

Bighorn Sheep Pneumonia & Management

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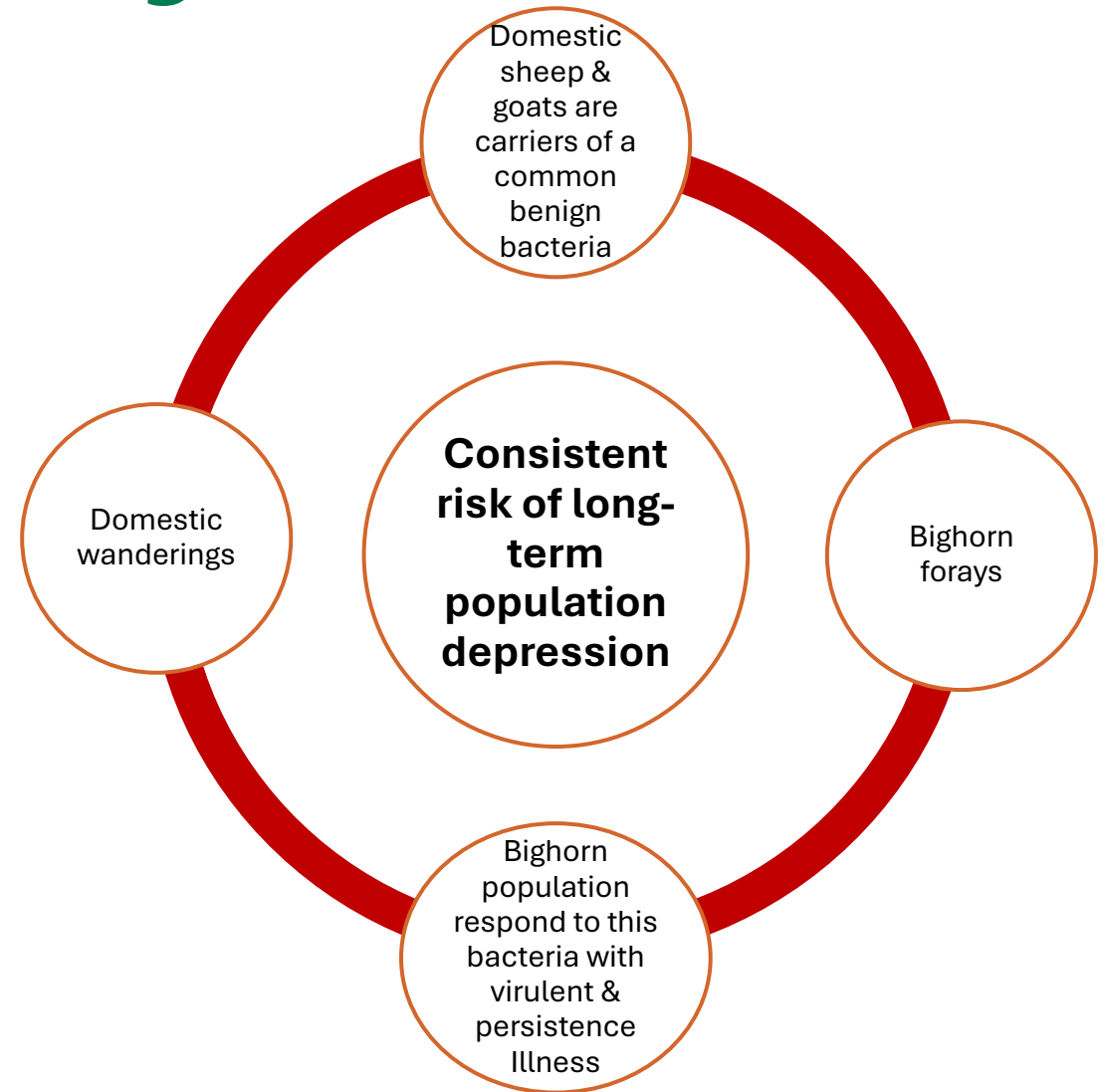


Washington
Department of
**FISH &
WILDLIFE**

Overview of Pneumonia in Bighorns



Photo Credit: WDFW, Laura Heine



Domestic sheep and goats carrying *Mycoplasma ovipneumoniae* (Movi)

- Intracellular bacterial flora common in domestic sheep and goats which is relatively benign
- Is widespread in domestic sheep:
 - 88.5% of large flocks tested positive (USDA CEAH, Sheep 2011)
 - Positive flocks: 62% of the ewes tested positive
 - ↑ prevalence as flock size ↑
 - Prevalence remains in smaller sheep and goat flocks (Heines et al. 2016)
 - Movi was present in 37.5% all small domestic sheep or goat
 - ↑ prevalence as flock size ↑
 - Average flock size of domestic sheep or goats with ≥ 1 Movi positive individual was 29
- Currently there is no efficacious treatment, therefore we have a consistent pathogen reservoir – Movi free flocks are difficult to maintain
- Transmission between domestics and bighorn sheep occurs via nose-to-nose contact or aerosol.
- Movi is not viable in the environment



Slide courtesy: Tom Besser

Bighorn Sheep Foray

Average summer probability of a male leaving the herds home range is 14%

- 50% - 8 km, 25% - 11km, 10% -21.7km; greatest distance \approx 35km (O'Brien et al. 2014)
- Male winter foray frequency and distances are similar to summer
- Contemporary research has documented 50 km

Average probability of a female leaving the herds home range is 1.5% & winter forays are substantially less

