

GYE Science Conference 2024  
Oral Presentation Abstract

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**Presentation Title:** Reconstructing 2000 years of herbivore abundance, identity, and impacts with molecular biomarkers in a catchment in northern Yellowstone National Park

**Abstract:**

Background

Large herbivores are important drivers of ecological processes, yet long-term patterns of herbivore abundance, community composition, and resource use are poorly understood. Recent advances in molecular biomarker analysis of lake sediments can provide new insights into how herbivores of the past interacted with their environments.

Methods

We tested the utility of fecal steroids in lake sediments for reconstructing past ungulate abundance and community composition in the Northern Range of Yellowstone National Park. We analyzed the molecular fingerprints of a selection of Yellowstone ungulates (bison, elk, moose, pronghorn, and mule deer) and compared the fingerprints to fecal steroids in sediments extracted from Buffalo Ford Lake, Wyoming.

Results/Conclusions

We present new long-term records of ungulate occurrence and suggest that management altered the timing, duration, and intensity of local ungulate use. Our results demonstrate that bison and elk were the dominant herbivores in the Buffalo Ford Lake area over the past two millennia. Fecal steroid influxes show that in the past 120 years local ungulate densities reached historically unprecedented levels. Multi-proxy comparison suggests that elevated populations likely contributed to declining forage taxa (*Poaceae*, *Artemisia*, and *Salix*), relative to long-term averages, and possibly increased lake production. Scaled-up biomarker analysis of multi-lake networks can potentially reveal long-term spatiotemporal dynamics of large herds in the Northern Range and beyond.

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**Session topics:** Ecosystem Resiliency; Native Fish and Wildlife Status, Trends, and Habitat Needs; Emerging Technologies