

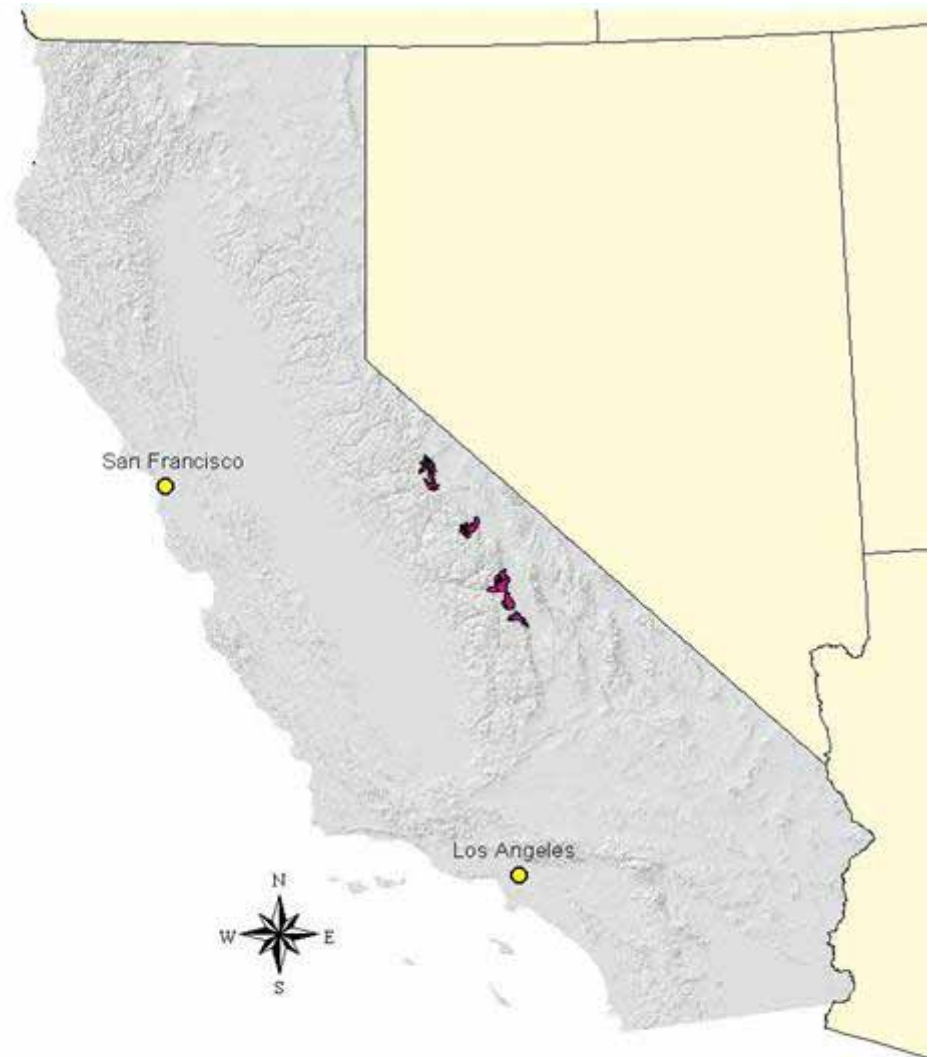
**ALPINE MEADOWS AND SIERRA NEVADA  
BIGHORN SHEEP: WILL CLIMATE CHANGE  
IMPACT RECOVERY?**

**Tom Stephenson, Lacey Greene, Mike Dodd,  
Lora Konde, and John Wehausen**

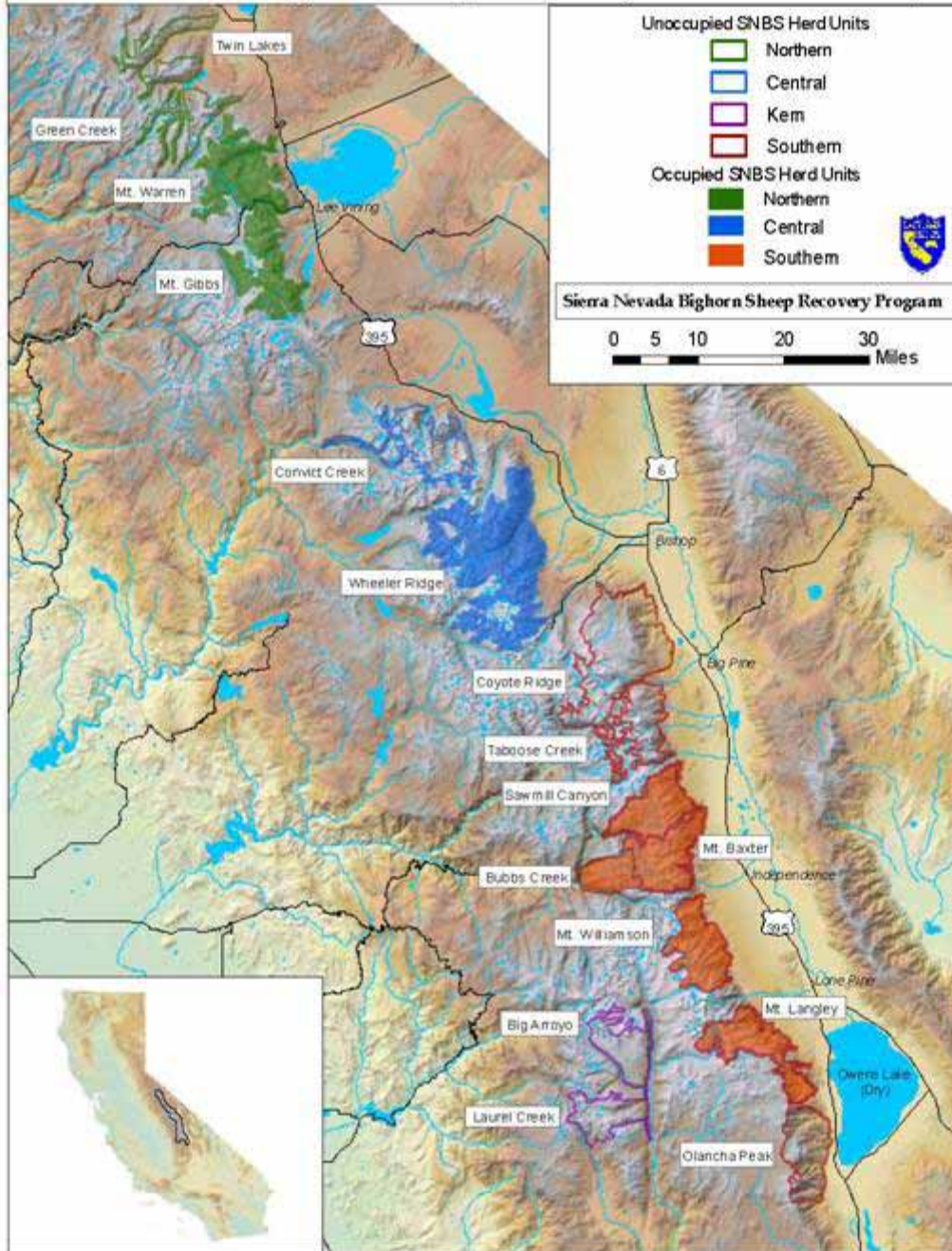
# Original Distribution of Sierra Nevada Bighorn Sheep

