

# *High Lonesome Ranch* Science and Stewardship



Cristina Eisenberg, PhD  
Research Director  
High Lonesome Ranch



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# Presentation Overview

- Key attributes of a resilient ecosystem
- Restoring ecosystem resilience using trophic cascades
- Role of private lands in ecological restoration
- Landscape-scale conservation on the High Lonesome Ranch

# What is a resilient ecosystem and why does resilience matter?

- Native species present
- Natural processes present and active
- Community able to persist in the face of climate change, mixed uses, and habitat fragmentation due to human development

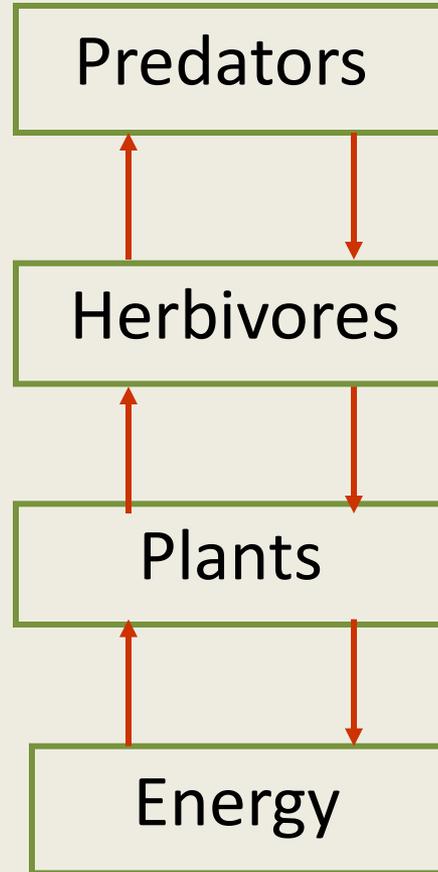
# What are trophic cascades?

Trophic cascades involve a relationship among members of a food web in which a top predator influences the abundance and behavior of its herbivore prey, and that in turn affects how things grow.



# Food Web Theory: Trophic Cascades

Energy from sunlight and disturbance controls plant growth, and this influences herbivore and predator abundance.



Predators control herbivore numbers and this influences herbivory and energy cycling—a trophic cascade.

Community structure is shaped from the bottom-up and from the top-down

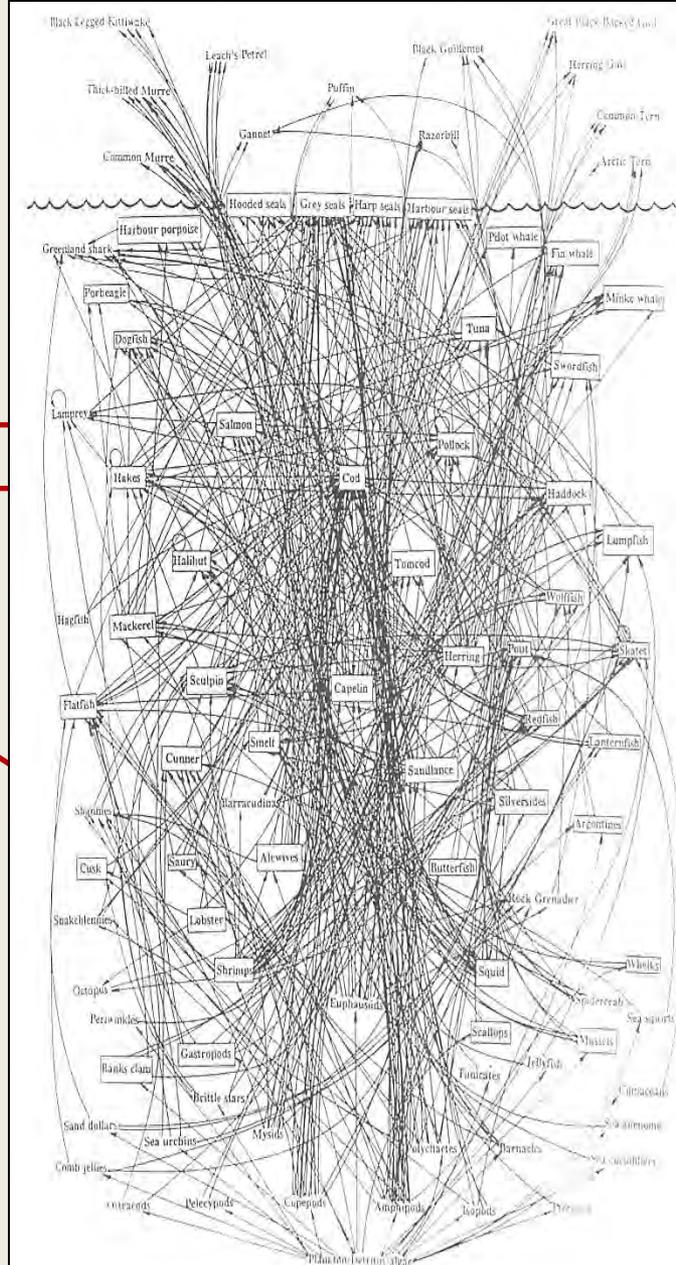
*Hairston et al. 1960; Murdoch 1966; Polis 1994*

# Trophic Cascades: A Conceptual Model



Aspen

Macro-Environment



Wolves

Elton 1927; Leopold 1943; Menge 1995; Power 1991; Ripple and Beschta 2007

*Lavigne 1995*

# Using Trophic Cascades for Ecological Restoration

This fundamental three-level food chain (keystone predators-prey-vegetation) indirectly touches many other members of the community, by improving habitat.



Thus trophic cascades driven by keystone predators increase biodiversity and create more resilient systems.



# Complexity of Food Webs in a Large Mammal System

To examine the relative influence of top-down and bottom-up factors and the context-dependence of these relationships in a wolf→elk→aspen tri-trophic system

## Three ecologically similar valleys:

All have similar climate, soils, and plant communities.

