

# yilíkʷlɬkn (Bighorn Sheep)

## Psoroptic Mange Initiative Information Update



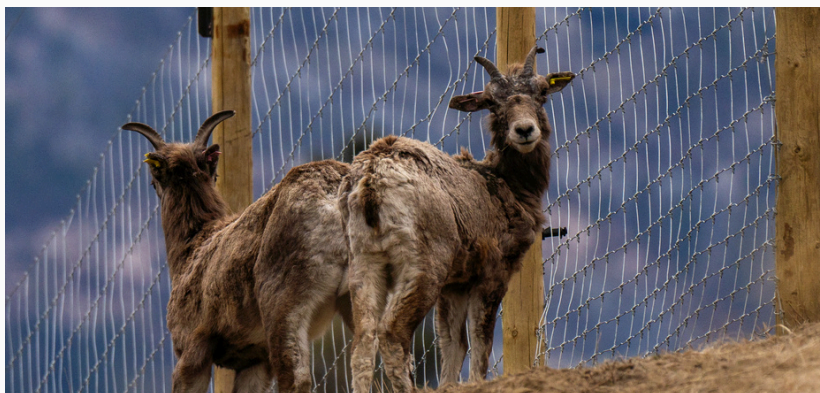
### BACKGROUND

Since time immemorial, yilíkʷlɬkn—bighorn sheep (*Ovis canadensis californiana*), have held deep cultural, ecological, and spiritual significance for the Syilx people, with whom they have long shared the tmxʷulaxʷ (land) and siwłkw (water). They have served as a vital subsistence resource for some communities, particularly in areas without large salmon runs, and continue to be highly valued by tourists, wildlife photographers, hunters, and residents as charismatic megafauna.

Across the Okanagan Valley, however, bighorn sheep have experienced substantial habitat loss and repeated disease outbreaks. The region's four subpopulations (Granby, South Okanagan, Ashnola-Similkameen, and Westside Road Population Units) have been affected by various diseases, including epizootic hemorrhagic disease (EHD), pneumonia linked to *Mycoplasma ovipneumoniae* introduced by domestic sheep, and Psoroptes mange caused by the introduced mite *Psoroptes cuniculi*. As a result, only about 700 bighorn sheep remain in the Okanagan today. In response, the Okanagan Nation and Wild Sheep Society continue to lead extensive monitoring and protection efforts focused on disease prevention, early detection, and maintaining habitat connectivity.

### WHAT IS PSOROPTIC MANGE?

Psoroptic mange (*Psoroptes sp.*) is a parasitic skin disease caused by mites that can have profound impacts on the health of yilíkʷlɬkn. Infestations lead to intense irritation, hair loss, inflammation, open sores, and scab formation. In advanced cases, thick crusting, particularly around the ears, can impair hearing and increase vulnerability to predators. Although these mites are not contagious to humans, they can persist in the environment for nearly a month in cold, dry conditions, enabling ongoing transmission among wild sheep.



(yilíkʷlɬkn (Bighorn Sheep) infested with Psoroptic mange, 2025)



The Syilx Nation continues the work of our ancestors by caring for the land and the living things that inhabit it. This initiative is part of our broader mission of naqsmiʔst ʔəl tmixʷ.

naqsmiʔst ʔəl tmixʷ is an nsyilxcən term that roughly translates to “coming together for all tmixʷ (all living things)”. This phrase highlights our commitment and duty to work collectively on all matters of mutual interest in respect to tmixʷ and tmxʷulaxʷ within the traditional Syilx territory.





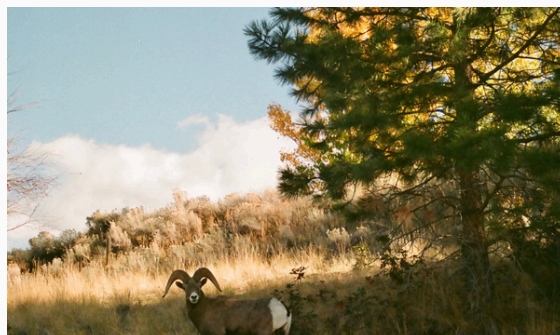
## Okanagan Region - Disease Work Updates

From 2024 into early 2025, the Okanagan Nation Alliance, WLRS, WSSBC, Syilx communities, and partners advanced major bighorn sheep initiatives, including maintaining 20–30 active GPS collars, deploying four new units, and completing TEK-informed habitat modelling to identify priority sites for connectivity and disease mitigation. Significant progress was also made on the Psoroptes Treatment Trial, with partners securing permits, building and repairing four 5-acre handling pens, and capturing 28 bighorn sheep, 11 of which have since produced healthy lambs.