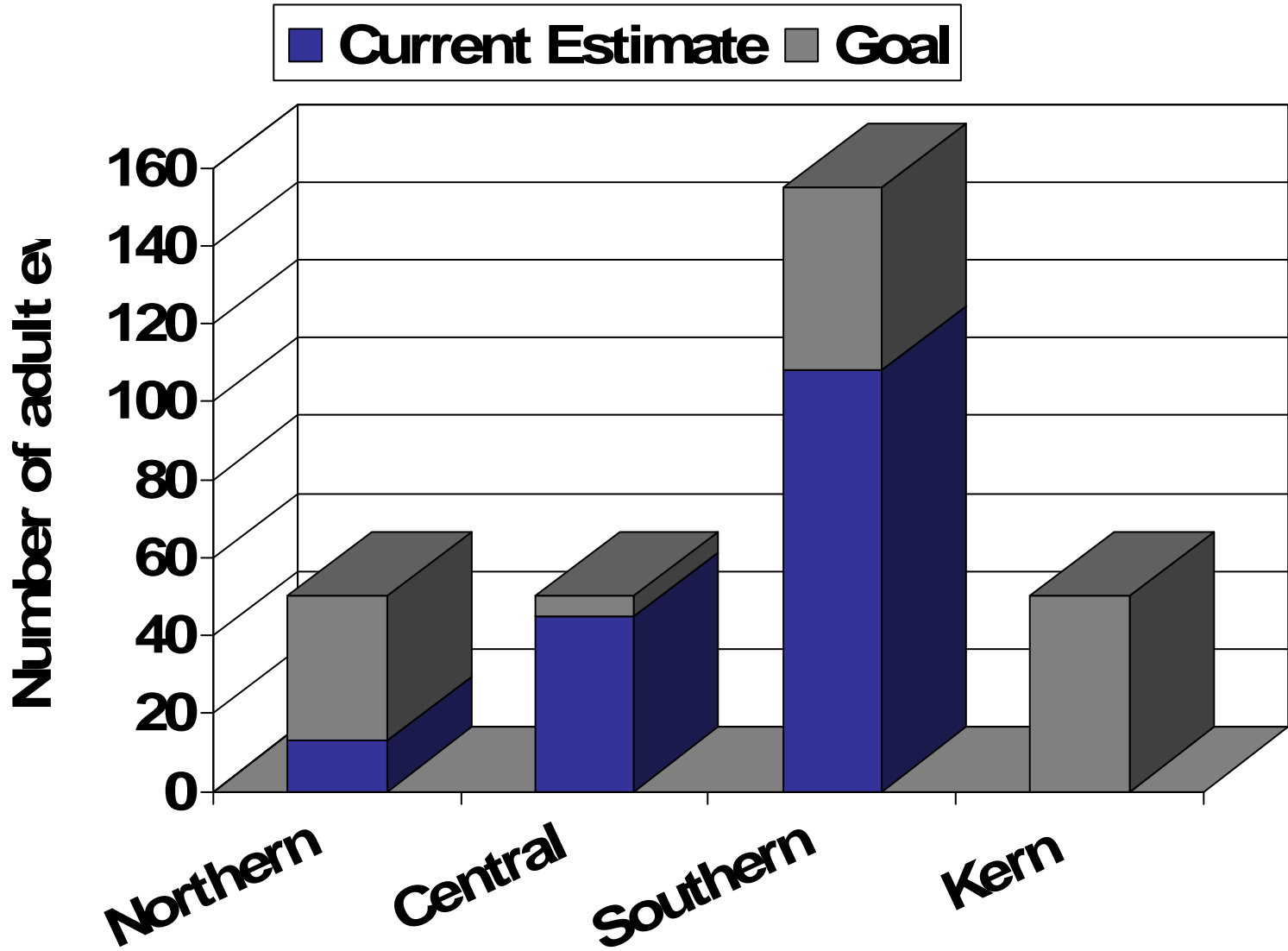


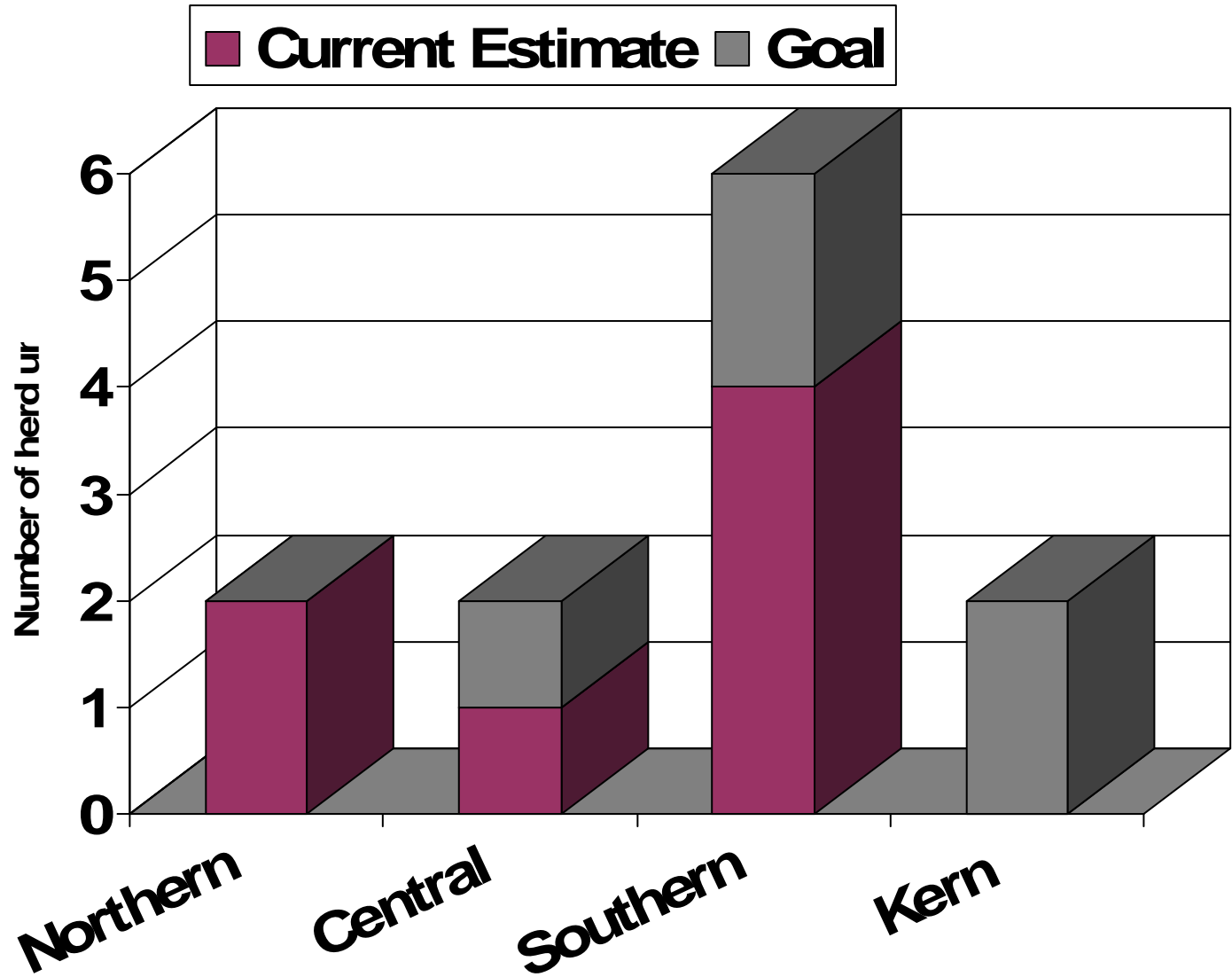
# Current Distribution of Sierra Nevada Bighorn Sheep