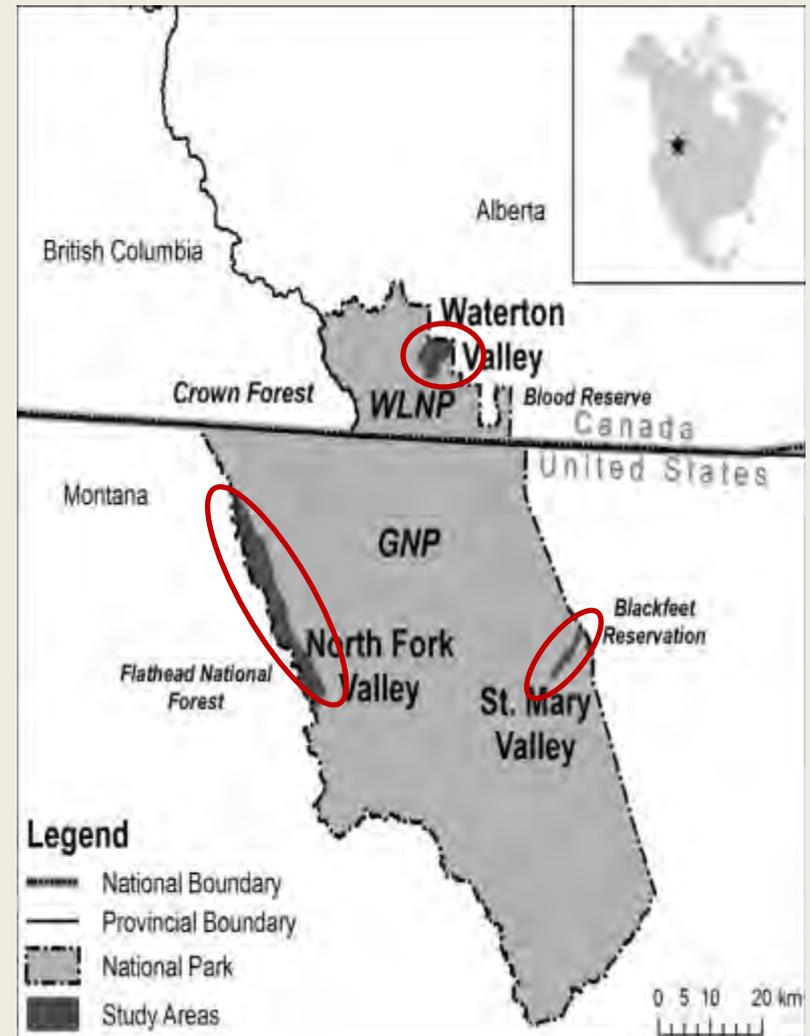
Foothills-parkland ecoregion, characterized by grasslands with patches of aspen.

All are elk winter range.

Saint Mary Valley  
Low wolf population  
Unburned sites only

Waterton Valley  
Moderate wolf population  
Unburned sites only

North Fork Valley  
High wolf population  
Burned and unburned sites



# Study Site

All elk winter range in Waterton Lakes National Park, AB, and Glacier National Park, MT, where livestock herbivory is not present



# Study Site: Aspen Communities

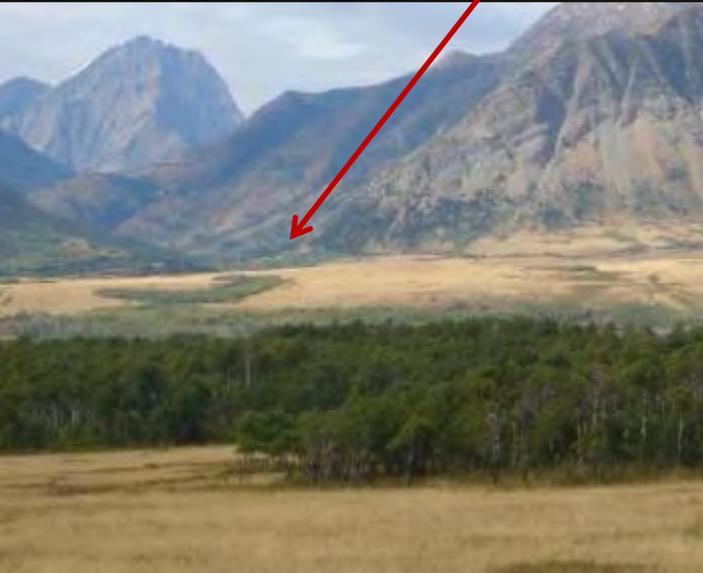


Saint Mary

Waterton

North Fork

North Fork  
(fire)



Recruitment



# Research Findings



- Elk response to predation risk is influenced by multiple factors.
- To understand elk response to wolf population you also need to understand the rest of the context.
- Other factors, such as fire, moderate the effects of wolf population.
- Unclear whether a trophic trickle or trophic cascade exists.

# How can we restore ecological resilience on mixed-use Western lands?

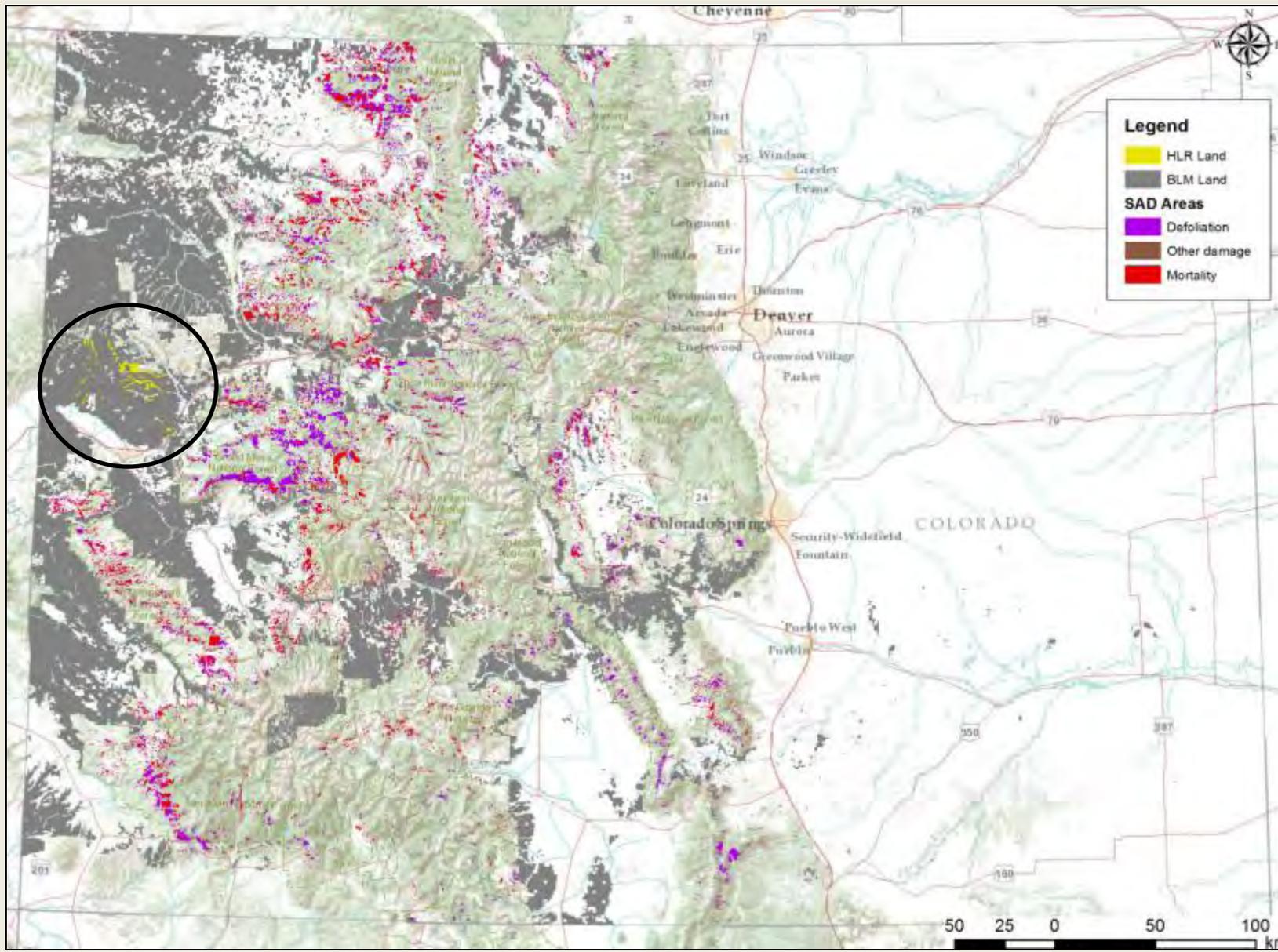


# The High Lonesome Ranch: Ecological Restoration and Trophic Cascades Applied Science



# Colorado with BLM, USFS, and HLR Land

(SAD, Defoliation, and Damage data only on USFS land)