In 2025, efforts focused on launching the new drug trial, importing medications, and completing ongoing animal-care work. An additional 36 GPS collars are being deployed in the Ashnola–Similkameen and South Okanagan herds to monitor disease spread, movement patterns, mortality, treatment outcomes, and high-risk contact zones. These expanded data will support baseline assessments, model transmission pathways, compare treated and untreated animals, and inform long-term herd-level management.

To coordinate disease response across borders, a transboundary working group was established with WDFW, the Colville Confederated Tribes, ONA, and the BC Wildlife Branch. The group has initiated joint population monitoring, disease surveillance, cross-border management planning, a US–Canada risk-of-contact model, and increased outreach to domestic sheep producers, including targeted testing of flocks within bighorn sheep range. A First Nations Policy Working Group, representing five Nations, and supported by the domestic sheep separation team.

ONA and the WSSBC are also collaborating on policy documents, minister letters, and continued advocacy to maintain wild–domestic sheep and goat separation.



## DISEASES IMPACTING yilíkʷlɔkn

### Epizootic Hemorrhagic Diseases (EHD)



**Bluetongue virus (BTV) and Epizootic Hemorrhagic Disease (EHD)** are midge-borne viral diseases of wild and domestic ruminants that can cause severe mortality during hot, dry conditions.

A major EHD outbreak occurred in the 1970s, and in 2021 BTV was confirmed in bighorn sheep near Mount Hull, Grand Forks, and the South Okanagan, resulting in heavy losses—including 75% and 40% population declines in Grand Forks and the South Okanagan, respectively—likely compounded by concurrent *M. ovi* infections.

In fall 2025, five EHD cases were confirmed in both the Ashnola–Similkameen and South Okanagan herds, and Bluetongue remains a non-treatable disease whose occurrence is driven by climate-related midge activity.

### *Mycoplasma ovipneumoniae* (*M. ovi*)



*Mycoplasma ovipneumoniae* (*M. ovi*) causes little illness in domestic sheep and goats but can lead to severe pneumonia outbreaks, major die-offs, and long-term poor lamb survival in wild sheep such as yilíkʷlɔkn. Within Syilx Territory,

*M. ovi* is established in the South Okanagan Population Unit, where a 1999–2000 outbreak caused a ~75% population decline and over a decade of low recruitment; renewed detection in 2020, genetically linked to the 2019 Mount Hull outbreak in Washington, confirmed ongoing transboundary transmission.

Although no cases are currently detected in the Ashnola–Similkameen herd, strong cross-border and valley-wide connectivity, combined with nearby domestic sheep operations, continues to pose a significant risk of future introduction.





## PSOROPTES CUNICULI

The Okanagan has historically supported a robust population of yilíkʷlxkn, with herds occupying both the east and west sides of the southern valley south of Kelowna. yilíkʷlxkn in the southwest portion of the Okanagan region of British Columbia are affected by a strain of Psoroptic mange—*Psoroptes cuniculi*, that has not previously been documented in bighorn sheep (Hering et al., 2021). *P. cuniculi*, typically known as an ear mite of domestic rabbits, has been identified in a specific bighorn sheep population in the southern Okanagan Valley, where it causes severe ear lesions and a broader systemic skin disease. Evidence suggests that the introduction of this parasite to local bighorn sheep likely originated from contact with infested rabbits at a wildlife park that closed in 1999 (Hering et al., 2021). Since its emergence, the disease has persisted and spread among nearby herds in the Ashnola-Similkameen Population Unit (Figure 2) (Harris et al., 2018; Reid, 2012).

## Ashnola-Similkameen Population Unit

The Ashnola-Similkameen Population Unit (ASPU) spans from Okanagan Mountain Park in the north to the border with Washington state (Figure 1). The ASPU historically was a robust and well-distributed population, with animals crossing the border between Washington State and British Columbia. The British Columbia population has undergone significant fluctuations over the past century. Domestic sheep allotments were removed from Flatiron in 1924; however, anecdotal reports suggest that interactions and grazing conflicts with domestic sheep persisted into the mid-1950s.