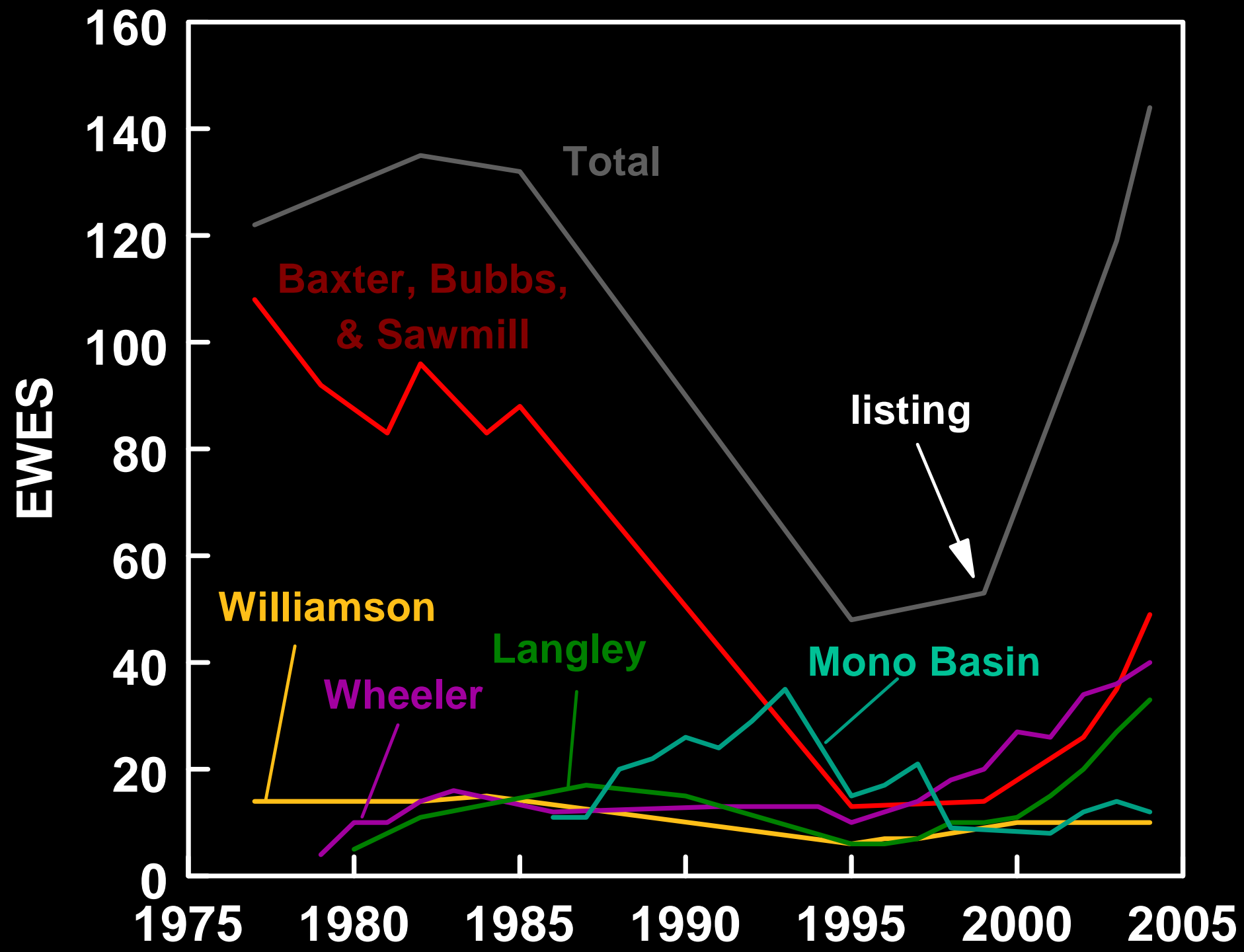


# Sierra Nevada Bighorn Sheep Recovery and Herd Unit Map







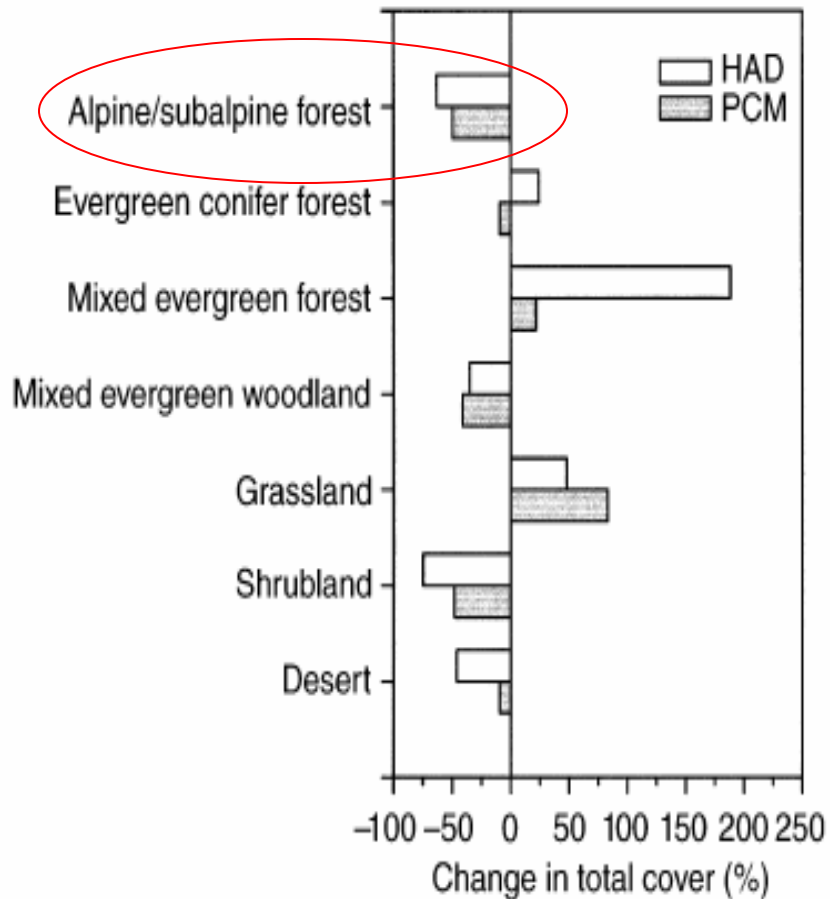


# Threats to Recovery

- Small Population Size
  - Demographic concerns (e.g., Allee effect)
  - Genetic concerns (e.g., inbreeding depression)
- **Climate**
- Habitat/Forest Succession
- Predation
- Disease

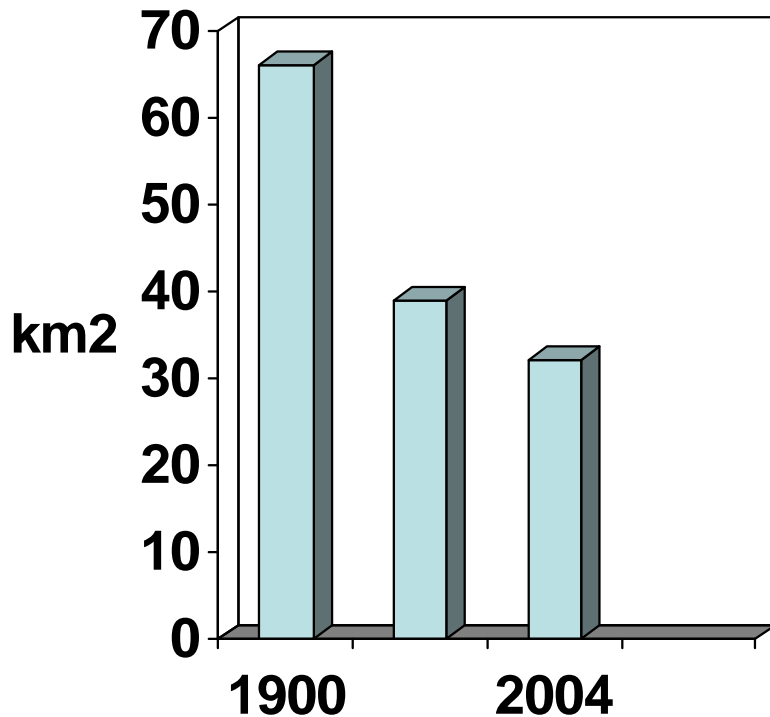


# Climate Change Predictions



- Decline in alpine meadow communities
- Tree-line is expected to rise in elevation