# HLR Science and Conservation Partners



# The High Lonesome Ranch: Place-Based Applied Science on a Working Landscape

- Located on the West Slope of the Rocky Mountains in West-Central Colorado
- ~200,000 acres of deeded and permitted lands
- Own all mineral rights



High Lonesome Science and Conservation  
Institute

Hal Salwasser, Institute Consulting Director

Cristina Eisenberg, Research Director



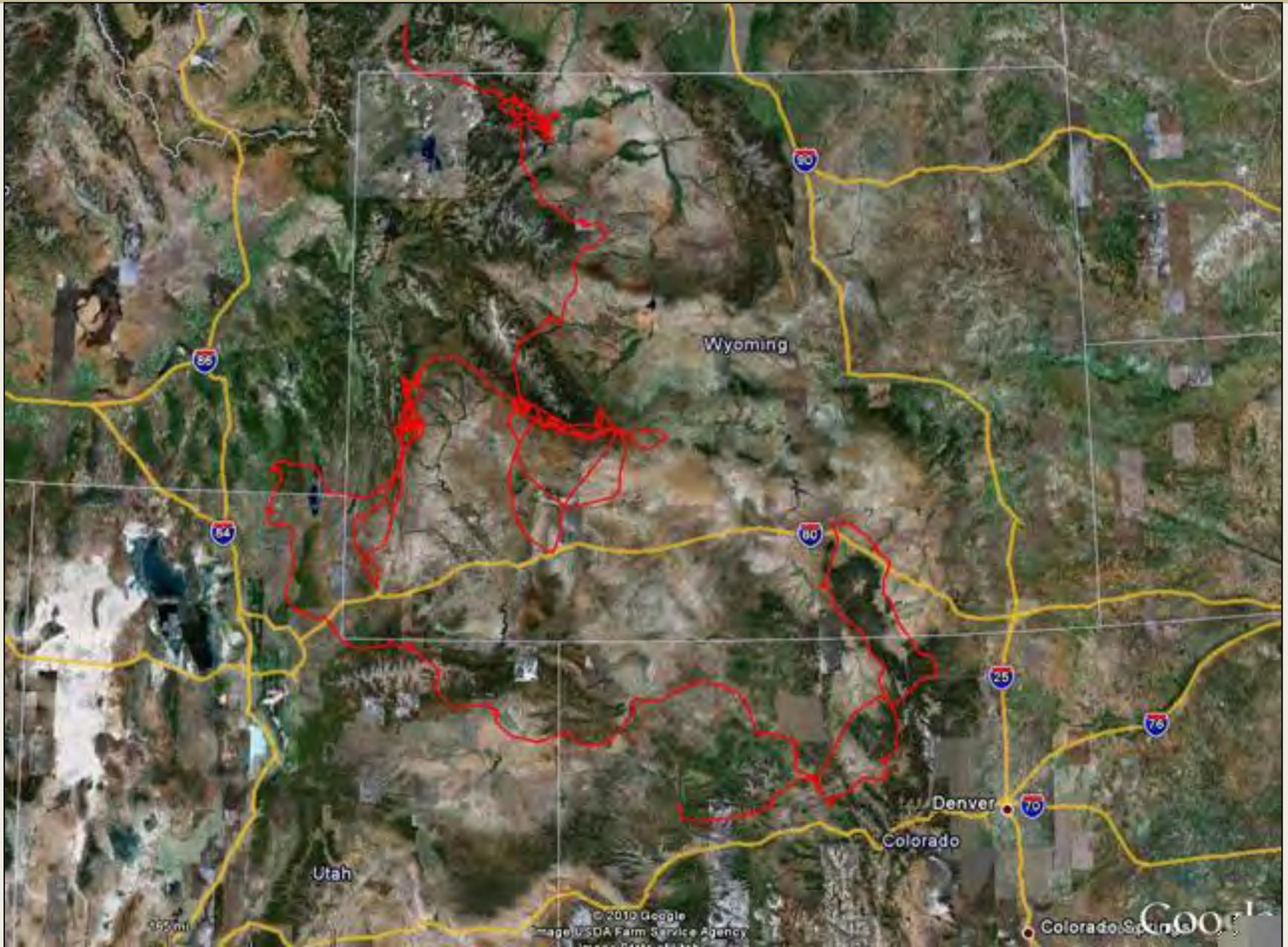
What's wrong with these aspen?



What's wrong with this stream?



# Visitors from the north?



# HLR Conservation History:

- Last wolf extirpated in 1935
- Ungulates irrupted, then were overhunted
- Range was over-stocked with cattle
- Range conditions deteriorated
- Paul R. Vahldiek, Jr. purchased ranch between 1994 and present
- Began rebuilding the game population and reducing cattle stocking rates to 25% or less of historical amounts

# HLR Conservation Strategy:

- Ecological Restoration that supports multi-trophic interactions
- Restore function and processes to damaged areas
- Create a network of wilderness Areas and minimize road use
- Manage and develop natural resources within a Land Ethic (Leopoldian) model



# Science and Ecological Restoration Projects

- Aspen Ecology and Trophic Cascades
- Aspen Ecological Restoration Program
- Riparian Trophic Cascades Project
- Kimball Creek Ecological Restoration
- Rangeland Restoration
- Native Plants Program
- Private Landowners Network (Wildlands Network)



