



Pack Stock in Sequoia and Kings Canyon Parks Have Minimal Overlap with Sierra Nevada Bighorn Sheep

Despite a lack of data to assess the claims, pack stock (horses, mules, burros, llamas) are assumed to have negative effects on public lands. Among them, Sequoia and Kings Canyon National Parks have received complaints that pack stock may affect Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*), a federally endangered subspecies. The potential effects are thought to be pack stock displacing sheep from meadows on their summer range, or through changes to sheep habitat or forage quality.

A research effort led by USGS sought to validate these effects, focusing on the Sawmill Canyon, Mount Baxter, Bubbs Creek, Mount Williamson, and Mount Langley herds. Researchers conducted an “association analysis” to test for potential spatial overlap in meadow use between sheep and pack stock, and to compare differences in community composition, structure, and diversity of vegetation among meadows with different levels of use by sheep and pack stock.

The association analyses indicated the potential for overlap between pack stock and Sierra Nevada bighorn sheep was minimal: only 1 percent of the potential meadow area in the sheep herd home ranges overlapped that of pack stock meadows.

As for whether pack stock were altering sheep habitat or affecting their nutrition, there were no systematic differences in overall vegetation structure or composition, or in diversity, cover, or composition of forage plant species, among the analyzed meadows. Variation in plant species composition was influenced primarily by random differences among meadows and environmental gradients, and there was little evidence that pack stock use contributed in meaningful ways to this variation.

The few differences among meadows with different levels of use by bighorn sheep and pack stock either were minor or were not in a direction consistent with negative effects. The analyses suggest that current management plans at Sequoia and Kings Canyon National Parks for pack stock grazing has likely minimized negative effects on Sierra Nevada bighorn sheep.

This Brief Refers To:

Klinger, RC, AP Few, KA Knox, BE Hatfield, J Clark, DW German, TR Stephenson. 2015. **Evaluating potential overlap between pack stock and Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*) in Sequoia and Kings Canyon National Parks, California**: U.S. Geological Survey Open-File Report 2015-1102, 46 p., doi:10.3133/ofr20151102
<http://www.werc.usgs.gov/ProductDetails.aspx?ID=5284>



The population of bighorn sheep in the Sierra Nevada has increased since being listed as federally endangered in 1999. (Image: Dave Graber/NPS)

MANAGEMENT IMPLICATIONS

- There is little overlap in spatial use of meadows by Sierra Nevada bighorn sheep and pack stock at SEKI. In particular, meadows that are both open to pack stock grazing and available to sheep represented a very small proportion of all meadows on the landscape.
- Grazing by both pack stock and sheep tend to be relatively intermittent and of low intensity, while the meadow vegetation patterns detected seem to be dictated by random environmental variables—raising the possibility that neither pack stock nor sheep grazing are causing specific impacts to meadow plant species diversity.
- Direct measurements of wildlife displacement can be difficult to design and implement. Using an “association analysis” approach to first assess indirect measures of potential impact can help justify whether in-depth experiments are needed to measure specific impact—which in this case, does not seem to be warranted.

RESEARCH CONTACT

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