A population high was documented in the Mid-1900s, with estimates ranging from 350 to 600 animals in the ASPU. Since then, declines have occurred in the early 2000s, with a continued decline until 2018, and a population stagnation has continued. Currently, the ASPU is estimated to have a population of around 175 individuals.



examples of Psoroptic mange infestation clinical symptoms

As an indicator species, the health of yilíkʷlxkn reflects the broader condition of the ecosystem.

The emergence of diseases such as Psoroptic Mange highlights the need for proactive, coordinated, and collaborative management.

Addressing these health challenges not only helps safeguard yilíkʷlxkn but also supports the well-being of other wildlife and livestock that share the landscape.

## Ashnola/Similkameen Population Unit

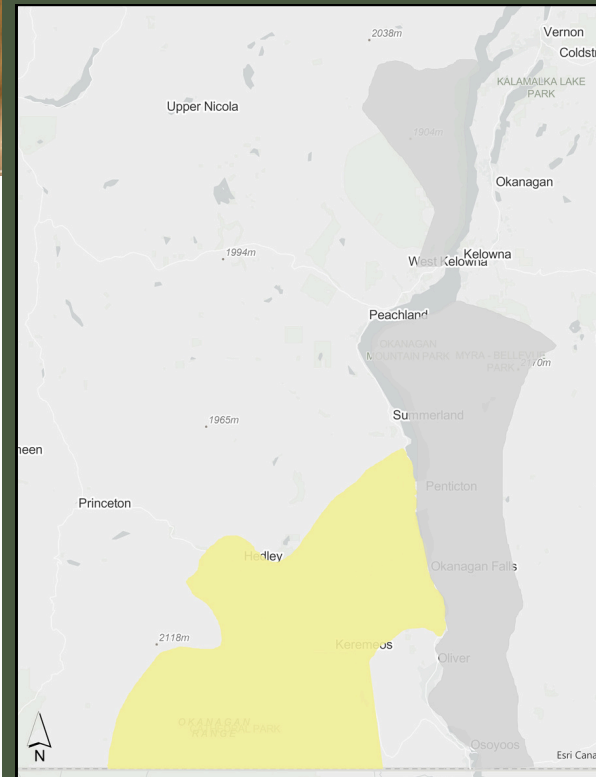


Figure 1: Ashnola-Similkameen Bighorn Sheep Population Unit in British Columbia.

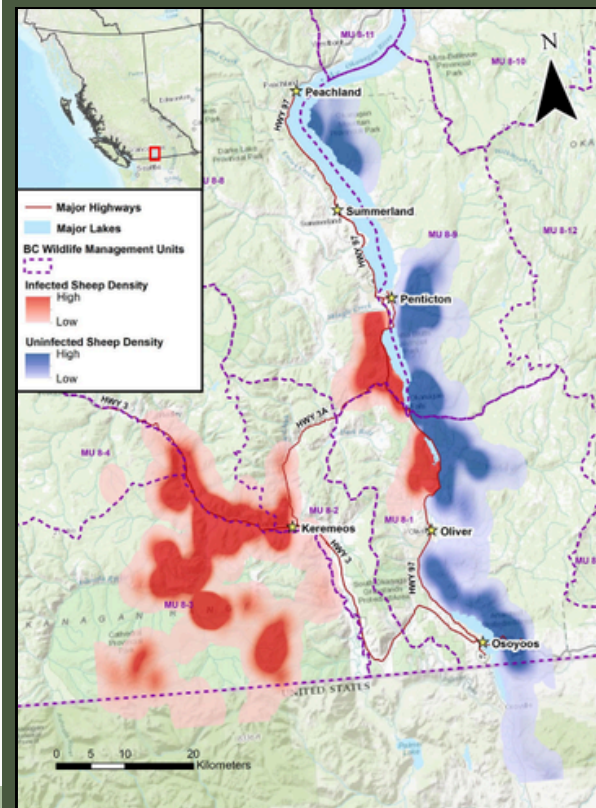


Figure 2: Estimated densities of bighorn sheep with Psoroptic Mange (red) and *Mycoplasma ovipneumoniae* Bacteria (blue) in the Okanagan Valley. The study this figure is from, can be found at the following QR code.