# HLR Ecological Restoration: Kimball Creek



Howard Whiteman, Scot Peterson, Murray State University; Robert Lee, Engineer



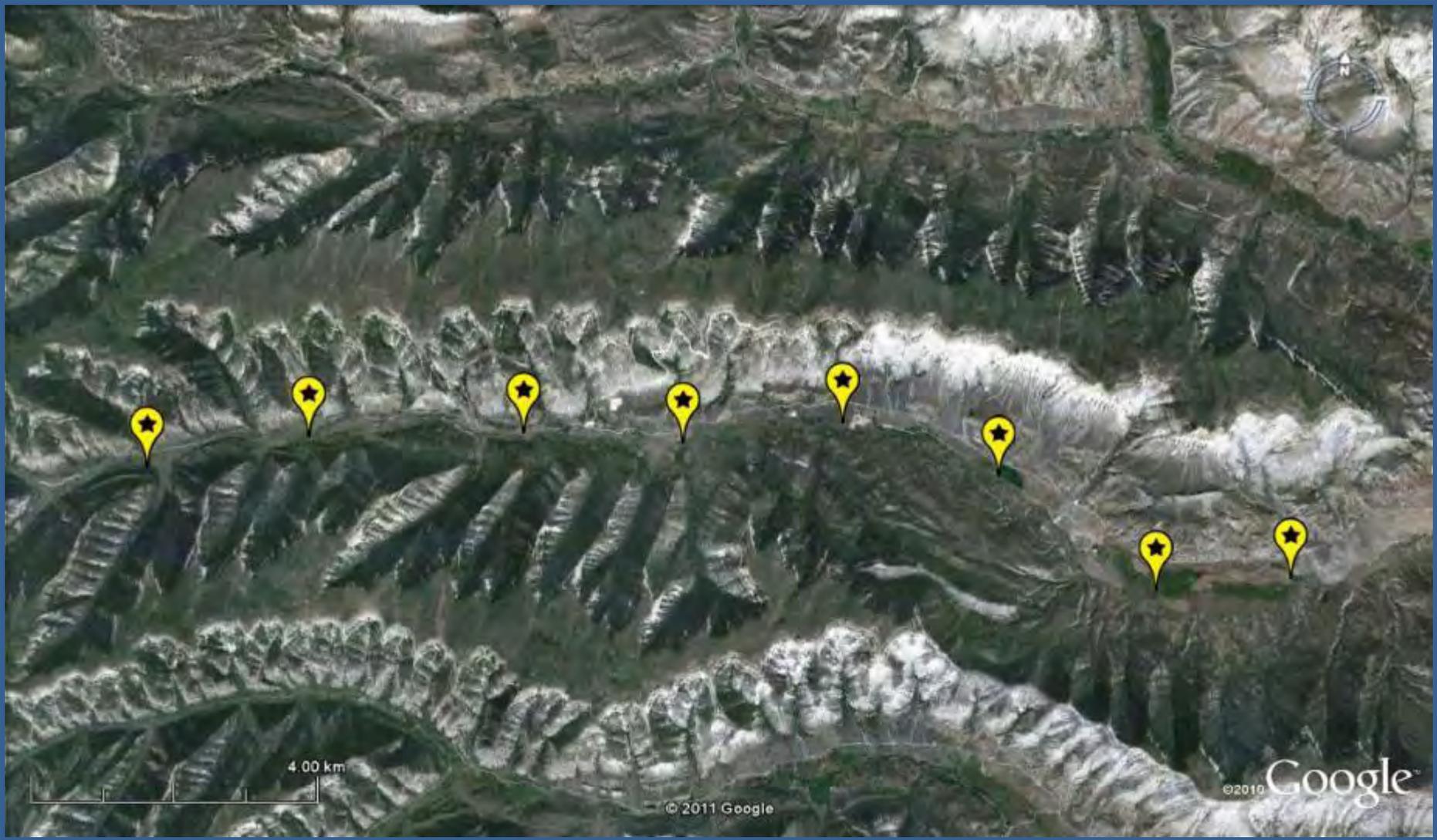




# HLR Kimball Creek Trophic Cascades Project



# HLR Kimball Creek Sampling Strategy





# Kimball Creek Restoration Project Scope

- 14-mile stream reach to be restored
- Restoration of a functioning floodplain
- Restoration of native flora and fauna
  - Natural recolonization
  - Reintroduction of native Colorado cutthroat trout

# HLR Aspen Trophic Cascades Research and Ecological Restoration Program

Cristina Eisenberg and Michael Soule: Trophic cascades  
S Trent Seager and Cristina Eisenberg: Aspen Restoration



# SAD: A Multi-Causal Phenomenon

- Pests
- Disease
- Climate Change
- Fire suppression
- Herbivory



# Aspen Restoration Strategy

Prioritize restoration at the landscape scale:

- Identify stands in crisis (% decline)
- Identify areas to maintain connectivity
- Test options (coppicing, exclosures, fire treatments)
- Restore multi-trophic processes