Foraging individuals are willing to spend time in non-preferred habitat

Wild and domestic sheep have interspecies attraction

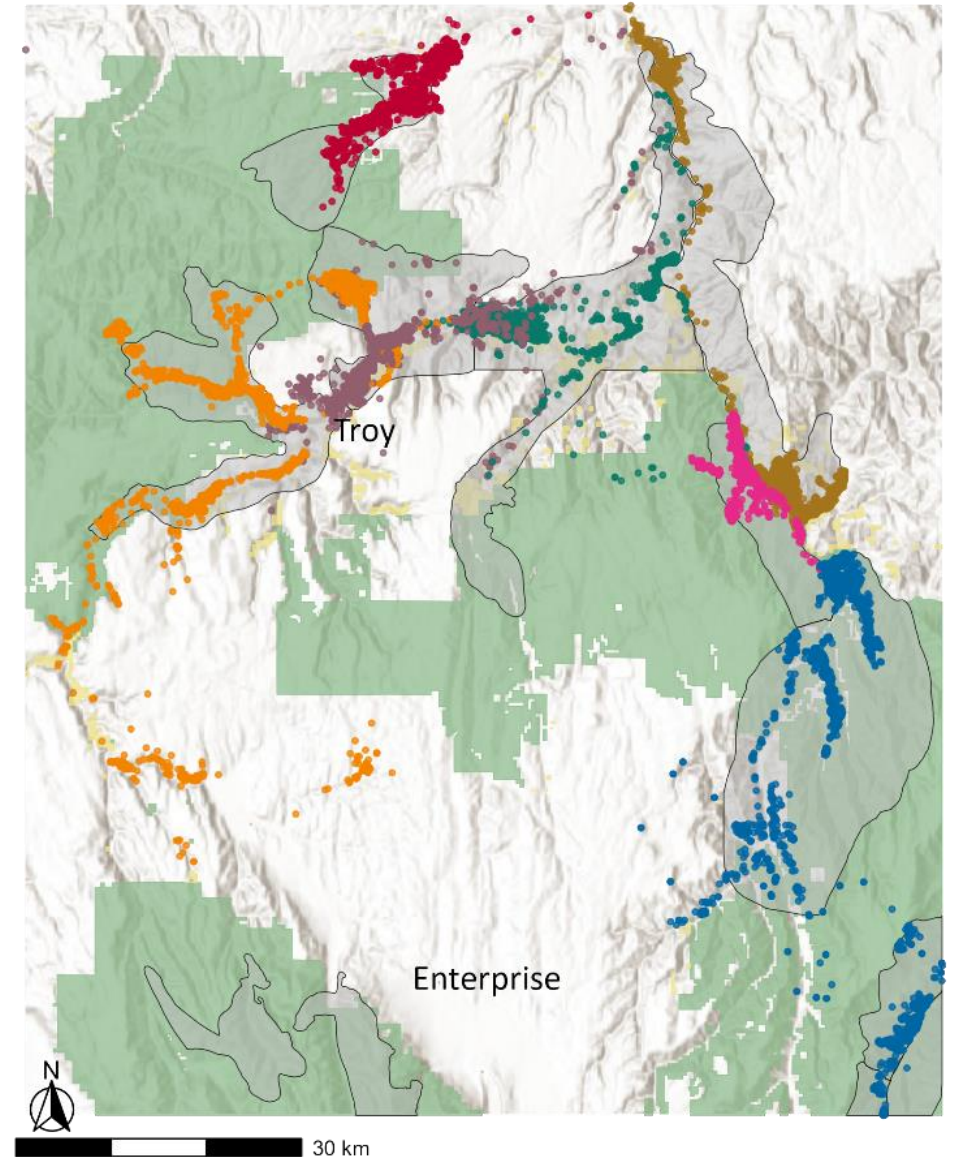
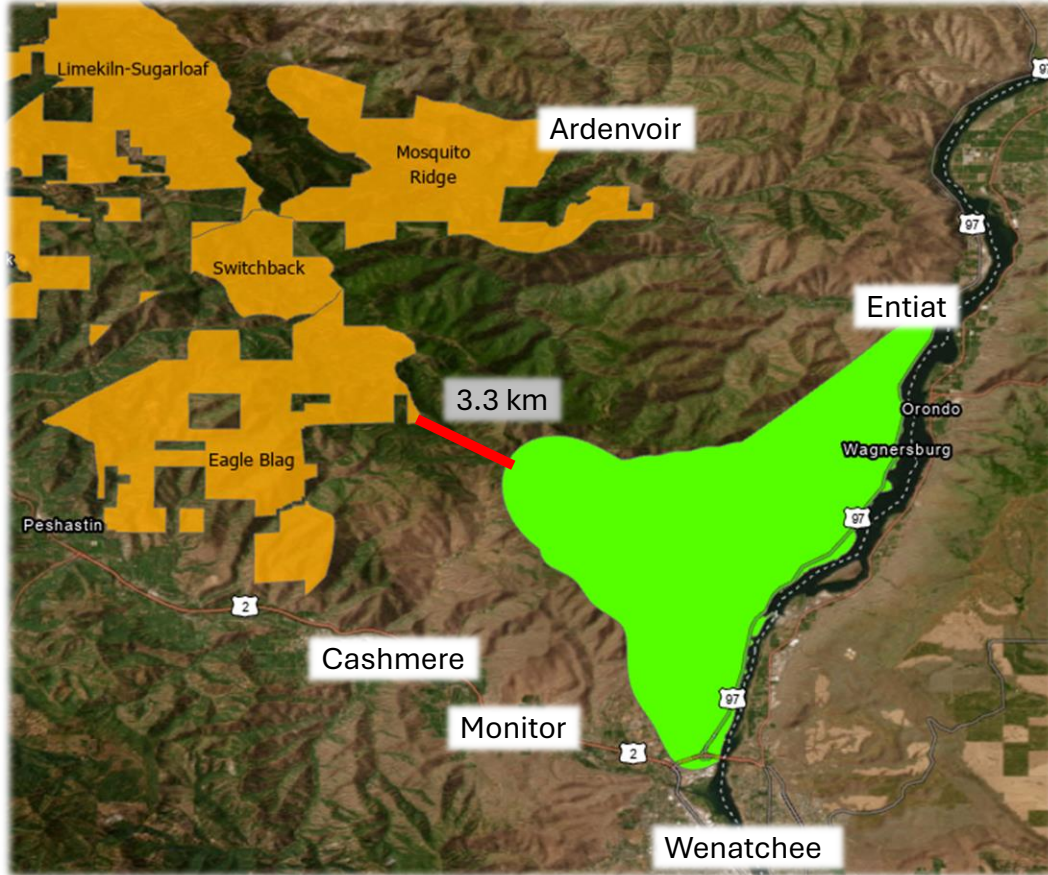
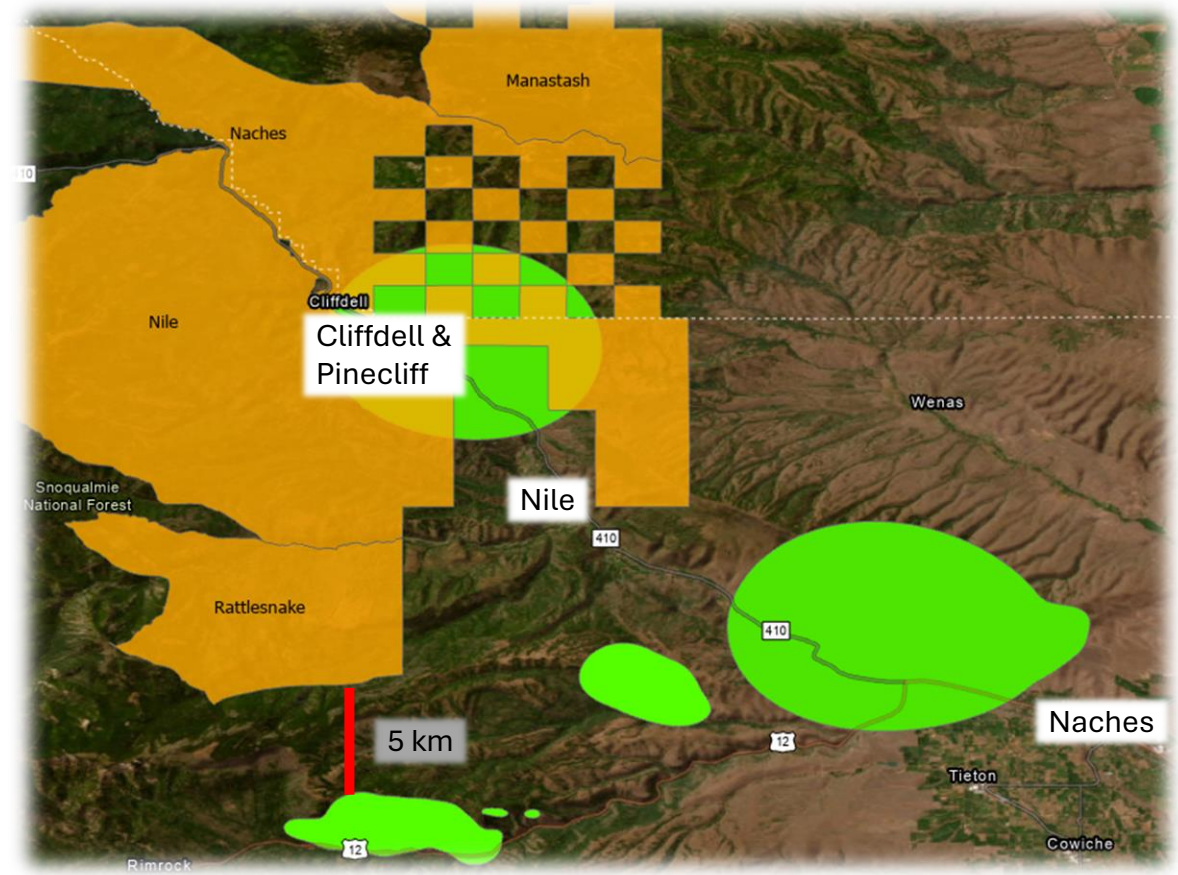