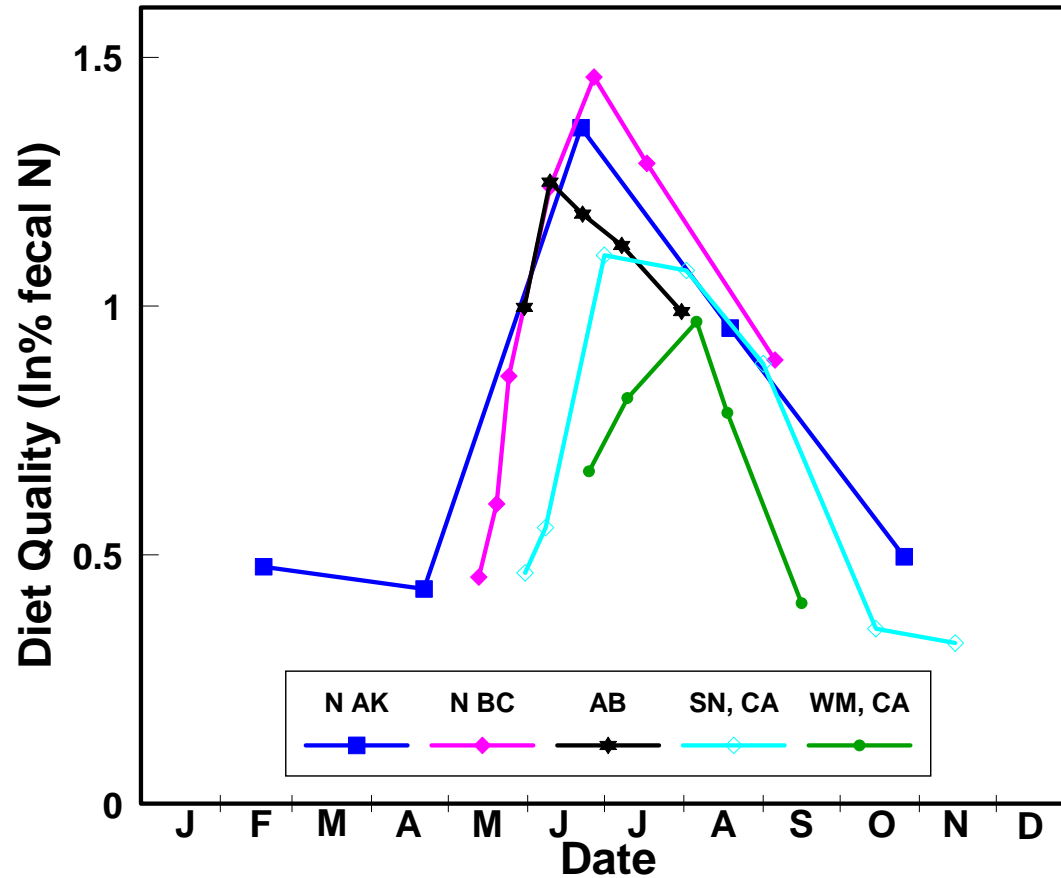
# Shrinking Glaciers and Snowfields



- Basagic documented a decline in the coverage of glaciers in the Sierra Nevada of almost 50% during the past century



# Diet Quality among regions







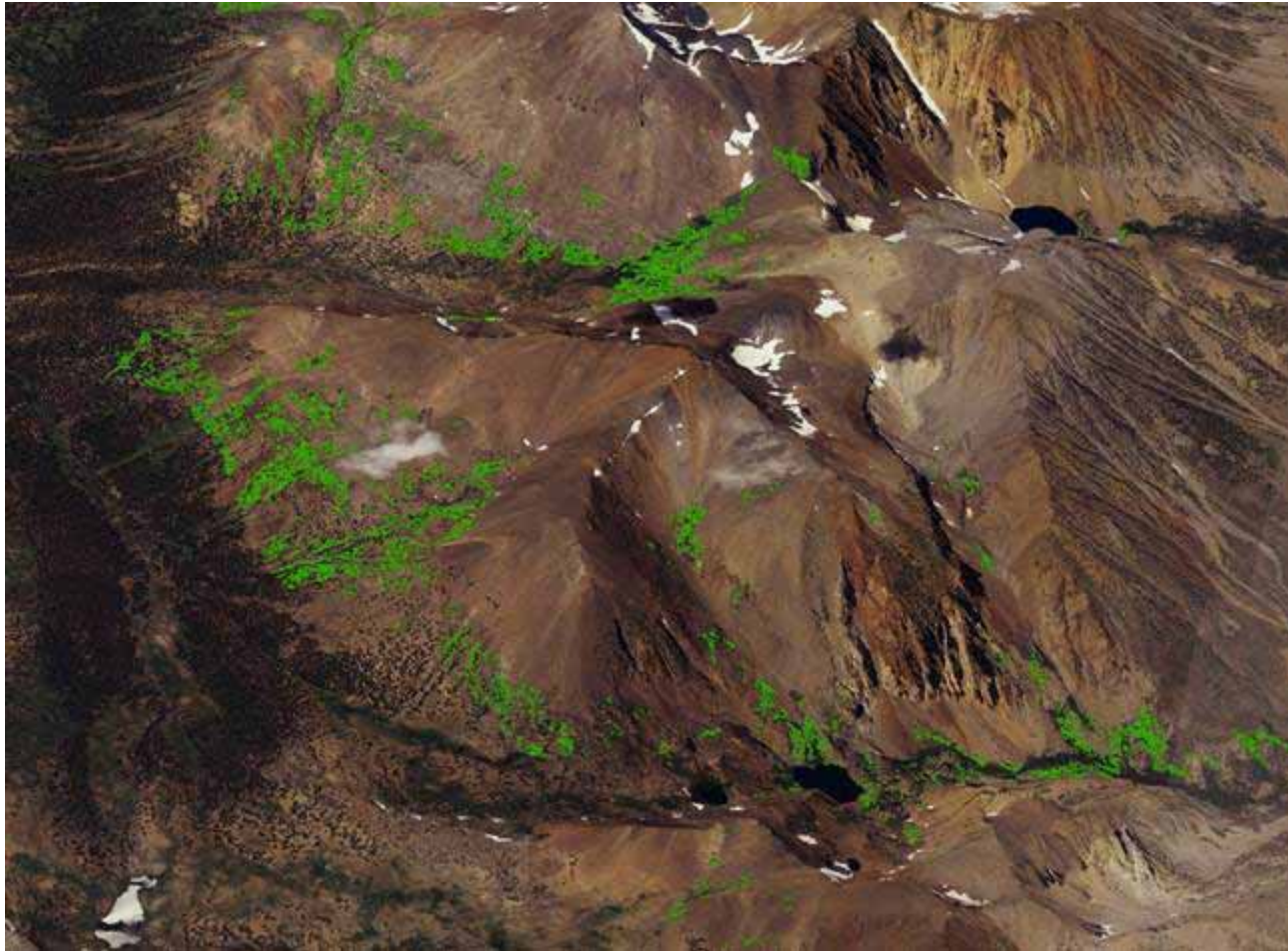
# Availability of Meadows within Herd Units