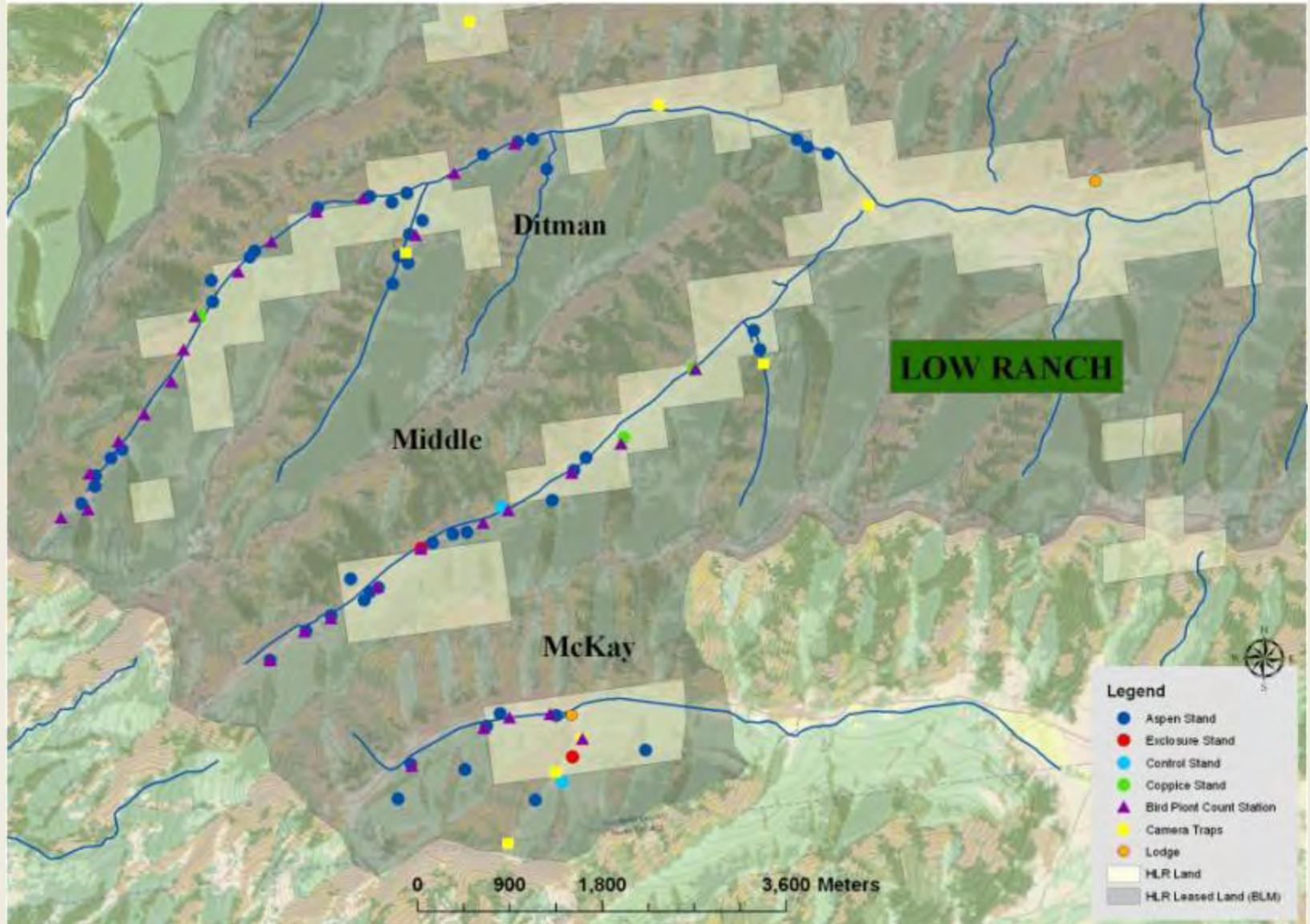


# High Lonesome Ranch – Overview Map



# Low Ranch Sampling

## High Lonesome Ranch Aspen with Science and Streams



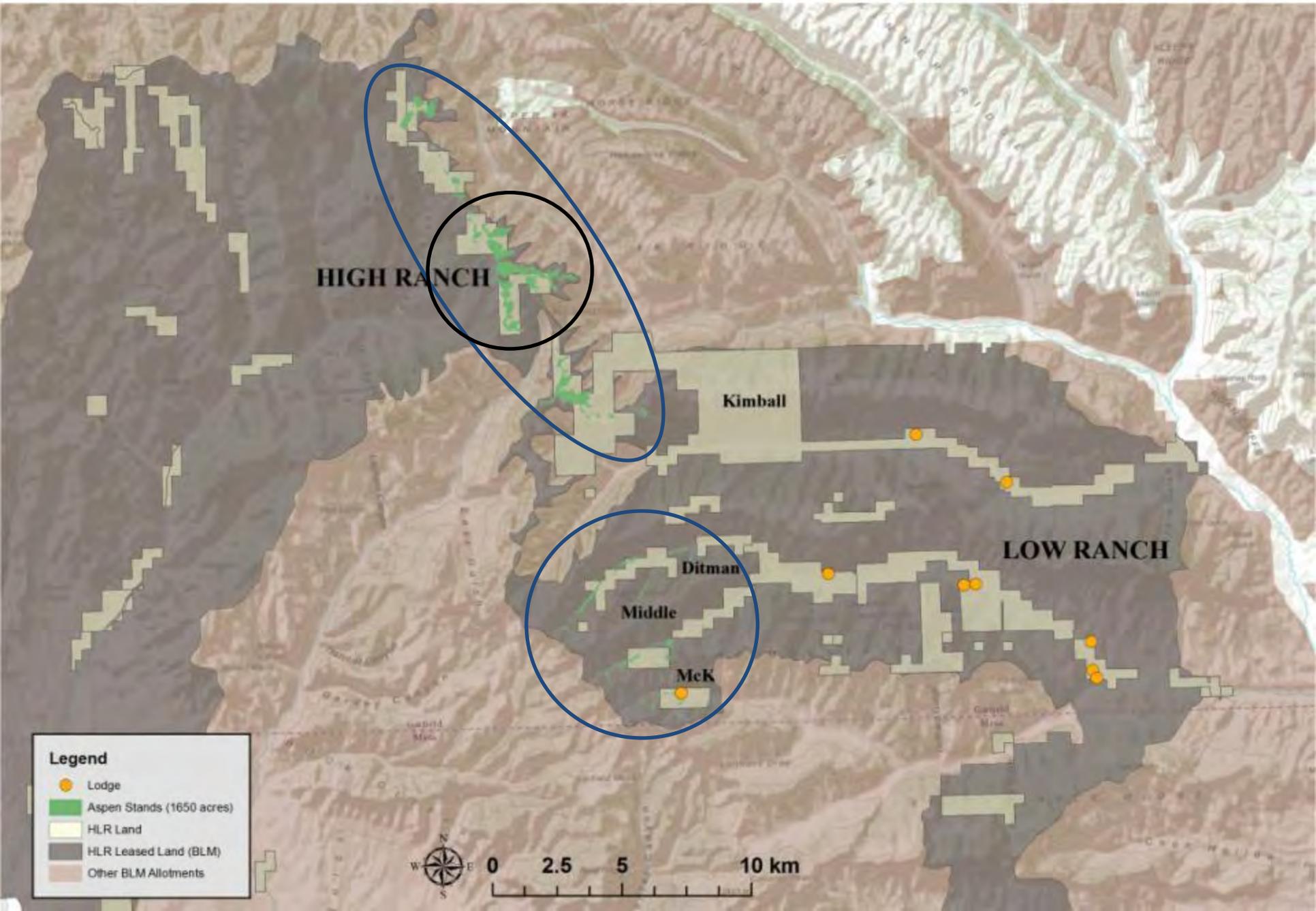
# Aspen Treatments

LOCATION	TREATMENT # 1	TREATMENT # 2	TREATMENT #3	NO TREATMENT
<b>HIGH RANCH</b> (2 REPLICATES)	Exclosure	Clear-cut Coppicing + jackstraw (CWD)	Clear-cut Coppicing + slash pile fence	Control
<b>LOW RANCH</b> (2 REPLICATES)	Exclosure	Clear-cut Coppicing + jackstraw (CWD)	Clear-cut Coppicing + slash pile fence	Control

