

Fraser River Disease Assessment, Herd Connectivity and Recovery

Thompson Region Year 2



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Project Background

Rugged escape terrain and open grasslands along the benches of the Fraser River provide over 150 kms of continuous habitat for California Bighorn sheep (*Ovis canadensis*) (Fig. 1). The bighorns that occupy this area are part of the Fraser River metapopulation, which together makes up approximately 60% of BC's California bighorns, with the remainder in the Thompson, Okanagan, Similkameen and Kettle valleys of BC. Following a peak in surveyed populations in the early 1990's the Fraser River bighorns have declined by over 50% with the estimated number of bighorns now at 500 sheep within the Thompson Region (southern portion of study area) and 300 sheep within the Cariboo Region (northern portion). Aerial surveys from 2019 noted that herds on the west side of the Fraser River within management unit 3-32 had declined by 16% just since the last survey in 2016. Poor lamb recruitment is widespread throughout the study area.

In 2011, in response to reports of sick lambs within the Pavilion herd (east side of Fraser River, near Lillooet), health samples were acquired and confirmed that sheep were carrying *Mycoplasma ovipneumoniae* (M.ovi) (Struthers *et al.* 2012). M.ovi is a respiratory pathogen originating in domestic sheep that invades the bighorn sheep lungs and predisposes affected animals to polymicrobial pneumonia (Besser *et al.* 2008, Cassirer *et al.* 2017). More recently, Provincial wildlife staff implemented a M.ovi testing program for wild sheep brought in for compulsory inspection. Thanks to this hunter-harvest surveillance program, an additional M.ovi positive bighorn ram was confirmed within the Marble range, where there is known connections among herds to the east (Chasm herd) and to the west (Fraser River herds). The widespread population declines and poor lamb recruitment observed in the study area may be explained by M.ovi persistence in these interconnected herds.

Building upon this foundation of work, the Wild Sheep Society of BC provided start-up funding to support a collaborative project between Ministry FLNRORD Thompson Region staff, the Provincial Wildlife Health Program, and the Provincial Domestic-Wild Sheep Separation Program Coordinator. The Wild Sheep Foundation and the Habitat Conservation Trust Foundation have provided critical financial support for this project in Year 2. This project has three core goals:

- 1) Determine the prevalence of M.ovi within bands of bighorn sheep occupying Fraser River bighorn sheep range within the Thompson Region;
- 2) Determine levels of herd connectivity between bands of sheep;
- 3) Implement herd recovery through the removal of M.ovi positive ewes "test and remove" to help persistent infected populations clear M.ovi and improve lamb recruitment.

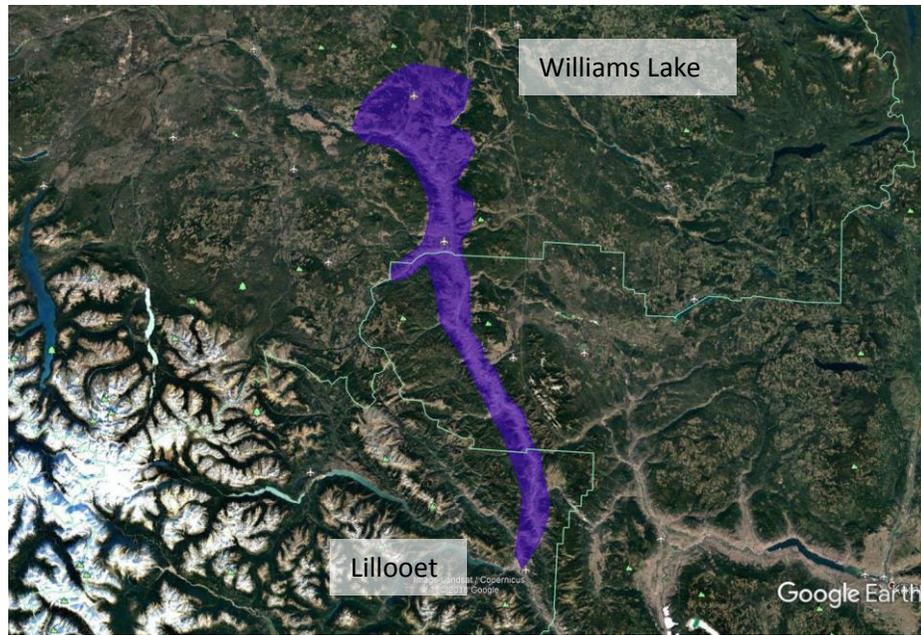


Figure 1. Study area for the Fraser River bighorn sheep disease assessment and recovery project

Summary of Activities Completed

Year 1 (2018-2019)

Aerial capture of 52 bighorn sheep were completed, with a focus on health sampling to determine prevalence of *M.ovi* and other bighorn sheep health determinants (following WAFWA 2015 Herd Health Monitoring Recommendations). Each captured sheep was assigned a unique Provincial Wildlife Health Identification number. Health samples were sent to the Abbotsford Health lab (AHC) for polymerase chain reaction (PCR) and Washington Animal Disease Diagnostic Lab (WADDL) for serology testing to determine the presence of antibodies to *M.ovi*. We deployed 40 Vectronic GPS iridium satellite tracking collars on ewes only.