Photo Credit: WDFW, Anna Boyle

Historic Sources of Transmission: USFS Sheep Grazing Allotments & Small Flock Domestic



Swakane Herd



Cleman Mtn & Tieton Herds

Transmission & Persistence of Movi with Bighorn Populations

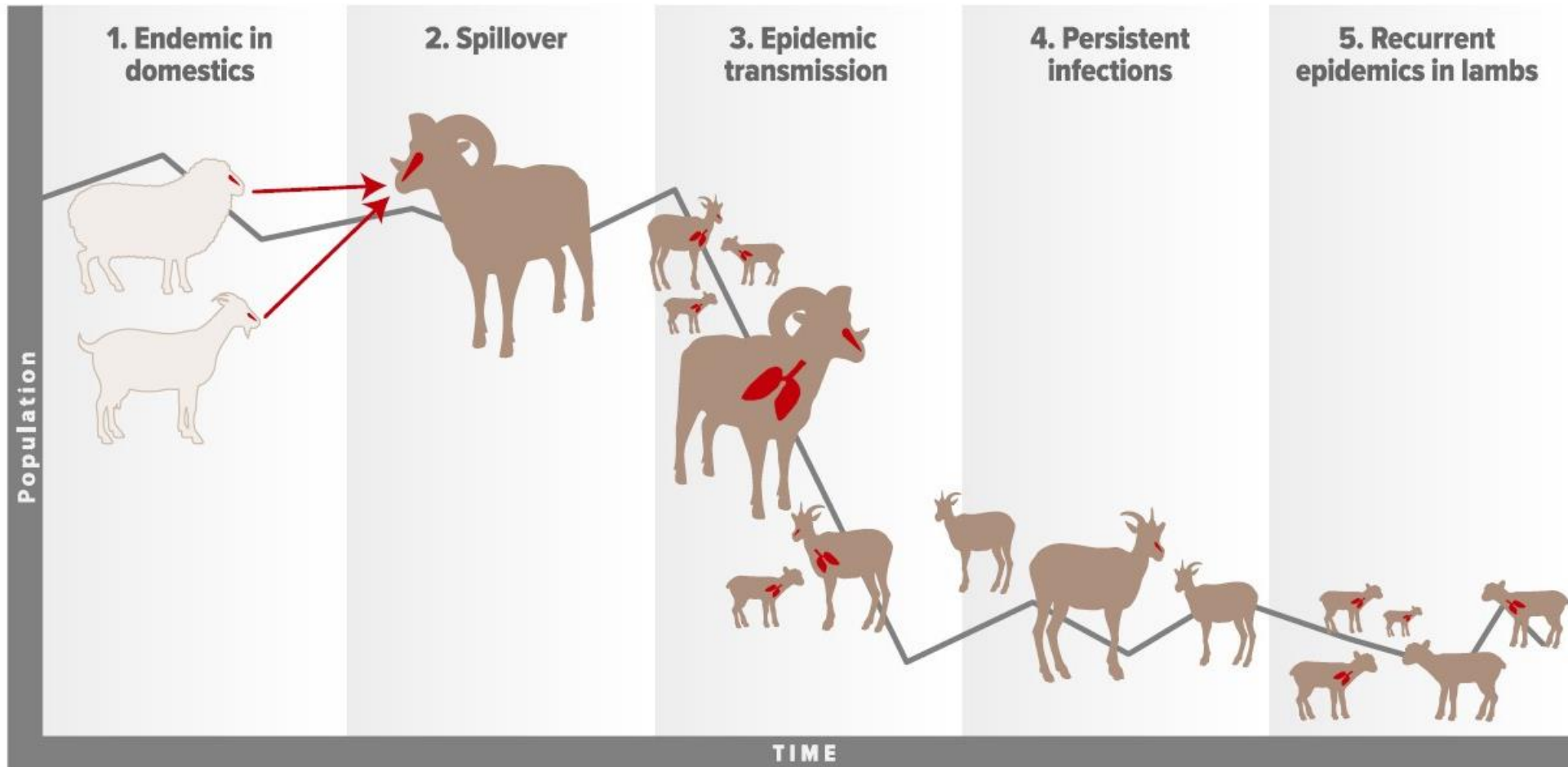
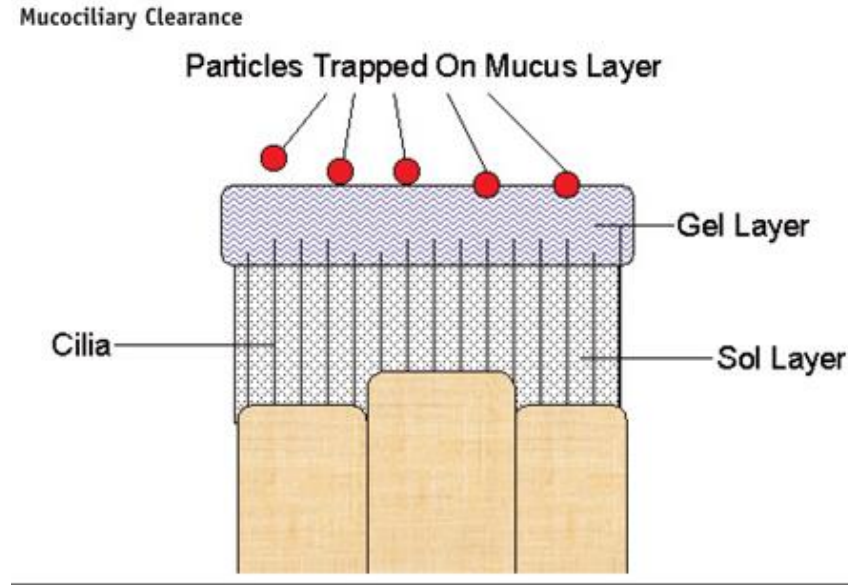
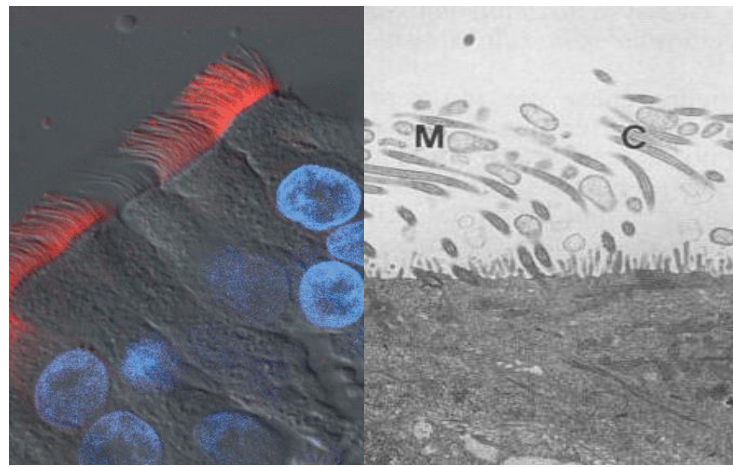
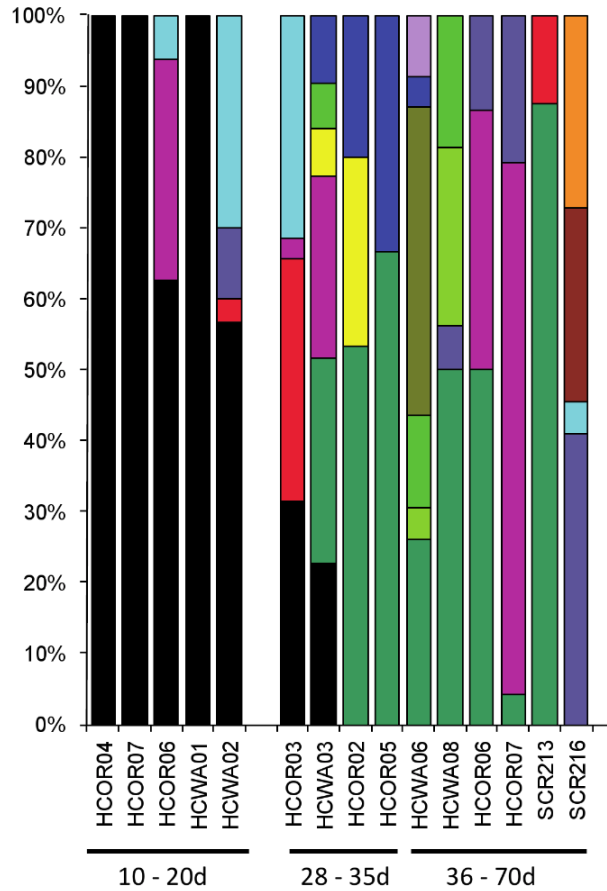