Mt. Warren	Mt. Gibbs	Wheeler Ridge	Mt. Langley
2%	0.8%	0.9%	0.3%

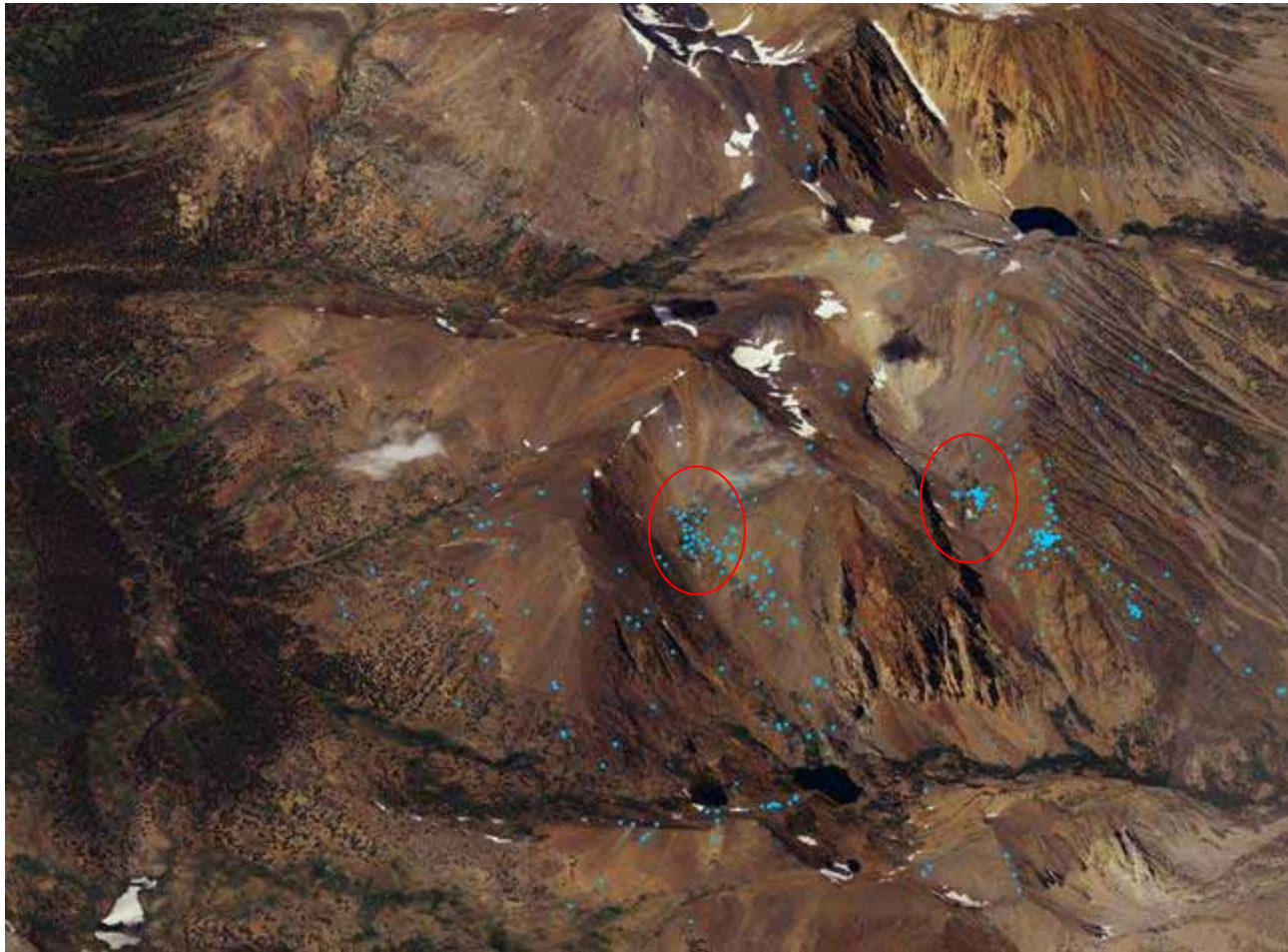
# Mt. Gibbs



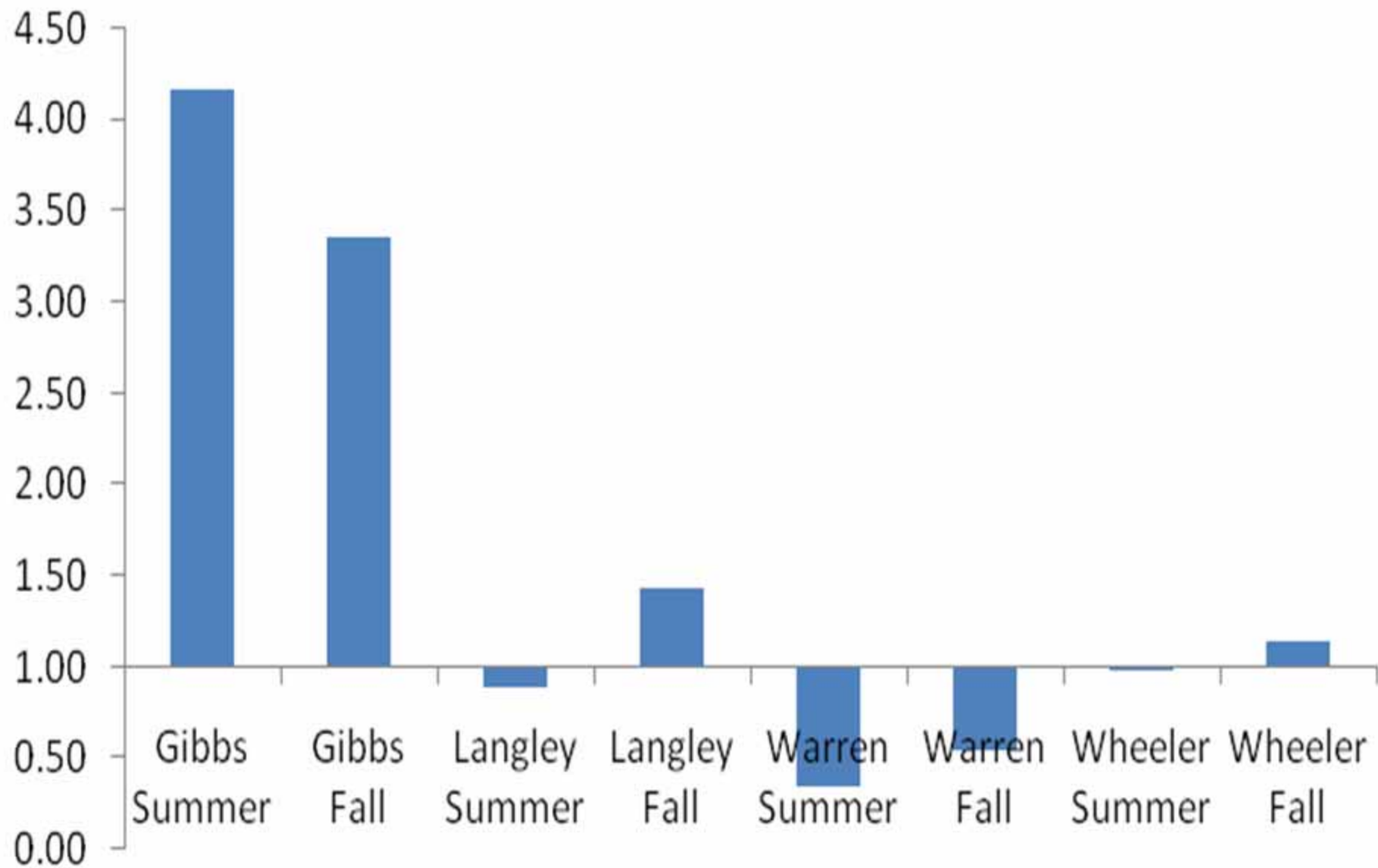
# Delineation of Meadows



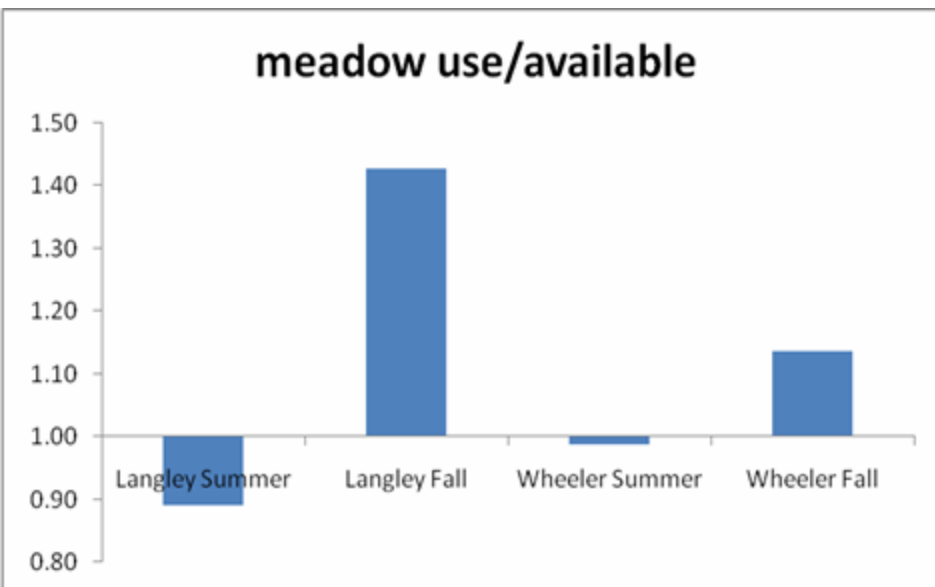
# Plot of Bighorn Locations



# EWES: use/available