Results from that first year of sampling confirmed 10% of nasal swab samples were *M.ovi* positive (5/52). Bighorn sheep that test positive for *M.ovi* on nasal swabs are actively shedding the bacteria. In blood serum samples, *M.ovi* positive detections were found in 20% of sampled bighorns (8/52 with 2 indeterminate). Bighorn sheep with *M.ovi* antibodies in blood serum have been exposed to *M.ovi* in the past and may or may not have cleared it. *M.ovi* positive samples (both nasal swabs and blood serum) occurred on both east and west sides of the Fraser River.

Year 2 (2019-2020)

In an attempt to break the cycle of *M.ovi* transmission from ewes to lambs, we chose to trial a test and remove approach in a treatment band of sheep on the west side of the Fraser River where Year 1 results confirmed prevalence of *M.ovi* and connectivity with other herds was low. This experimental trial will also provide wild sheep managers with more information on the feasibility and effectiveness of this

recovery option that has not yet been attempted in Canada. The project will provide useful information on the challenge of capturing >90% of all ewes and yearling rams in a band of sheep, as well as the novel use of portable Polymerase Chain Reaction (PCR) units in the field. Two Biomeme real-time PCR thermocyclers and required accessories were purchased by the Wild Sheep Society of BC, and the Wild Sheep Foundation. Cost per unit and ancillary equipment and supplies was over \$10,000 per unit. To our knowledge, this is the first project in Canada using animal-side PCR testing on bighorn sheep to detect M.ovi.

For the treatment herd, we selected the Ward Creek band of sheep (Fig. 2), located between Watson Bar and French Bar Creeks on the west banks of the Fraser River. Surveys indicated essentially no lamb survival during the past 2 years, and Year 1 sampling (2019) indicated a higher prevalence rate of females shedding M.ovi than elsewhere on the Fraser River. This band also represents the largest nursery group on the west side of the Fraser in Region 3. Kernel home range analysis from collared animal locations were used to determine treatment and control herd boundaries (Fig. 3).

In February and March of 2020, in partnership and collaboration with several groups (Government of BC, Wild Sheep Society of BC, Wild Sheep Foundation, Wild/Domestic Sheep Separation Program, Arcadia Outfitting, Ward Creek Ranch, Filter Studios and the St'at'imc Nation), we captured, tested and removed M.ovi positive ewes from the Ward Creek band of sheep. During the 7 logistically complex field days over 2 sessions, crews of 12-15 people completed helicopter capture and sampling of 47 bighorn sheep (46 ewes, 1 juvenile ram) in a remote area of the treatment bighorn sheep range. We were confident that 95% of the ewe population within the treatment band were captured and tested. First Nations community members attended each field session and provided valuable support. A documentary film crew (Filter Studios) was on-site during the first field season. The documentary film is funded through the Habitat Conservation Trust Foundation (HCTF) and will develop a film on M.ovi and the risk to wild sheep. Ministry of Agriculture staff working on M.ovi policy options in BC also attended one of the field session to witness the project first hand. The timing of this project, and the parallels with the unfolding Covid 19 pandemic were not lost on anyone. Wild sheep and domestic sheep don't do social distancing well.

Out of the 47 bighorn sheep captured, 11 tested positive for M.ovi and were euthanized. Tissue samples from euthanized bighorns (lung, liver, adrenal gland, heart, spleen, trachea, kidney) were shipped to Animal Health Lab (AHC, Abbotsford) for histopathology, bacteriology, and PCR for M.ovi. Replicate nasal swabs were also sent to the AHC (Abbotsford) and WADDL (Washington). Blood serum samples have also been sent to WADDL and all M.ovi positive DNA extracts (from PCR testing of nasal swabs) will be analyzed at WADDL to determine strain type.

