording and Sharing

This aspect of the Golden Rocky Mountain Bighorn Sheep Project-Phase 1 involves recruiting individuals to record and share wildlife sightings (dead or alive, any species). This activity will engage members of the community and tourists and offer an opportunity for education and inclusion.

Individuals who use the highway frequently would be targeted (Parks Canada employees, school bus drivers, CP rail staff, lawyers travelling to court, etc.) as would tourists and travelers via information at visitor centers and charging locations.

Recruits would be asked to do the following as often as possible:

1. Download the free app “maps.me”
2. Download the map for the Golden area
3. When they see wildlife, keep driving and make a bookmark on the map
4. Save the location
5. Edit the location bookmark to include the date, time, number of animals seen, species, sex, activity*
6. Save the changes
7. Share the location by email
8. Enter the email goldenwildlifesightings@gmail.com**
9. Send

*Educational material will be made available to help know the species, sex and age as well as general information about wildlife likely to be seen in the area. Codes for data entry would also be provided.

** From here latitude and longitude of the location will be entered into GIS and maps.me for both creation of a large databank and a personal log of the adventure.

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