Photo Credit: Plowright et al. 2017

Polymicrobial Bronchial Pneumonia in Bighorns



Slide courtesy: T. Besser

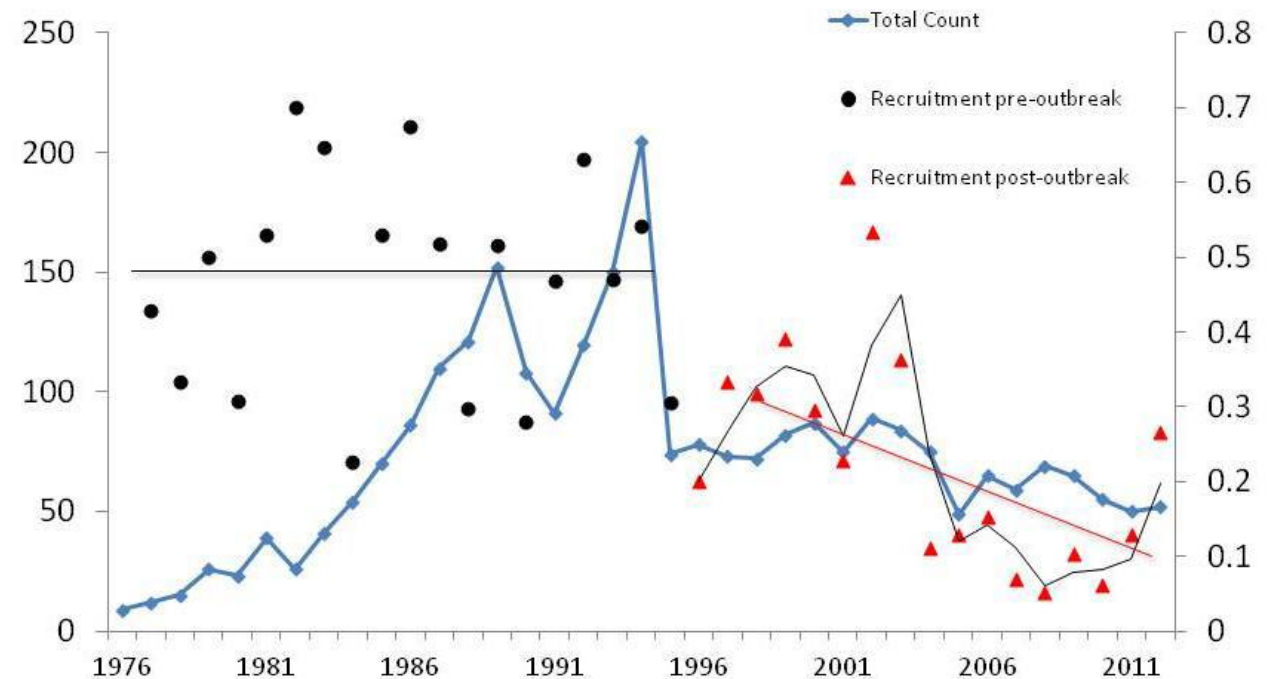
Movi, Population Level Impacts

- Initial all-age die-off range between 5%-95% functioning as a **density dependent model** of transmission
- Prevalence of chronic carriers' range between 5% - 15%
- > 60% probability of illness each subsequent year following transmission, with lambs carrying this burden, resulting in continued poor population performance (Cassirer et al. 2013)
- At this stage it is believed bighorn sheep social structure, specifically their formation of sub-herds alters pathogen transmission to a **frequency dependent model** (Manlove et al. 2016)
- Population growth transitions to λ of < 1.0 for decades after transmission (Manlove et al. 2016)

Black Butte Recruitment

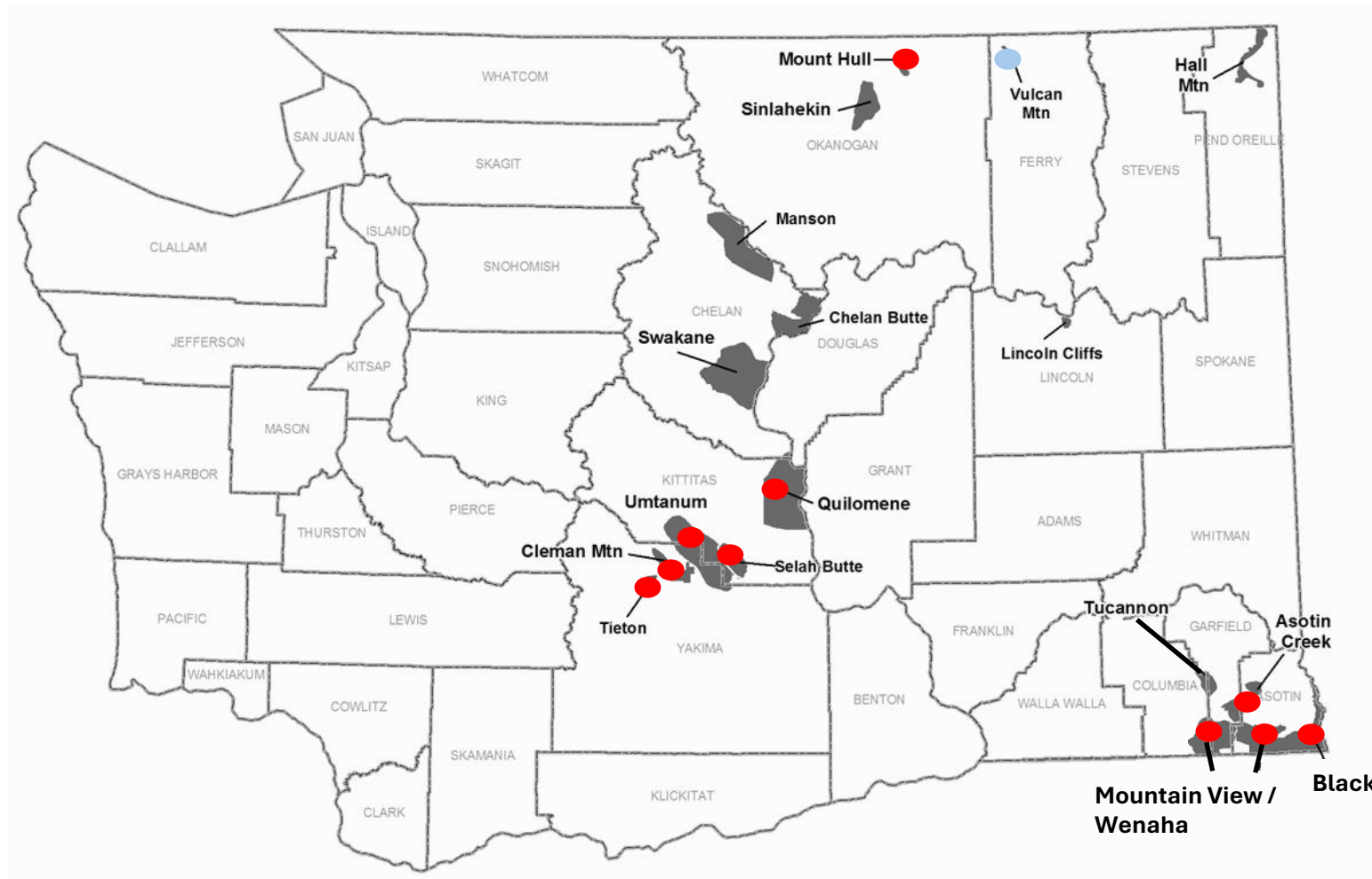
Pre-outbreak Average 0.47

Post-outbreak Average 0.22



Courtesy: Frances Cassirer, Idaho Department of Fish and Game

Movi Status of Washington's Populations



Movi positive populations

- 2009 Umtanum/Selah Butte
- 2013 Tieton – depopulated
- 2019 Mount Hull
- 2020 Cleman Mtn.
- 2021 Quilomene
- 2023 Black Butte
- 2024 Mountain View/Wenaha
- 2024 Asotin Creek