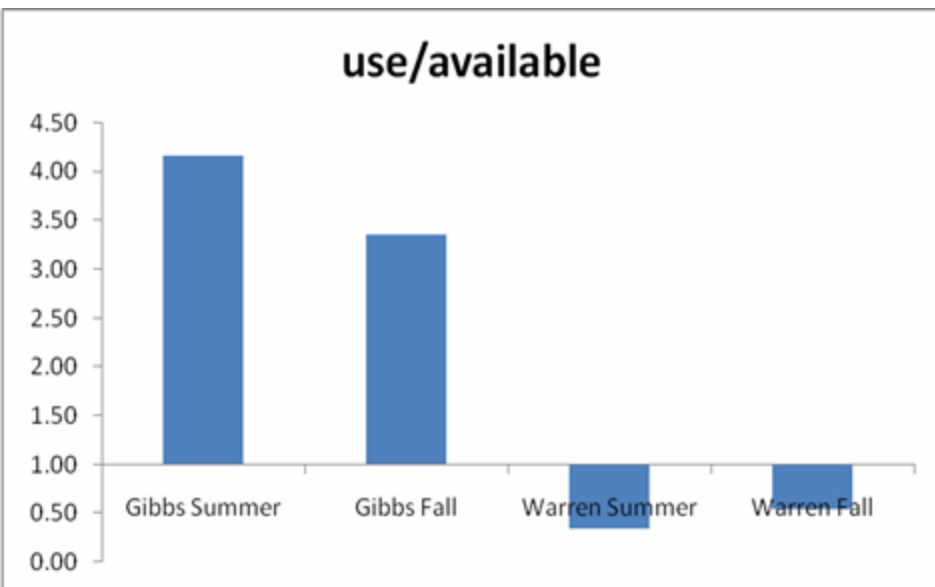


# Use by larger populations



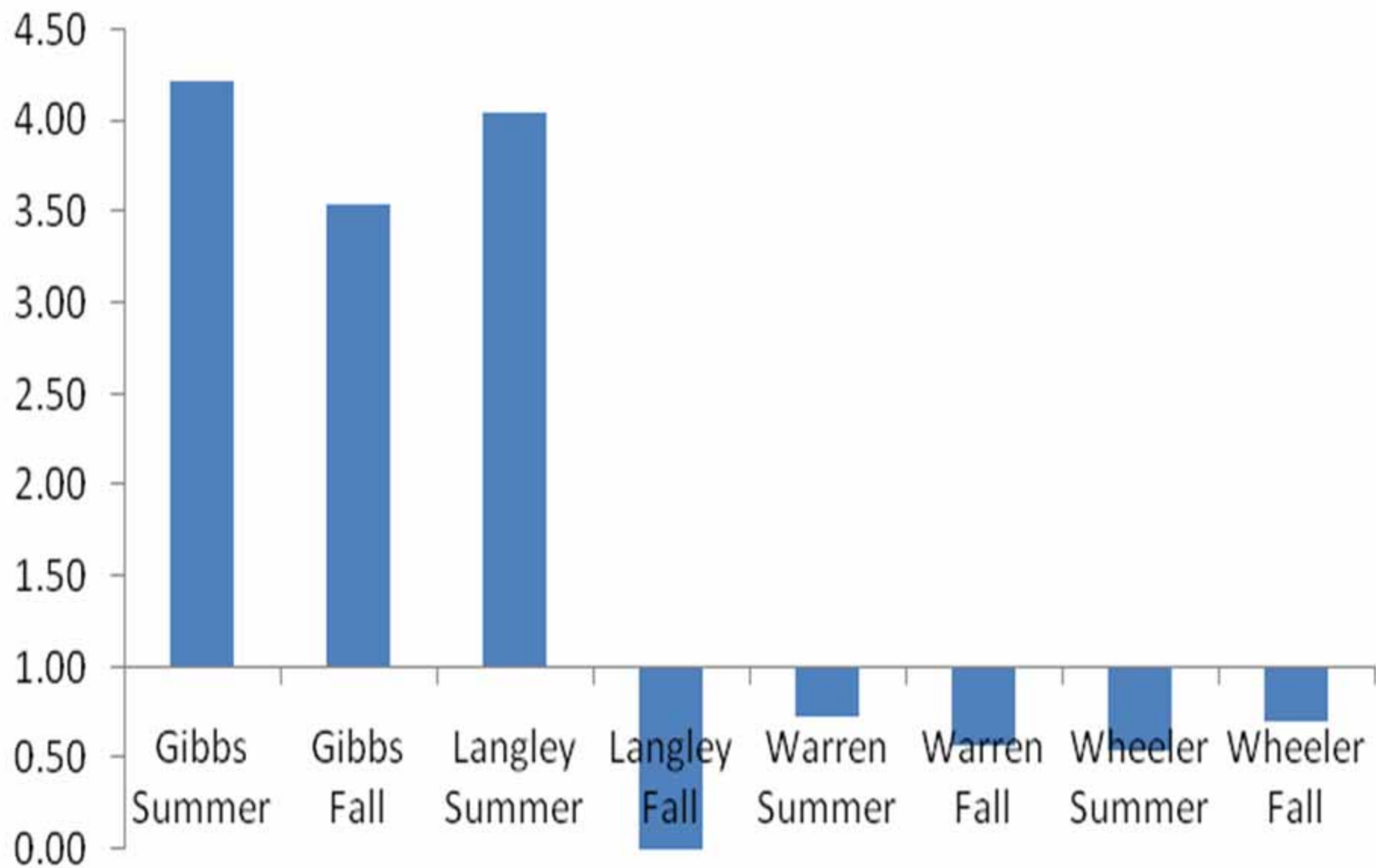
- Greater selection during autumn
- If meadows senesce early, nutrient availability will decline during pre-winter foraging that is important for fat deposition