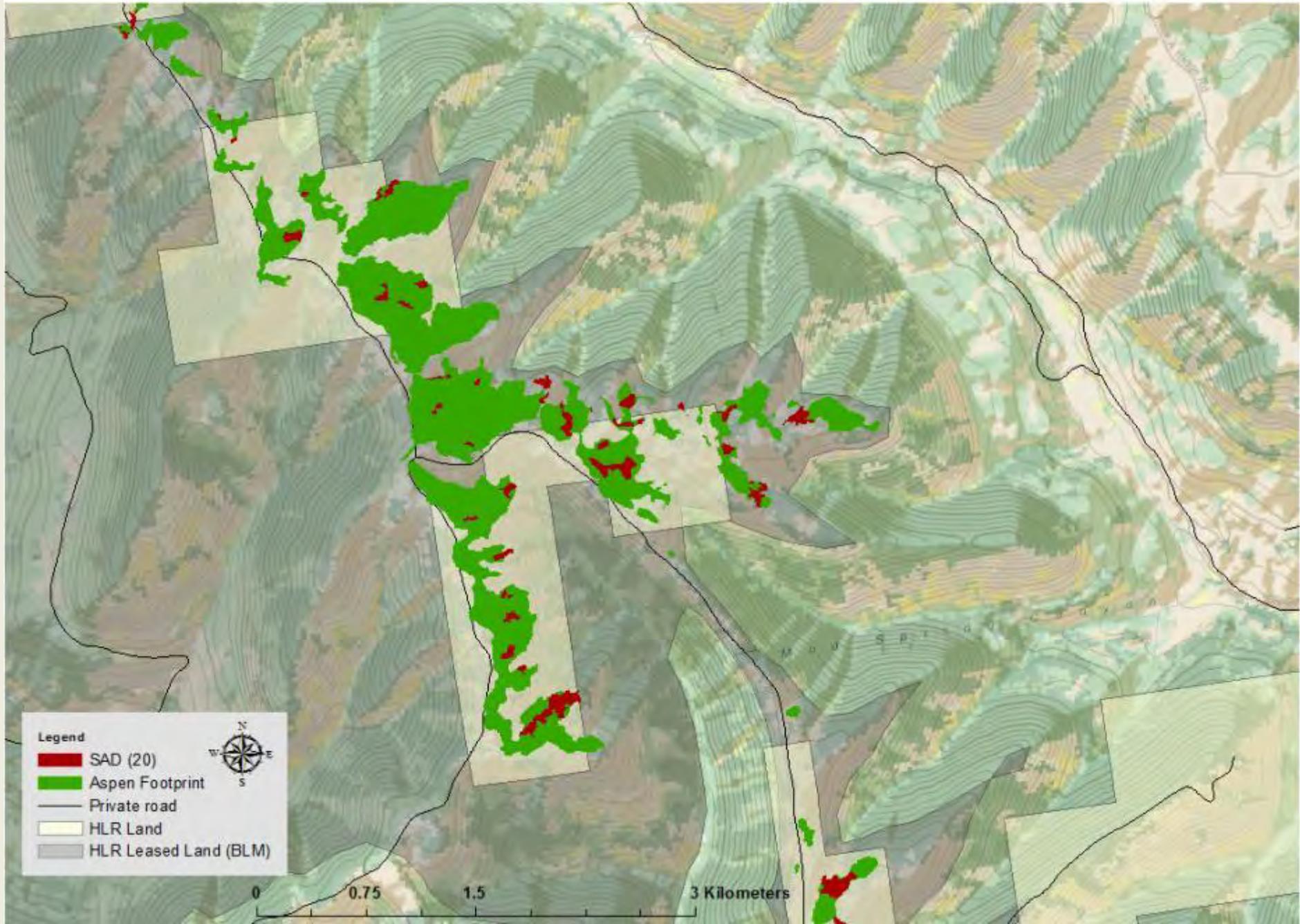
# HLR Large Herbivore Exclosures



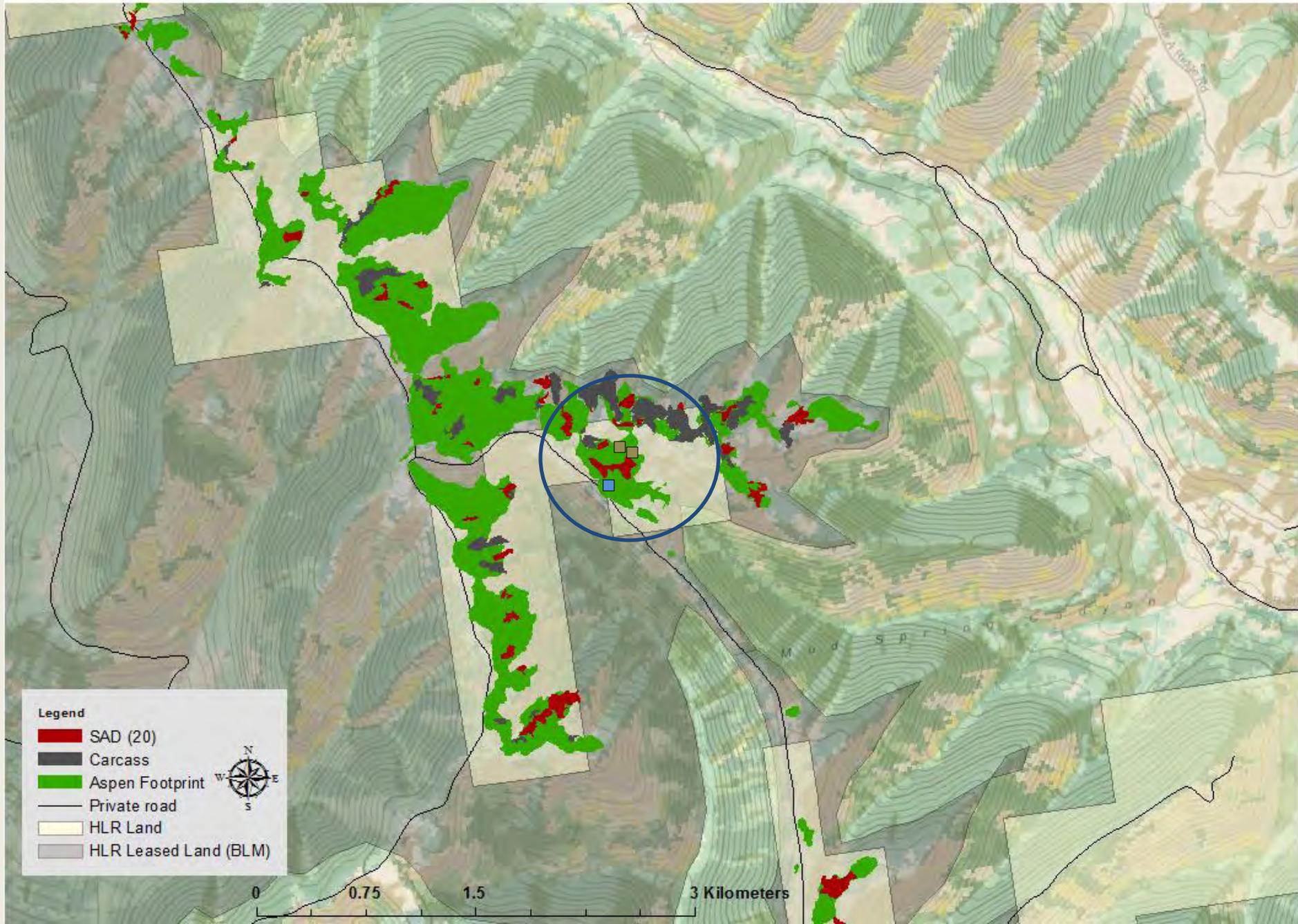