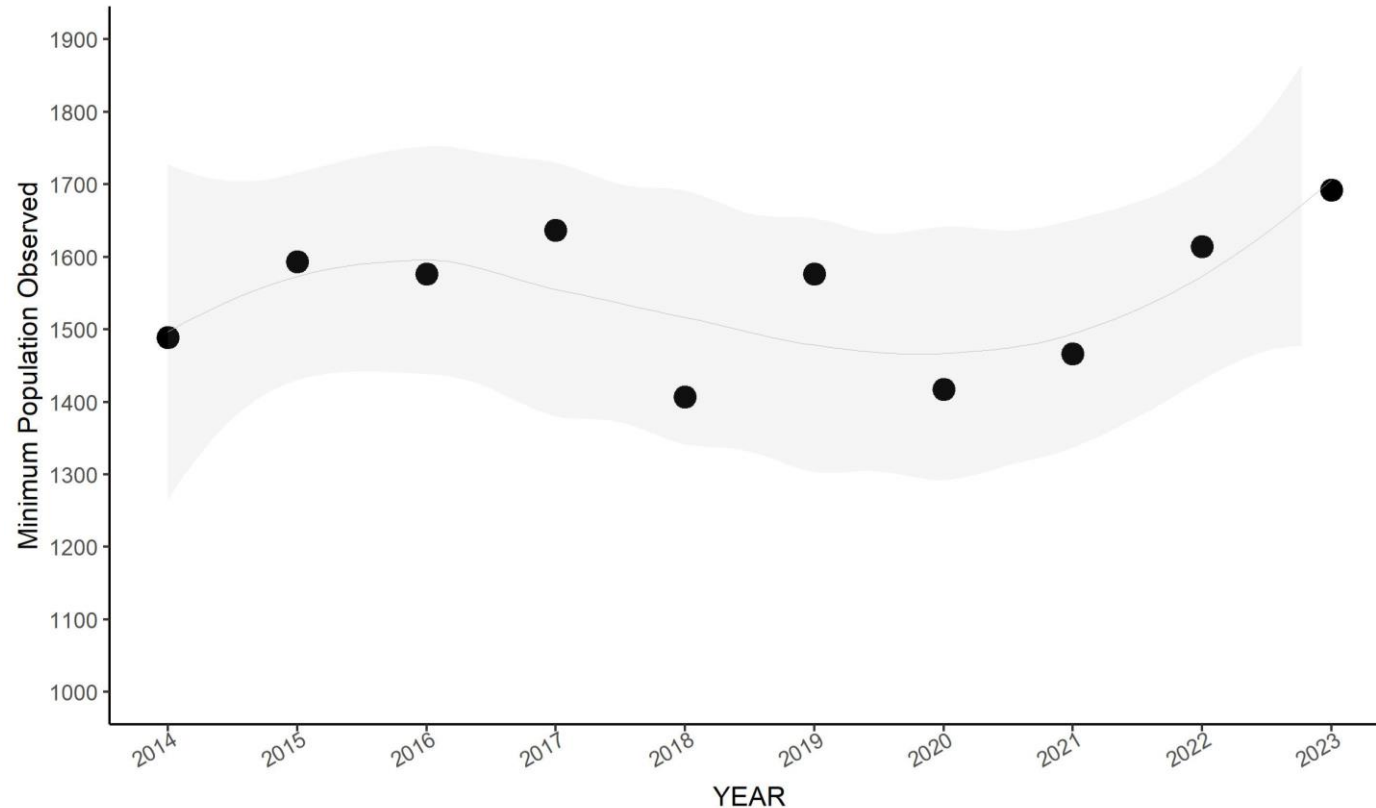
2025 Movi testing

- Vulcan Mtn.

Movi free populations

- Swakane
- Chelan Butte
- Manson
- Sinlahekin
- Lincoln Cliffs
- Hall Mountain
- Tucannon

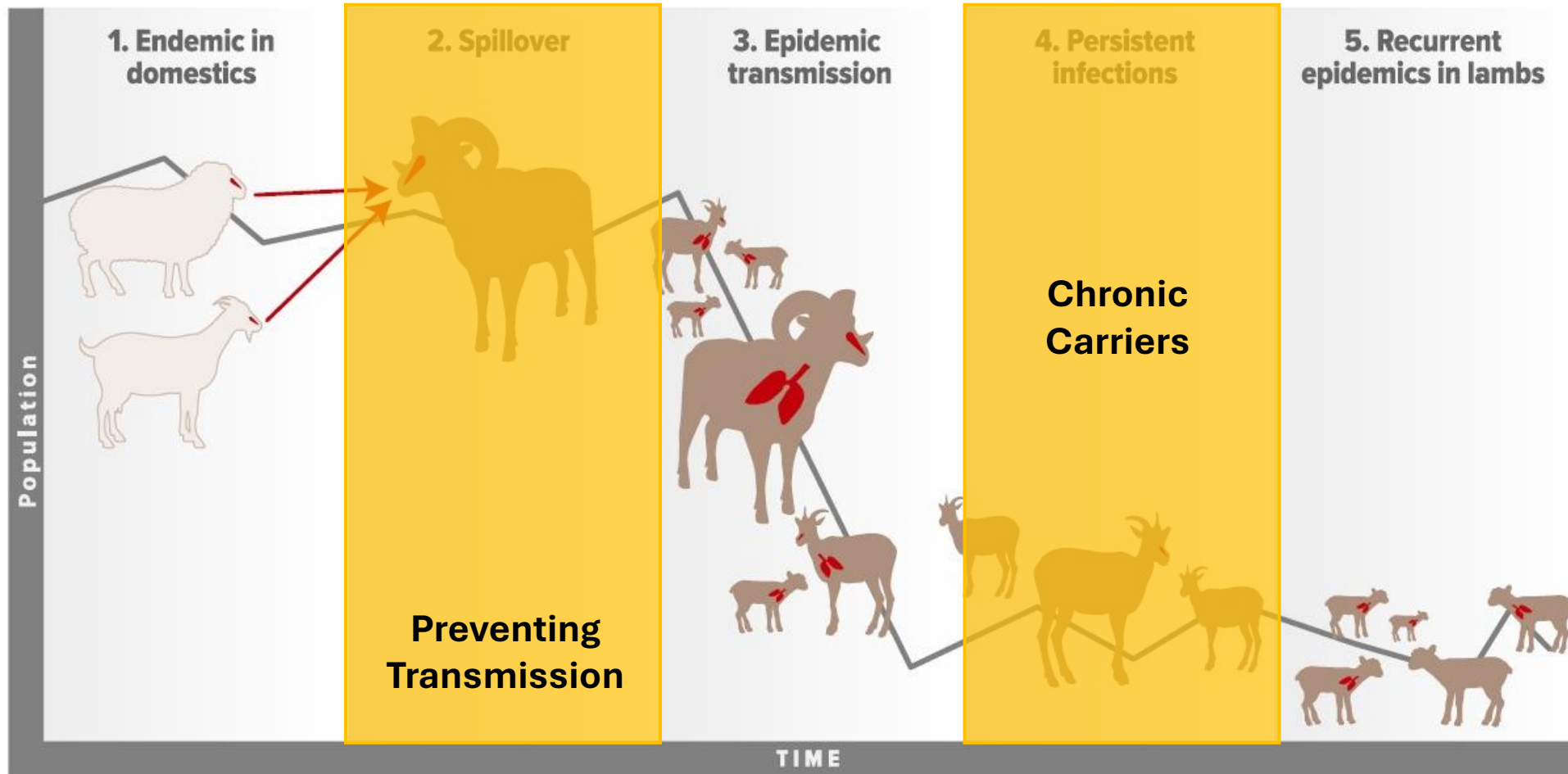
Statewide Abundance Estimates from Monitored Populations 2009 – 2023



Statewide population declines have been offset by significant increases within the Blue Mountains: Specifically, the Mountain View/Wenaha herd.