# Use by smaller populations



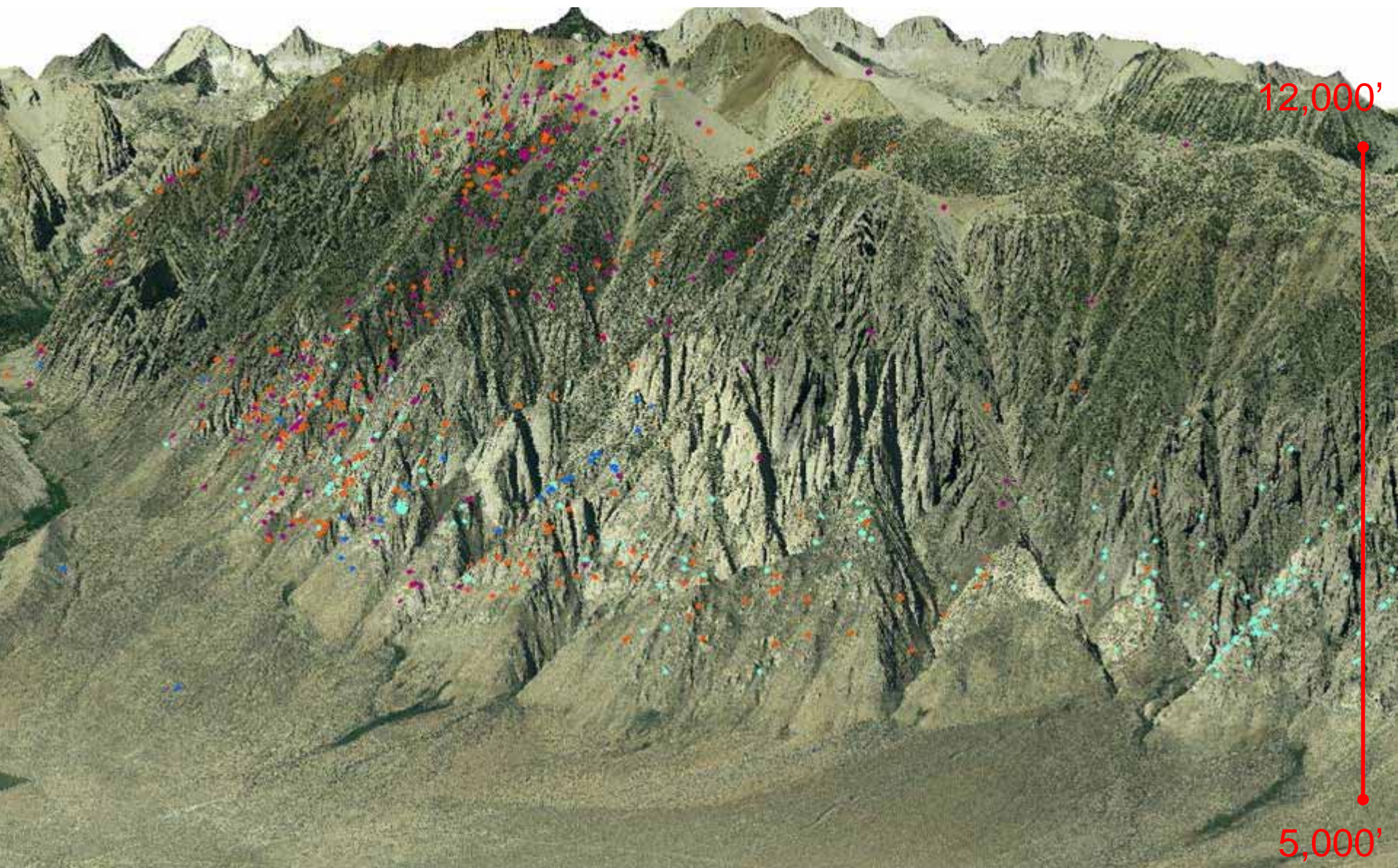
- Gibbs exhibited strong selection
  - Meadows are at the core of their range
- At Warren, apparent avoidance may be a function of low availability in the core of the range

# RAMS: use/available



# Conclusions

- Sierra bighorn populations are small relative to historic levels.
- We hypothesize that as populations grow and expand, meadows will become more essential for supporting larger populations.
- Meadows on the periphery of some ranges may have yet to be discovered.
- Importance of meadows may vary among granitic and metamorphic ranges.

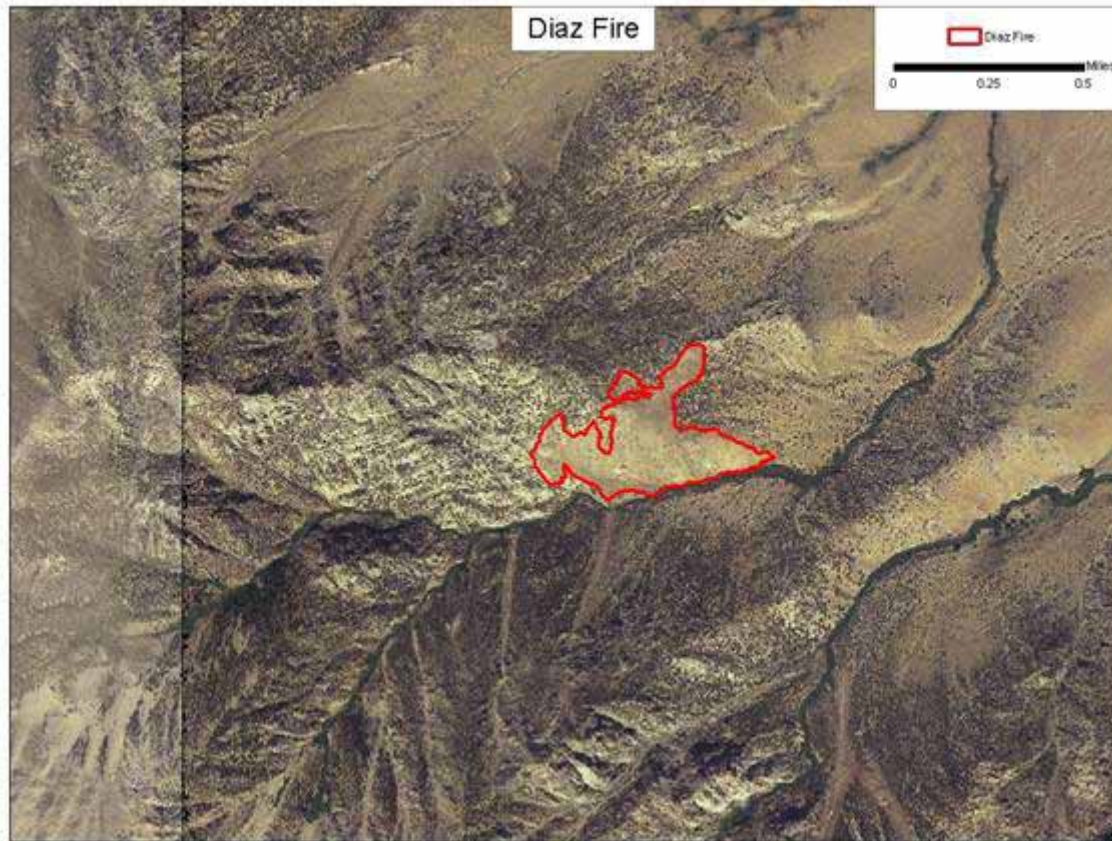


12,000'

