



Northern Wild Sheep and Goat Council



TABLE OF CONTENTS

Tributes to Dr. Valerius Geist (1938 – 2021) xii-xix

Northern Wild Sheep and Goat Council: Position Statement
Commercial and Recreational Disturbance of Mountain Goats:
Recommendations for Management xx-xxxiv

Virtual Social xxxv-xxxvi

DISEASE PLENARY: IN A BLINK AT THE BRINK

Bighorn sheep (*Ovis canadensis*) disease management in Wyoming
Doug McWhirter, William H. Edwards and Peach Van Wick 1

“Little Bo-Peep, please test your sheep” Managing disease risk in Alberta
Anne Hubbs and Mark Ball 13

***Mycoplasma ovipneumoniae* surveillance in Yukon wildlife**
N. Jane Harms, Kristenn Magnusson, Meghan Larivee, Maud Henaff and Mary Vanderkop 14

The role of bighorn ewe infection status in managing pneumonia in lambs
Frances Cassirer, Tom Besser, Logan Weyand, Raina Plowright, Kezia Manlove, Brandi Felts,
Tyler Garwood, Jon Jenks, Mike Cox, Peregrine Wolff, Paul Cross, Andy Dobson, Jack Hogg,
Pete Hudson, Matt Jeffress, Chad Lehman, Amy Lisk, Pat Matthews, Paul Wik and
Dan Walsh 15

A preliminary look at what drives individual and herd response to *Mycoplasma ovipneumoniae*: Integrating information from focal herds and wider-scale monitoring
Kezia Manlove, Kylie Sinclair, Lauren Ricci, Brianna Johnson, Jace Taylor, Annette Roug
and Mike Cox 16



DISEASE AND PARASITES

Mycoplasma ovipneumoniae: Mitigating the risk of transmission in Yukon
Kristenn Magnusson, N. Jane Harms, Mary Vanderkop, Jesse Walchuk and Matthew Larsen 17
Bighorn movement and domestic sheep presence surrounding a case of acute fatal pneumonia in a bighorn sheep
Kevin A. Blecha and Karen A. Fox..... 18
Symptom progression and serological dynamics following introduction of a low-virulence Mycoplasma ovipneumoniae strain in a desert bighorn herd
Brianna Johnson, Kezia Manlove, Janice Stroud-Settles, Jace Taylor and Annette Roug 29
Identifying drivers of bighorn sheep population recovery in the wake of pneumonia die-off events
Kylie Sinclair, Mike Cox, Peregrine Wolff and Kezia Manlove 30
Health Surveillance in thornhorn sheep (Ovis dalli) herds in British Columbia and Alaska
Caeley Thacker, Helen Schwantje, Thomas Lohuis, Kathreen E. Ruckstuh and Douglas Whiteside 31
Determining the source of the Psoroptes outbreak in British Columbian bighorn sheep
Adam M. Hering, Neil B. Chilton, Tasha Y. Epp and Murray R. Woodbury 32
Testing of new options for the treatment of Psoroptes ovis in bighorn sheep
Adam M. Hering, Andrew Walker, Helen Schwantje, Tasha Epp, Craig McLean, Aaron Reid, Sean O'Donovan, James Pepper, Cailyn Glasser and Murray Woodbury 33

HABITAT AND CLIMATIC FACTORS

Mapping Alberta bighorn sheep winter range – RSF validation and inter-jurisdictional collaboration
Grant Chapman, Scott Jevons, Layne Seely, Kim Poole, Rob Serrouya, Irene Teske, Anne Hubbs, Jack Hogg, Kathreen E. Ruckstuhl and Dale Paton 34
Evaluating characteristics of mineral licks used by two mountain ungulates
Emma C. Grusing, Blake H. Lowrey, Jesse DeVoe and Robert A. Garrott 35



Northern Wild Sheep and Goat Council



Estimating nutritional carrying capacity of bighorn sheep in the Elk Valley
Kyle H. Knopff, Meghan M. Beale and Christina Small 36

Spatial genetic structure of Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*) at the northern limit of their native range
Samuel Deakins, Jamieson C. Gorrell, Jeffery Kneteman, David S. Hik, Richard M. Jobin and David W. Coltman 37

Evaluating bighorn sheep restoration using genomics
Elizabeth P. Flesch, Tabitha A. Graves, Jennifer M. Thomson, Kelly M. Proffitt, P.J. White, Thomas R. Stephenson and Robert A. Garrott 38

MANAGEMENT

Despite denials, persistent harvest-based selection leads to the evolution of smaller horns in mountain sheep
Marco Festa-Bianchet and Michael B. Morrissey 39

Size-at-Age of Alberta’s bighorn sheep (*Ovis canadensis*)
Nils Anderson 40

Management update and summary: Alaskan Dall Sheep 2020
Wayne E. Heimer 49

Fast phenotypic change in a sexually selected trait: A new mechanism
Peter Neuhaus, Susanne Schindler and Kathreen E. Ruckstuhl 57

Reintroducing and augmenting mountain goat populations in the north cascades: Translocations from the Olympic Peninsula, 2018-2020
Richard B. Harris, Clifford G. Rice, Ruth L. Milner and Patti Happe 58

Removing non-native mountain goats from the Olympic Peninsula
Patti Happe, Kristin Mansfield, Jenny Powers, William Moore, Susan Piper, Bryan Murphie and Richard B. Harris 79



POPULATION ECOLOGY

An integrated population model for Rocky Mountain bighorn sheep in the Elk Valley
Steven F. Wilson and Christina Small 94

Stone’s sheep lambing habitat selection in the Cassiar Mountains, British Columbia
Grace Enns, Bill Jex and Mark S. Boyce 105

Limiting factors on a small herd of Rocky Mountain bighorn sheep residing in the Kicking Horse Canyon, near Golden, British Columbia
Margaret Langley 106

BEHAVIOUR AND ECOLOGY

Behavioural states as a proxy for habitat hotspots by mountain goats (*Oreamnos americanus*) using hidden Markov models
Laura Kroesen, David Hik and Seth Cherry 113

Colonization of a reclaimed landscape by bighorn sheep (*Ovis canadensis*)
Beth MacCallum and Alice Paquet 114

Mountain goat response to human activity in Jasper National Park
Kyle H. Knopff, Aliah R.A. Knopff and Martin G. Jalkotzy 131

Mountain goats and people: Cultural resurgence as Indigenous methodology
Charles R. Menzies 132

From pellets to genomes: New tools provide novel insights into mountain goat ecology and evolution
Aaron B.A. Shafer, Sarah E. Haworth, Daria Martchenko, Jesse Wolf and Kiana B. Young 133