# High Lonesome Ranch



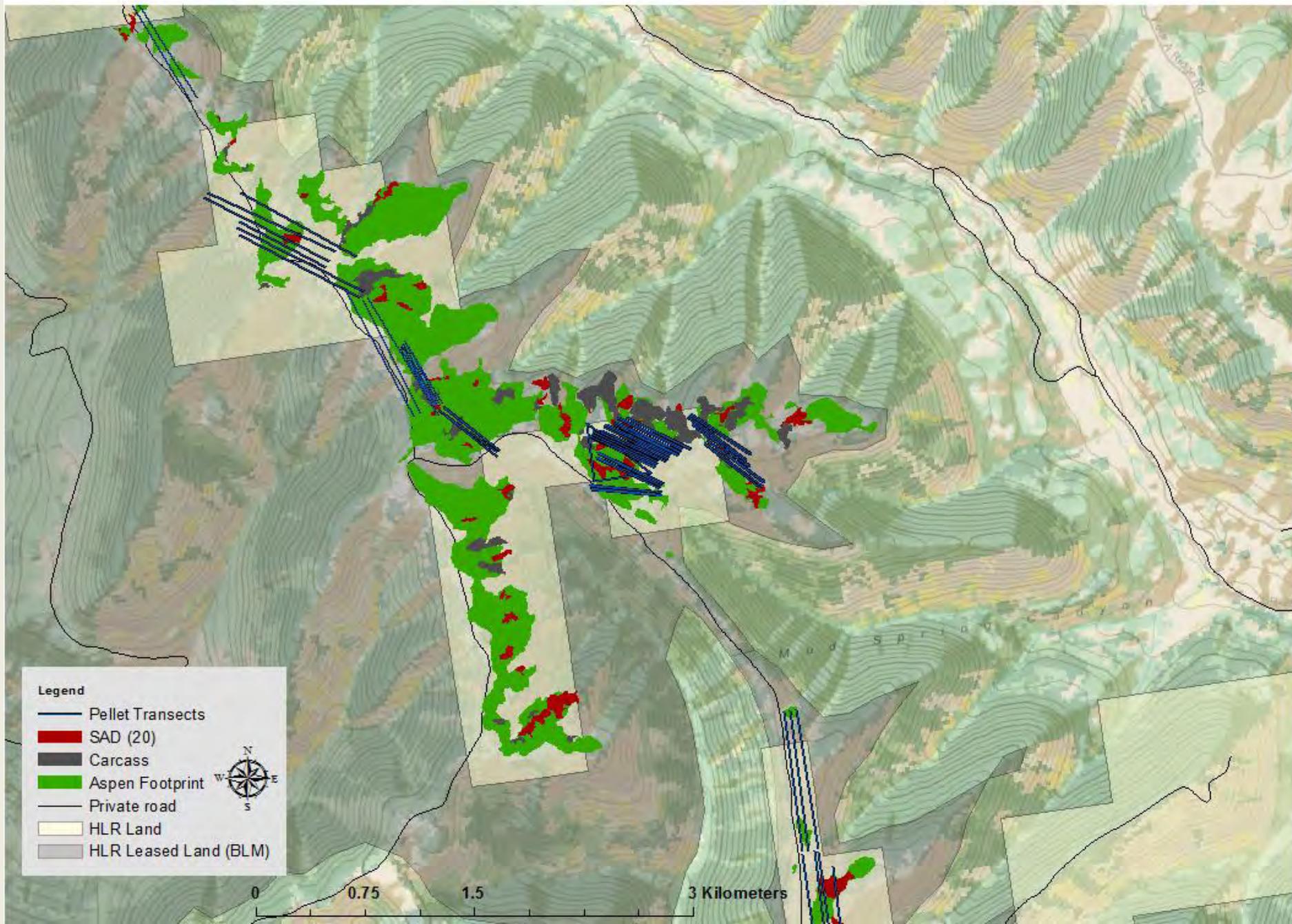
# HLR & BLM Land - High Ranch Aspen Stand Boundaries