Although, given the recent transmission event documented in December 2023 we expect future declines

Managing Movi



Preventing Transmission, small flocks

Bighorn Health Programs

- Asotin County Conservation District, Hells Canyon Initiative
- WDFW Ungulate Section Biologist, North and Central Cascades



Program offers:

- Education & Outreach
- Movi screening
- Biosecurity testing
- Bighorn deterrents:
- Guard dogs
- Fencing options
- Compensation
- Problem Solving



Know your flock's status



Photo Credit: Asotin County Conservation District

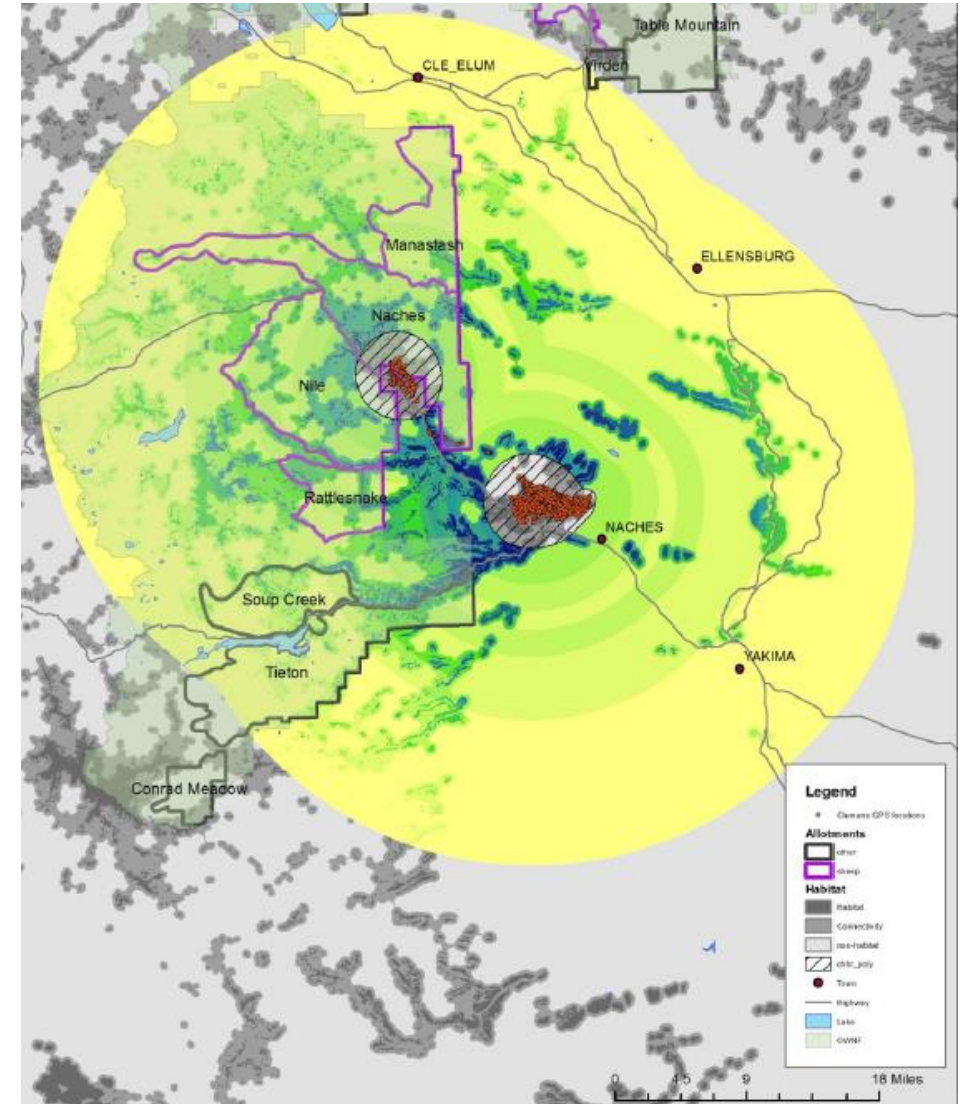
Preventing Transmission, large flocks

US Forest Service, Okanogan-Wenatchee & Umatilla Natl' Forests

- Domestic Sheep Grazing Allotments

Working with USFS Oka-Wen staff and consultants on their Domestic & Bighorn Sheep Grazing EIS

- Application of the Risk of Contact Model (O'Brien et al. 2014)
- Provided data to inform their modeling
- Review of output products
- Goal is to either change the allotments to cattle or increase the distance between wild and domestic sheep



Chronic Carriers

Depopulation

- 2013 Tieton

Test & Remove Management

- Capture the population
 - 100% capture or 95% capture (2x)
- Test to identify Movi positive individuals
- Remove all positive sheep

2021 Yakima Canyon

- 2017-2020 population reduction
- 2021 Implemented Test & Remove
 - Captured 80 of 100 adults
 - 8 tested positive, 7 removed immediately, last one, a juvenile ram, prior to lambing
 - Great start, but not Movi free