Fraser River Bighorn Sheep

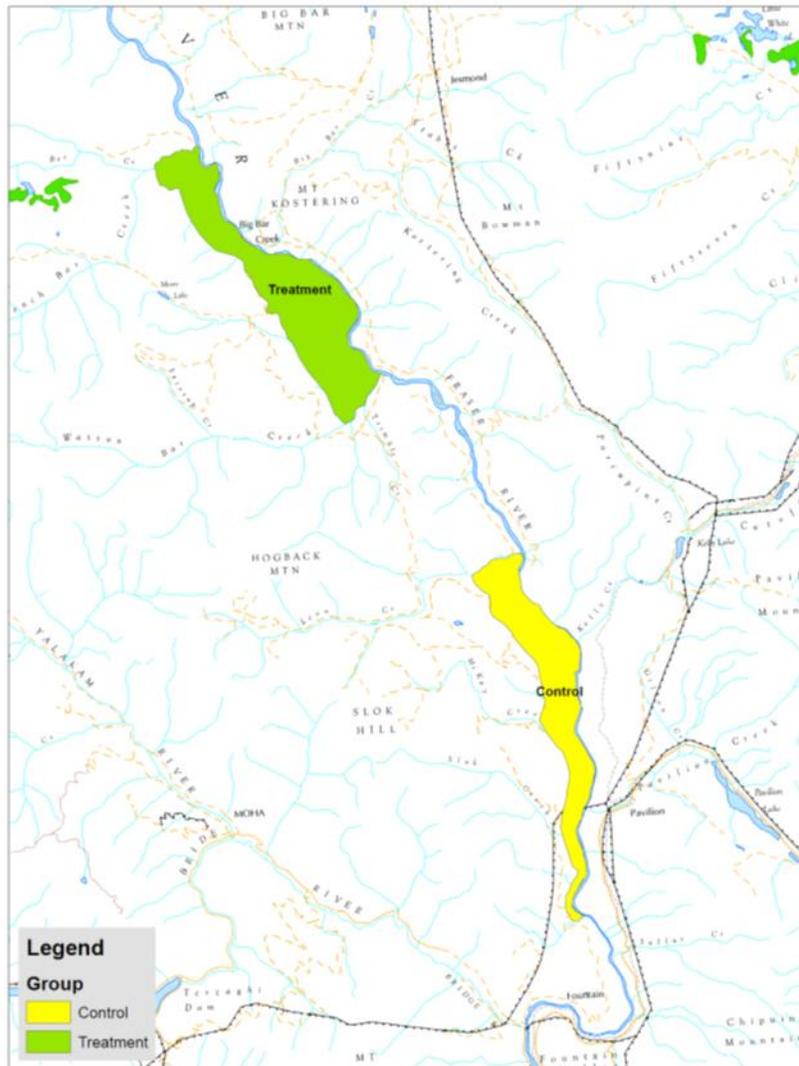


Figure 2. Test and Remove, treatment herd at Ward Creek (North- Green) and control herd at Leon Flats (South-Yellow).

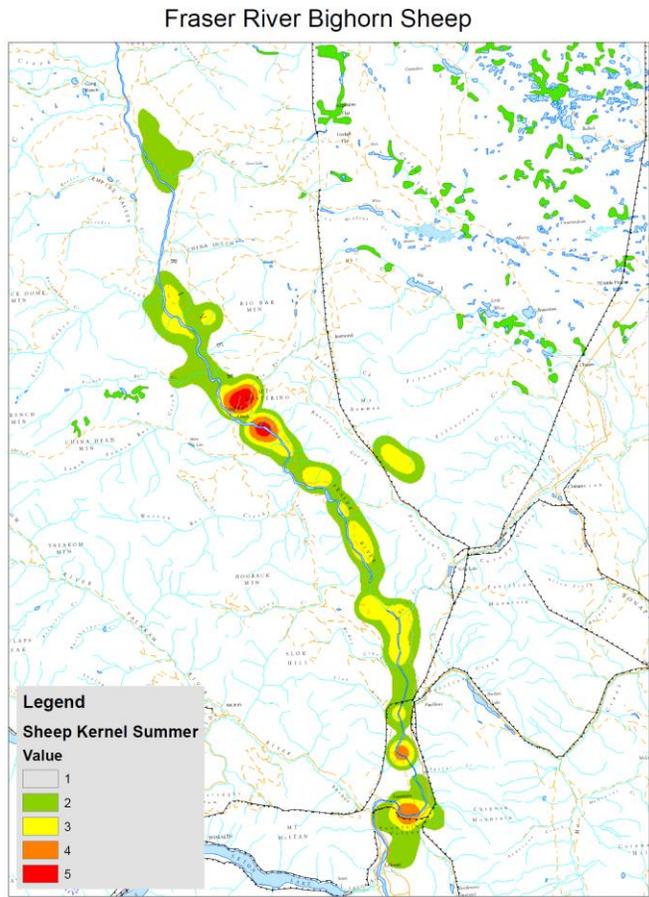


Figure 3. 95% Kernel Summer home range of Bighorn Sheep within the Fraser Study Area.

Summary of Project Activities to Date

- Since capture and sampling 52 bighorns and collaring 40 (March 2019), 6 mortality alerts from collared bighorns were investigated via helicopter flight from Kamloops to attempt to determine cause of mortality and to collect samples when possible
- Aerial lamb counts and collar analyses were completed to identify appropriate treatment and control bands
- Late winter (Feb-March) helicopter capture with field support crews of 12-15 people in remote location on Fraser River was planned, coordinated, and successfully executed, capturing and testing over 90 % of treatment band
- Two Biomeme animal-side PCR units were purchased and tested by veterinarians with Min FLNRORD wildlife health staff at AHC Lab in Abbotsford using known M.ovi positive samples
- 47 bighorn sheep were captured, sampled, and animal-side tested for M.ovi
- 11 bighorn sheep that were actively shedding M.ovi were removed from the population
- Replicate nasal swab samples have been submitted to 2 different labs for comparative analyses
- Tissue samples from euthanized animals have been submitted to lab
- Annual progress report has been completed
- Members from the Wild Sheep Society of BC, Guide Outfitters Association, and First Nations, are involved with summer lamb count surveys.

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