## yilíkʷlɁkn (Bighorn Sheep) Psoroptic Mange Clinical Trial

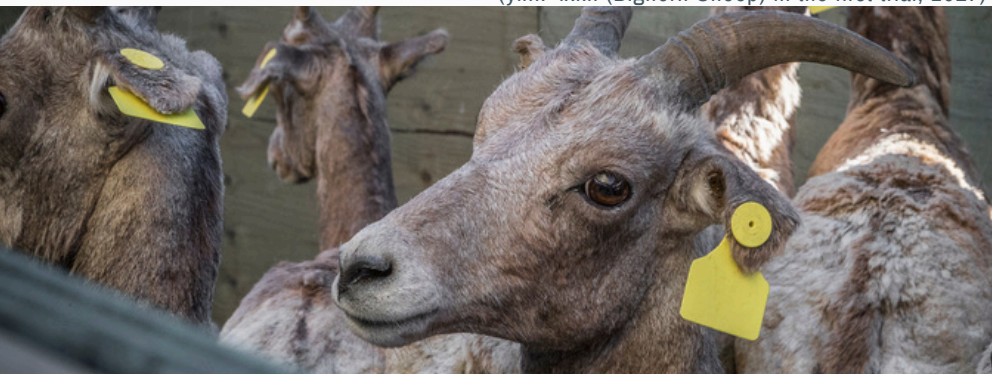
Since Psoroptic Mange is not a naturally occurring disease in yilíkʷlɁkn, there is an inherent responsibility to work toward eradicating it from affected populations. There is also a responsibility to do everything possible to prevent its further spread to naïve or currently unaffected herds in other regions.

A pilot project completed in 2019, jointly run by the Penticton Indian Band, the BC Ministry of Forests Lands and Natural Resource Operations, and the University of Saskatchewan, attempted to find a treatment for Psoroptic mange and demonstrated that a single dose with a new oral antiparasitic medication called Fluralaner (FLEXOLT ) could likely clear bighorn sheep of infestation after only a single treatment and would provide some period of protection from re-infestation (Hering, 2020).

However, the study ran out of time to determine the final duration of protection, and the relatively small sample size used in the pilot study (2-3 animals per treatment group) left some further uncertainty. Therefore, further affirmation and testing are required before Fluralaner can be used on free-ranging bighorn sheep. It is anticipated that animals treated with Fluralaner will experience complete treatment and may be protected from re-infestation for between 1 and 2 months following a single administration. New advancements in treatments have occurred since the last trial, with new clinical drug options now available.

The current research is using naturally infested bighorn sheep from the affected herds into four research enclosures and treating them with long-acting ML, Moxidectin (Cydectin 2% LA, Zoetis Ltd), the previously tested oral Fluralaner treatment, or a combination treatment combining ML and Fluralaner. The information provided by this trial will form the foundation of future disease treatment initiatives. This research aims to provide wildlife managers with effective treatment options and information on the period of protection that animals could have before the first animals become susceptible to re-infestation from untreated herd mates. This information will form a crucial part of a future treatment plan for wild sheep populations.

(yilíkʷlɁkn (Bighorn Sheep) in the first trial, 2017)



## Clinical Drug Trial Objectives

### Project Objectives:

This work is part of a larger adaptive wildlife management strategy to develop practical, applied, effective, and ecologically sound approaches to managing *Psoroptes* sp. infestations in bighorn sheep. From a sustainability perspective, bighorn sheep herds in the Okanagan are now under serious threat, with a significant decline in animal numbers in affected herds. However, some herds we believe remain free of mange, which provides hope for reducing its prevalence. Whole-herd treatments are feasible over time, and mass capture methods using bait areas with large drop nets or corral traps are available. However, the first step is demonstrating efficacy before moving to these whole-herd treatments. Two parallel investigation objectives regarding *Psoroptes* management in BC should be prioritized simultaneously.

### 1. Trial and Treatment Efficacy

- Confirm treatment options, dosages, delivery, and efficacy in wild and captive yilíkʷlɁkn.
- In a 15-18 month trial, ~36 *Psoroptes*-infested yilíkʷlɁkn will be treated in captive enclosures to assess drug effects.
- Assess yilíkʷlɁkn population response to large-scale treatment.