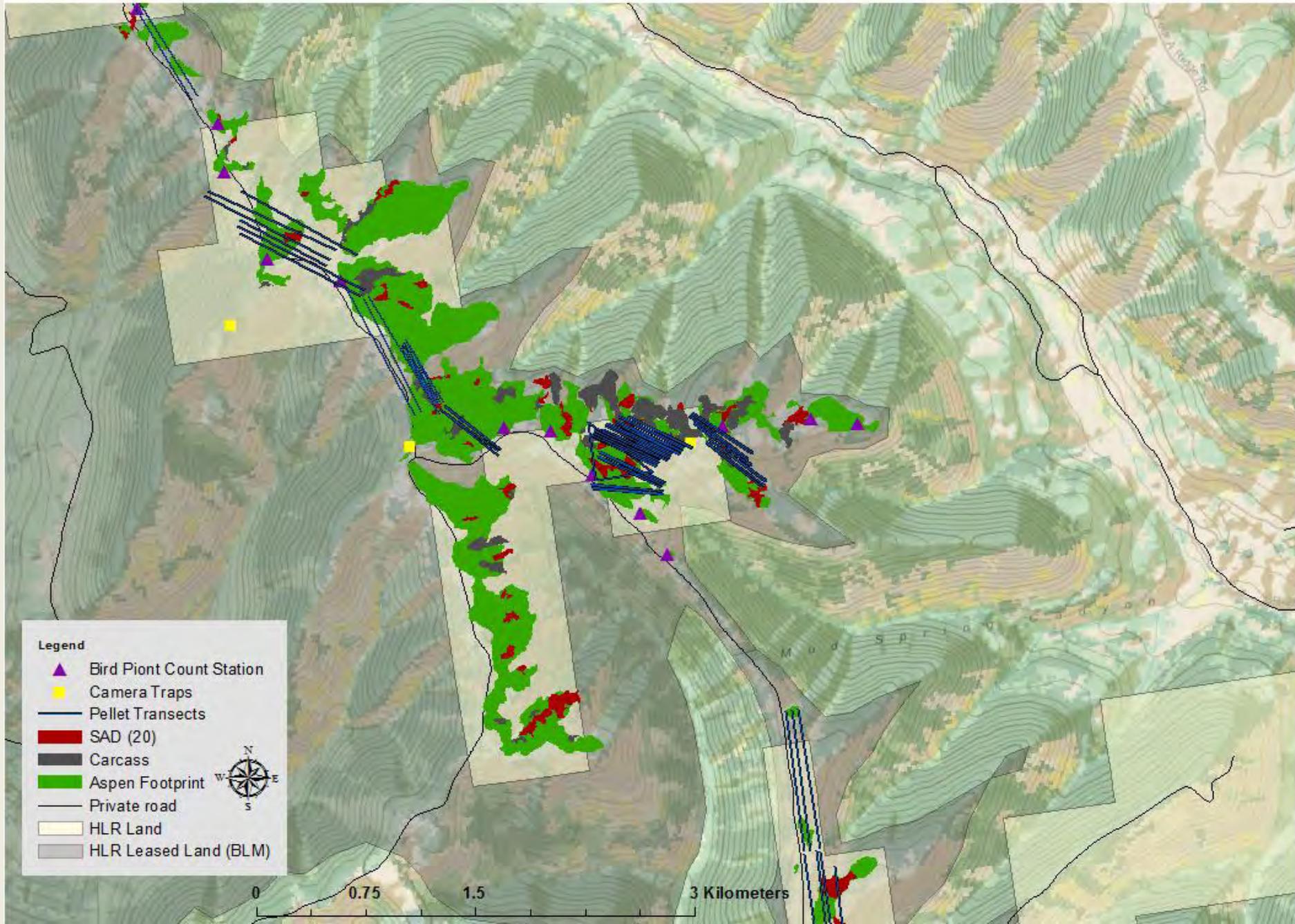
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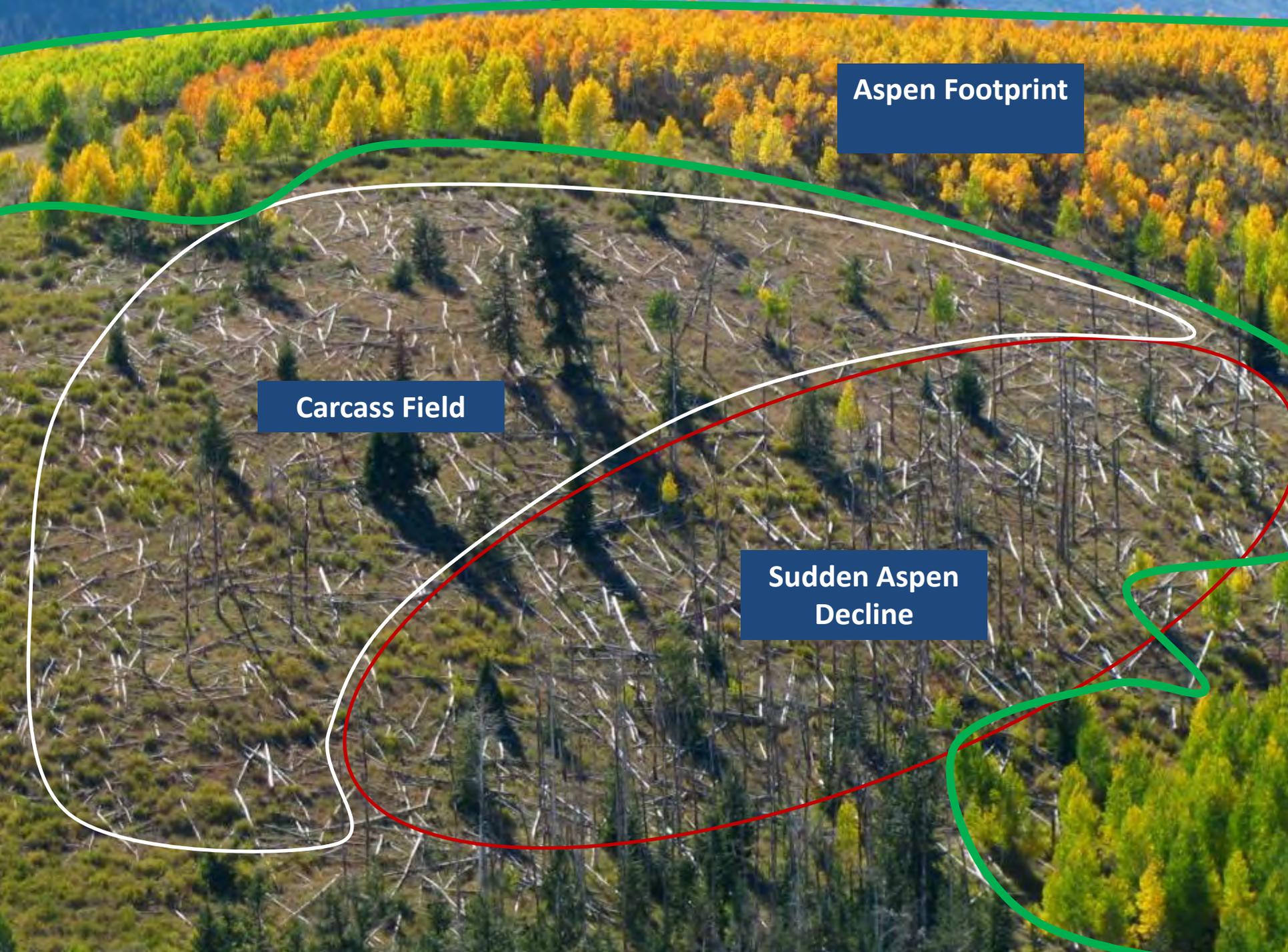


# HLR & BLM Land - High Ranch Aspen Stand Boundaries



# HLR & BLM Land - High Ranch Aspen Stand Boundaries





**Aspen Footprint**

**Carcass Field**

**Sudden Aspen  
Decline**

# HLR Science and Conservation Partners

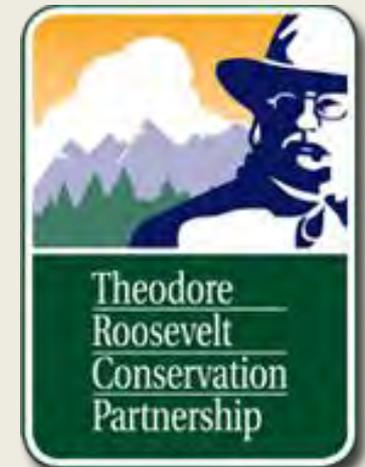
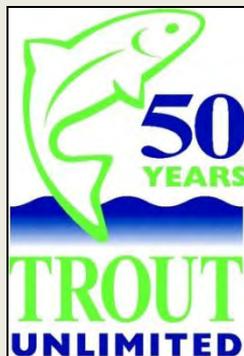


TRINITY  
UNIVERSITY

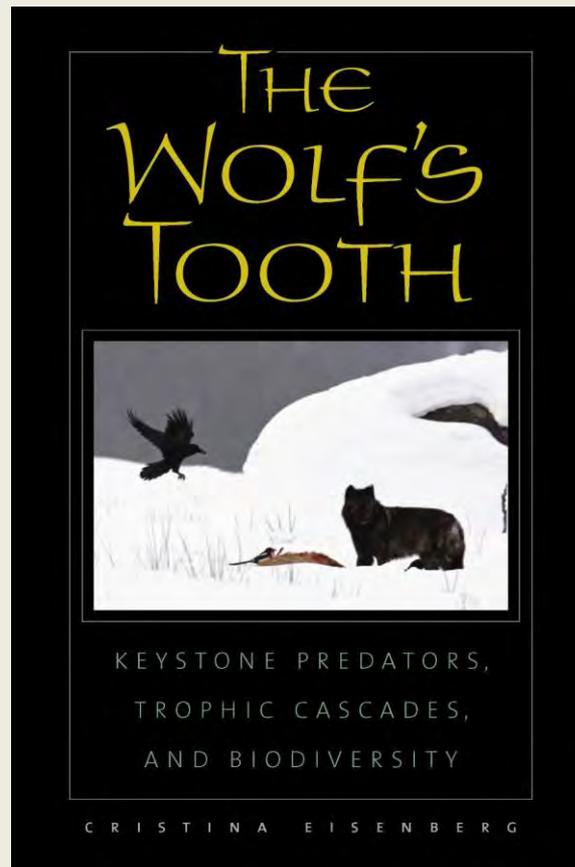
**Prescott College**



BLM



*The Wolf's Tooth: Keystone Predators, Trophic Cascades, and Biodiversity*



# Questions?

Thanks to:

Wayne Padgett

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Hal Salwasser

Michael Soule

Scott Stewart

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