Photo Credits: William Moore

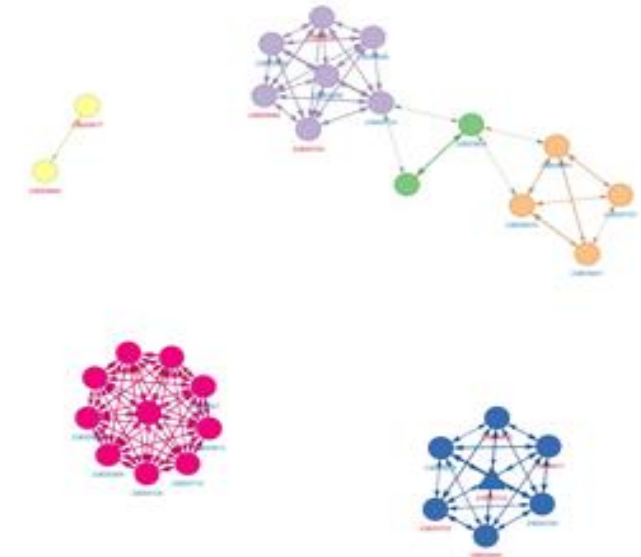
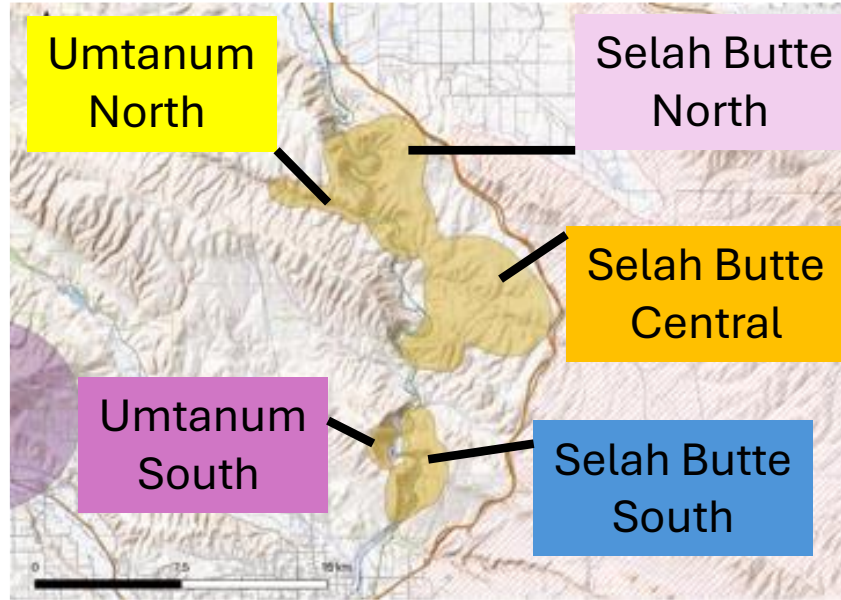
Chronic Carriers

Optimizing Test & Remove

Collaborative Research:

WDFW, IDFG, ODFW, & Funding from WSF

- Collar to determine sub-herd Community Networks
- Identify sub-herds with chronic carriers
 - Adult seroprevalence
 - fall lamb ratio
- Capture within high seroprevalence sub-herds
- Validate chronic carrier clearance with lamb capture and serology



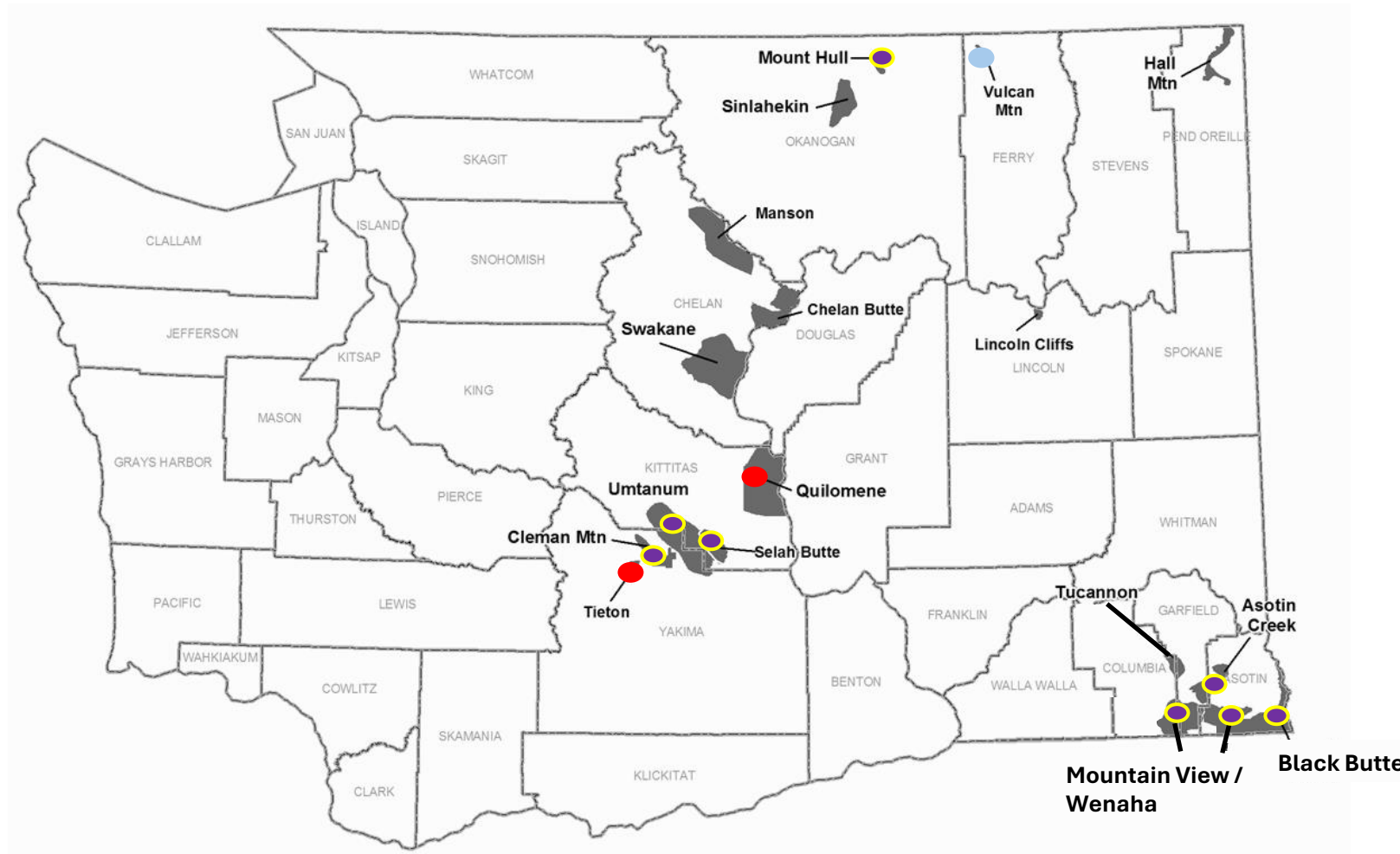
Sub herd	Avg. Serial Prevalence
Umtanum North	moderate
Umtanum South	high
Selah Butte North	Low
Selah Butte Central	Low
Selah Butte South	Low

Photo Credits: William Moore

WDFW Management

Active Movi Management

- Umtanum/Selah Butte
 - optimizing T&R Treatment
- Cleman Mtn.
 - optimizing T&R Control
- Mount Hull
 - monitoring Community Net.
- Black Butte
- Mountain View/Wenaha
- Asotin Creek
 - Monitoring acute illness





Questions

Photo Credits: Emily Jeffreys