### 2. Disease Monitoring and Spread Prevention

- Monitor *Psoroptes* spread to uninfected populations in BC and Washington.
- Use ELISA testing to detect infections early and validate their effectiveness for yilíkʷlɁkn.
- Track yilíkʷlɁkn population metrics (mortality, growth) and prevalence in infected populations.

### Drug Objectives

Fluralaner (FLEXOLT) and long-acting Moxidectin (Cydectin 2% LA) show promise as drugs for achieving the goal of herd-wide treatment. The next research steps with these drugs are as follows: 1- Confirm that Fluralaner (FLEXOLT), long-acting Moxidectin (Cydectin 2% LA), or a combination of both effectively clear infested bighorn sheep of *Psoroptes* infestation following a single treatment.

2- Determine the length of protection against re-infestation provided by the treatment

3- Determine which drug is the most effective and should be prioritized for broader use in a larger population

### Expected Impact

This work aims to establish an effective, scalable treatment for *Psoroptes* in wild sheep herds, advancing adaptive wildlife management strategies to sustain wild sheep populations across BC and internationally.





# TRIAL UPDATES

Following the safe capture and transport of the selected bighorn sheep for the Psoroptic Mange Clinical Trial, the animals have now settled into the research pens. After placement into the pens, they become increasingly accustomed to their new environment, which will serve as their home for the next 15–18 months while the trial is underway. The sheep are fed a mixture of grass and alfalfa hay every day, and a grain mixture.

The first lamb arrived on Easter Monday morning. We've taken the time to let the sheep settle into their new environment and reduce stress, creating optimal conditions for both healthy births and the eventual commencement of treatment. Once the lambs are well bonded with their mothers and everyone is fully acclimated, we begin the next steps and conduct our first handling to take samples and trim their hooves.

The next step in the drug trial was to administer the designated drug treatments to the animals in each pen.



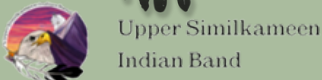
yilíkʷlxkn (Bighorn Sheep) Pens: Ewes from Pen 1 Feeding, 2025.



yilíkʷlxkn (Bighorn Sheep) getting their hooves trimmed, 2025

# PROJECT LEADS

This work would not be possible without the countless volunteer hours and the exceptional collaboration among project leads and partners. Below are several of the key project leads, and we will be publishing a comprehensive volunteer and partner update report in the new year.







## Drug Administration

Drugs for this research project, had to be approved by Health Canada and then imported from two different factories in Australia and New Zealand. Significant delays occurred when working with Health Canada on the Experimental Studies Certificates, delaying drug administration. Drugs were finally imported into Canada in October, with the drug administration booked for November.

### Clinical Trial Drugs were administered to 28 of the 37 yilíkʷlɔkn.

- Pen 1
  - received Fluralaner.
- Pen 2
  - received a combination of both Fluralaner and Moxidectin.
- Pen 3
  - received Moxidectin.
- Pen 4
  - did not receive treatment and are the control animals that will be used to test the drug's effectiveness.

Over the coming months, we will continue conducting monthly evaluations of each treatment to assess both its effectiveness in clearing Psoroptic mange infestations and the duration of protection provided against re-infestation. All handling procedures follow established best practices and approved animal-care protocols. During processing, animals are blindfolded to reduce visual stimuli, and their legs are gently hobbled to minimize stress and ensure safe, efficient handling.

Animals will be brought back into the handling system one month after treatment to assess for active infestation development. This step will confirm whether re-exposure has occurred and will support evaluation of the prophylactic longevity of the Fluralaner and Moxidectin treatments. ELISA blood tests will be used to detect secondary antibody responses, typically emerging within 2–3 days post-exposure, which provide an additional confirmation of infestation status.

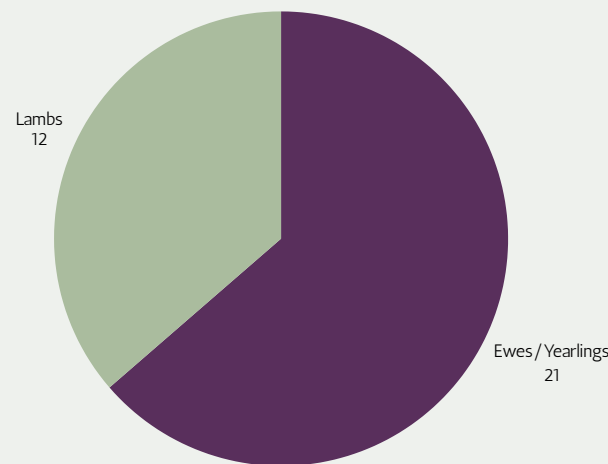
This approach offers a robust, practical, and ecologically relevant framework for studying *Psoroptes* sp. infestations. By closely simulating natural reinfestation dynamics, the study will generate meaningful insights into transmission pathways, treatment efficacy, and long-term disease management strategies for yilíkʷlɔkn populations.