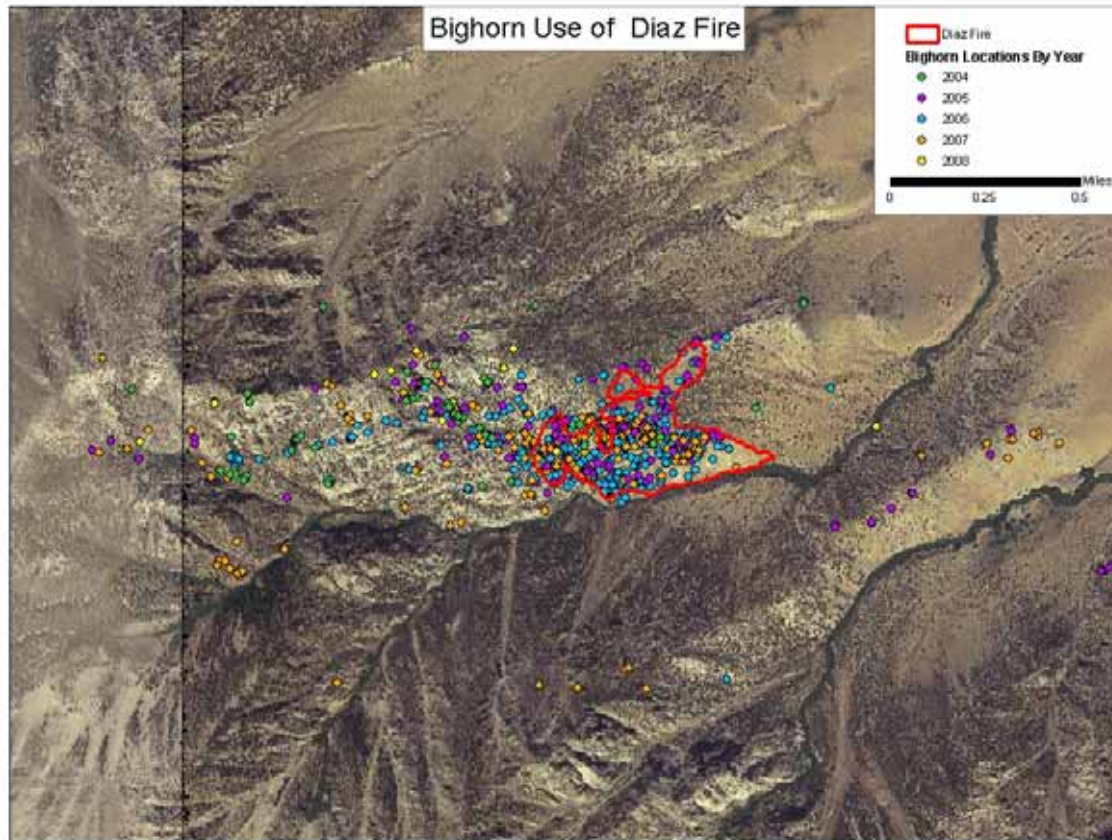
5,000'



# Prescribed Fire

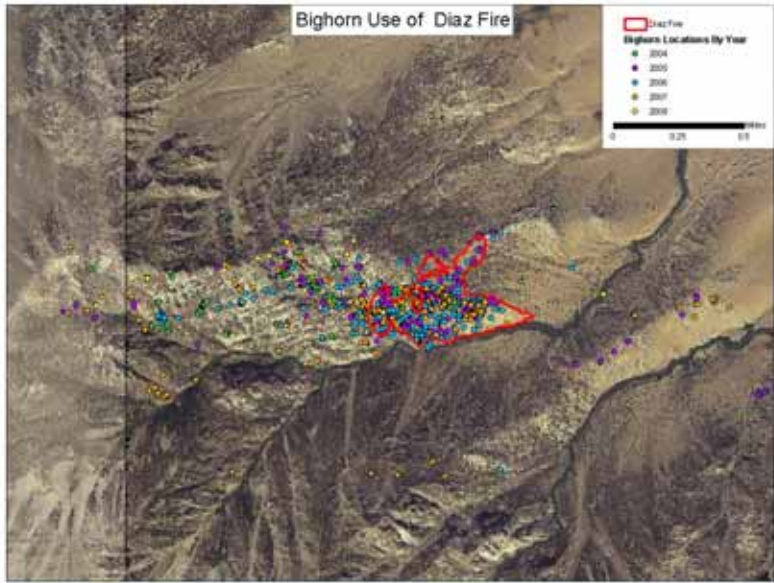


# Bighorn Use of Burns

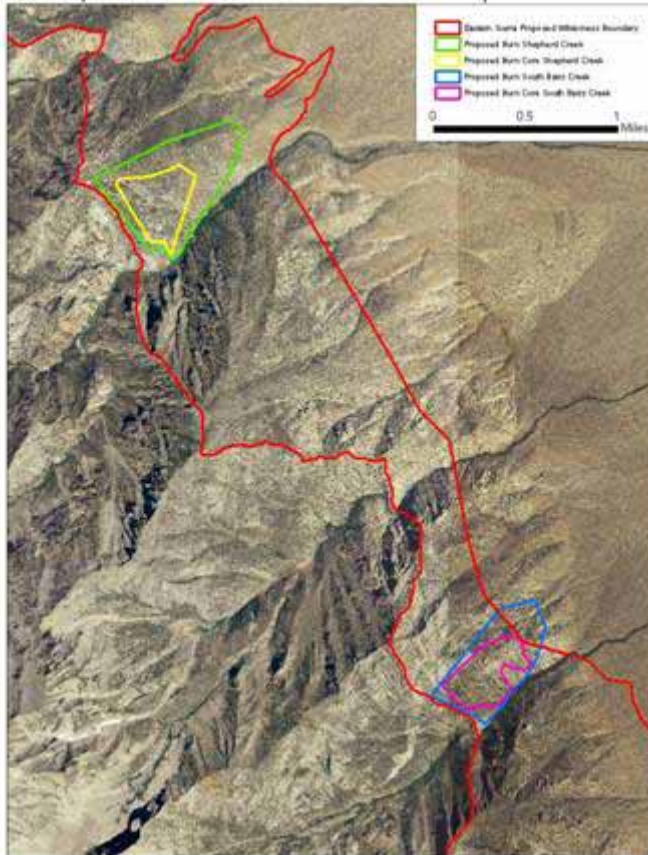


# Acknowledgements

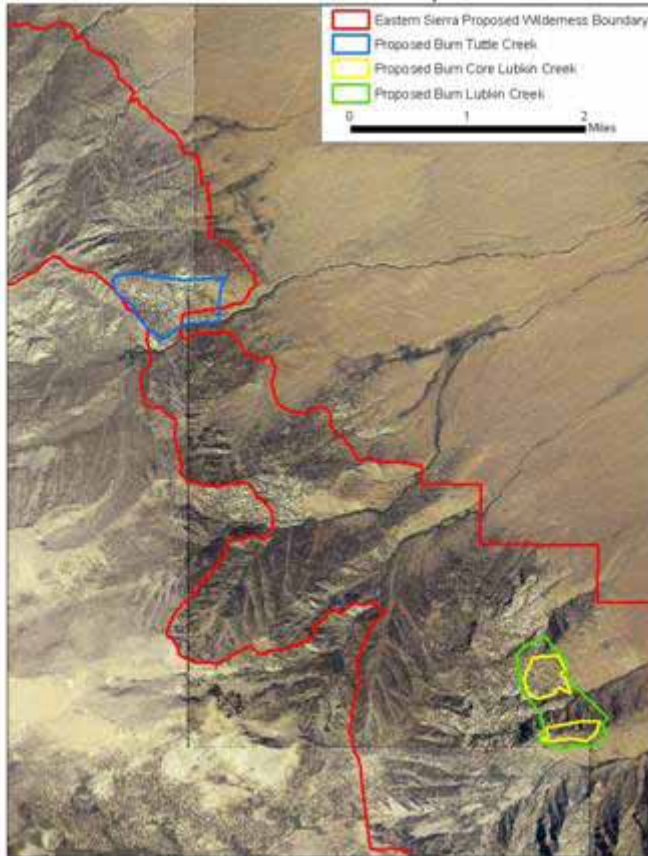
- CDFG
- USFWS
- BLM
- Kathleen Knox
- Dave German



### Shepherd Creek & South Bairs Creek Proposed Burns



### Tuttle Creek & Lubkin Creek Proposed Burns



# Lee Vining & Mt. Gibbs Proposed Burns