Preliminary observations already show improvements in hair coat condition among treated animals. While further analysis and laboratory testing are still required, the early results are promising and indicate positive treatment response.

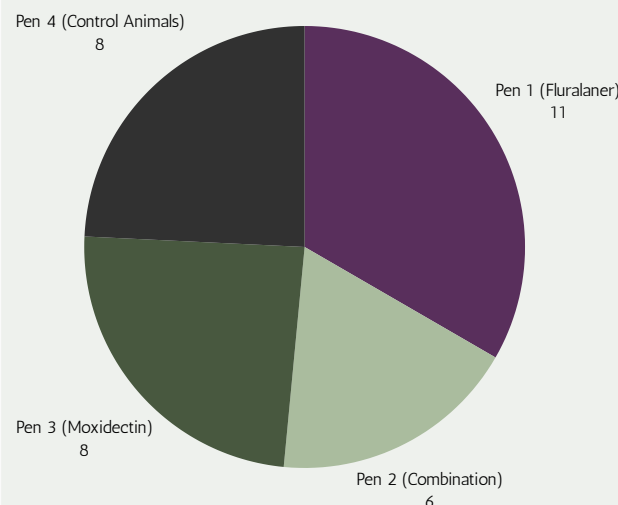


BEFORE and CURRENT of a yearling yilíkʷlɔkn (Bighorn Sheep) that was treated in November, 2025.

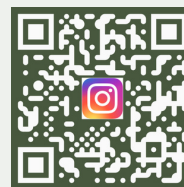
Treatment Summary by Sex/Age



Treatment Summary by Pen



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 tmix<sup>™</sup> Program Lead  
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[mclarke@syilx.org](mailto:mclarke@syilx.org)



# Frequently Asked Questions

## Bighorn Sheep Psoroptic Mange Trial



### **Are the yilíkʷlɔkn that are being captured for the trial ever coming back to their herds?**

Yes! All yilíkʷlɔkn will be returned to their original capture locations. Upon release, ewes should be pregnant and accompanied by their lambs. The lambs will receive an enhanced start to life by being raised in secure pens, ensuring protection from predators during their early development.

### **What methods were being used to guide the sheep into the pens?**

yilíkʷlɔkn are habitual animals. PIB staff worked to determine areas where the sheep have been spending time and baited these areas to try to use Corral Traps to catch large groups simultaneously. A mild winter prevented corral trapping from working, but the sheep were captured using Helicopter net-gunning.

### **Have there been previous treatment trials?**

Yes! A 2016-2019 trial found that Fluralaner (BRAVECTO™), an oral antiparasitic, effectively treated Psoroptes in yilíkʷlɔkn, but the duration of protection was undetermined. Additional trials are needed to refine dosage, duration, and delivery for free-ranging herds.

### **Will there be opportunities to visit the pens?**

Absolutely! People will have the chance to visit the yilíkʷlɔkn. To prioritize the animals' well-being, we will arrange small group visits that encourage expressions of gratitude, respectfully and thoughtfully. Sharing the work being done by the Nation with the community is a priority,

# Frequently Asked Questions

## Bighorn Sheep Psoroptic Mange Trial



### Are you using medicine for the yilíkʷlxkn or is it a drug?

The term “drug” refers broadly to any chemical compound used to affect biological processes. In contrast, “medicine” refers specifically to those drugs used with the intent to treat, prevent, or manage disease. All medicines are drugs, but not all drugs function as medicines. For clarity, the products referenced in this study, such as Fluralaner and Moxidectin, are drugs we are trialling. These drugs will be considered a “medicine” if one of them works and is then explicitly administered to improve the health of yilíkʷlxkn by treating Psoroptic mange.

### How are the yilíkʷlxkn given each drug?

Fluralaner is administered orally using a drench gun, which ensures the full dose is delivered safely and allows the animal to swallow the medication properly.

Moxidectin is given as a subcutaneous injection, meaning it is injected into the layer of tissue just beneath the skin, specifically behind the ear, to ensure accurate and effective absorption.

### Why can't we let the yilíkʷlxkn heal on their own or give them food or supplements?

The yilíkʷlxkn in these herds have been infested with *Psoroptes cuniculi* for more than 20 years and have been unable to clear the infestation naturally, even with supplemental feeding using hay and minerals. Since *Psoroptes cuniculi* is not naturally occurring in bighorn sheep, these animals have no natural resistance to the parasite. We are observing poor recruitment in affected populations, with yearlings appearing to be more severely impacted. The systemic hair loss, scabbing, and overall decline in condition associated with mange likely increase vulnerability to predation and exposure-related mortality.

Even within the controlled pen trial, where animals receive high-quality hay, minerals, and grain daily, they remain unable to clear the infestation without treatment. While intervention in natural systems is typically avoided, this infestation was human-introduced, and as such, we have a responsibility to mitigate its impacts and work toward restoring the health of these herds.



# Frequently Asked Questions

## Bighorn Sheep Psoroptic Mange Trial



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### What are control animals?

Control animals are intentionally left untreated so they can represent a naturally mange-infested bighorn sheep. In research, a control animal does not receive the treatment being tested and serves as a baseline for comparison. By comparing treated animals to these controls, researchers can clearly determine whether a treatment is effective.

### Why did you put rams in the pens?

We brought the rams into each pen to make sure the mature ewes didn't miss their breeding window. Once the ewes came into estrus in November, the rams began showing up outside the pens, clearly trying to get in.



### What is the reinfestation period?

To replicate natural *Psoroptes sp.* reinfestation in a controlled setting, we will use a co-housing approach. Ten naturally infested control animals will be divided among the three treatment pens (two-three per pen) approximately three months post-treatment. This allows natural mite transmission to occur and provides a realistic measure of treatment durability. Introducing two infested “index” animals per pen more closely reflects natural conditions and increases the likelihood of reinfestation compared to using a single animal.

Following established protocols, co-housing will continue for 1–2 months, during which we will monitor when—and if—treated animals become reinfested, providing insight into how long each treatment offers protection. To avoid cross-contamination during handling, treated animals will always be handled first, followed by the untreated controls.

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# Frequently Asked Questions

## Bighorn Sheep Psoroptic Mange Trial



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### **What is the *yilík<sup>w</sup>lxkn* (Bighorn Sheep) diet?**

The sheep in the pens are provided a natural diet that includes alfalfa, grass, hay, loose mineral supplements, and the natural green-up that grows in their pens. Jack Knife Brewery has also graciously been donating its spent grain from the brewing process—which is completely alcohol-free. Together, this creates a balanced mix that supports their health and well-being.

### **Where are all the *yilík<sup>w</sup>lxkn* (Bighorn Sheep) in the study from?**

The sheep in the pens come from the Ashnola-Similkameen Population Unit, which extends from Penticton down to the US Border. The sheep currently in the pens are from the PIB Reserve, Ashnola, Similkameen, and Chopaka.

### **How long will they be held in the pens?**

They will be in the pens for the duration of the trial which will be approximately 15 months to 18 months.



### **Will there be opportunities to volunteer to feed the sheep?**

Absolutely! The sheep are always looking for more people to help give them hay and grain each day.

Message WSSBC Director Peter at [pgutsche@wildsheepsociety.com](mailto:pgutsche@wildsheepsociety.com)

To get on the volunteer list and do a orientation!

”



# **Adopt A Sheep**

## **Okanagan Bighorn Sheep**

### **Treatment Program**

#### **Adopt A Sheep**

- 1. Erik Skaaning**
- 2. Red Stag Construction**
- 3. Texas Bighorn Society**
- 4. Texas Bighorn Society**
- 5. Alberta Chapter of Wild Sheep Foundation**
- 6. Alberta Chapter of Wild Sheep Foundation**
- 7. Cam Foss**
- 8. Sigrid Lightfoot**
- 9. Barbara Watt**
- 10. Keremeos Cawston Sportsmens Association**
- 11. Foss Media**
- 12. Devon Stewart**
- 13. Adam Crompton**

#### **Adopt A Lamb**

- 1. Jack Cail**
- 2. Jack Cail**



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