



Forest Service
U.S. DEPARTMENT OF AGRICULTURE



Rocky Mountain Research Station Science You Can Use *(in 5 minutes)*

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Mountain Goats and Recreation—Effects on an alpine sky island

The La Sal Mountains are an isolated sky island in southeast Utah. These high-altitude ecosystems are especially vulnerable to climate change and human-caused disturbances. In 2013 and 2014, the Utah Division of Wildlife Resources (UDWR) introduced nonnative mountain goats to the La Sals to enhance hunting and wildlife viewing opportunities. Recreation has increased in the area since then. Mountain goats and increased recreation are affecting plant species of conservation concern, suggesting that an adaptive management approach may be needed to maintain the ecosystem and the sensitive species it supports.

Recently published work by Jeanne Chambers, Scientist Emeritus with the Rocky Mountain Research Station (RMRS) in Reno, Nevada, and other RMRS and Forest Service scientists detailed the results of a 5-year (2016–2020) monitoring effort. The team evaluated the separate and interacting effects of year, recreational use, and mountain goat use on (1) populations of plant species of conservation concern, (2) cover of grasses and forbs, and (3) ground cover (leaf litter, bare soil, pavement [pebbles and small rocks], and rock). The study area, which includes a Forest Service Research Natural Area, supports 11 plant and three animal species of conservation concern.

They used motion-sensing cameras to monitor goat and hiker use of study areas, and assessed goat pellet counts, plant species, and ground cover type.

The La Sal daisy grows only in the alpine plant community in the La Sal Mountains of southeastern Utah. USDA Forest Service photo.

Monitoring results suggested decreases in La Sal daisy, a critically imperiled endemic plant species, and other forbs of conservation concern. Mountain goats and increased recreational use have a role in these reductions. Mountain goats can affect sensitive plants on high-altitude slopes through trampling, wallowing, and grazing.

The team found increases in leaf litter, bare soil, and pavement and decreases in cryptobiotic soil crusts toward the end of the monitoring period. Disturbance of sensitive cryptobiotic soil crusts can erode soil and affect habitat suitability for vulnerable alpine plant species.

Climate change may be exacerbating the effects of mountain goats and recreation, leaving less room for error in managing this and similar ecosystems. The La Sal area is predicted to see higher temperatures and more variable precipitation with climate change, and, like much of the Southwest, climate change effects are expected to be larger than in higher elevation areas.

The Forest Service manages the land in the study area for watershed and alpine ecosystem values as well as

Mountain goats can affect sensitive plants like the La Sal daisy on high-altitude slopes through trampling, wallowing, and grazing. They were one of the most common species recorded on trail cameras deployed in the research area. Image modified from a USDA Forest Service photo by Lily Henley.



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for recreation, while UDWR manages the wildlife. The agencies try to collaborate to achieve mutually agreeable ends, but the different missions can create management challenges.

“This collaborative monitoring effort of our sensitive alpine ecosystem and the species it supports has revealed concerning trends related to the introduction of mountain goats and increasing recreation in the highest reaches of the La Sal Mountains,” says Michael Engelhart, Moab/Monticello District Ranger. “The correct balance between wildlife and social interactions with a habitat that is already under stress from climate change remains to be determined, but trends need to be acknowledged as part of any ongoing and future management steps of the agency and our partners.”



The La Sal Mountains are an isolated sky island mountain range on the Colorado Plateau near Moab, Utah. USDA Forest Service photo.

KEY MANAGEMENT CONSIDERATIONS

- Monitoring data showed a reduction in the frequency of the La Sal daisy, as well as in the cover of forbs and cryptobiotic soil crusts, by the end of the 5-year study. Some of these changes could be attributed to the presence of mountain goats and increased recreation.
- Bare soil and pavement occurred most frequently in areas with high recreation and goat use.
- The cumulative effects of mountain goats, increased recreation, and climate change on this slow-to-recover ecosystem are still unknown.
- Continued collaborative monitoring by the Forest Service and Utah Department of Wildlife Resources can help develop adaptive management strategies for maintaining the resilience of this alpine sky island.



A Forest Service crew from the Manti-La Sal National Forest collecting data on alpine plants. USDA Forest Service photo.

FURTHER READING

Chambers, Jeanne C.; Smith, Barb; Baggett, L. Scott. 2022. [Five-year effects of introduced mountain goats and recreation on plant communities and species of conservation concern in an alpine sky island](#). American Midland Naturalist. 188(2): 177–198.

NOAA. 2015. Boosting ecosystem resilience in the Southwest's sky islands. U.S. Climate Resilience Toolkit. <https://toolkit.climate.gov/case-studies/boosting-ecosystem-resilience-southwests-sky-islands>.

PROJECT LEADS

Jeanne Chambers is a Senior Scientist (Emeritus) with the RMRS Maintaining Resilient Dryland Ecosystems team in Reno, Nevada.

Barb Smith is a District Wildlife Biologist with the Moab/Monticello District, Manti-La Sal National Forest, in Moab, Utah.

L. Scott Baggett is a Statistician with the RMRS in Fort Collins, Colorado.

The Rocky Mountain Research Station is one of seven units within USDA Forest Service Research & Development. RMRS maintains 14 field laboratories throughout a 12-state geography encompassing parts of the Great Basin, Southwest, Rocky Mountains, and the Great Plains. While anchored in the geography of the West, our research is global in scale. RMRS also administers and conducts research on 14 experimental forests, ranges and watersheds and maintains long-term research databases for these areas. Our science improves lives and landscapes. More information about Forest Service research in the Rocky Mountain Region can be found here: <https://www.fs.usda.gov/research/rmrs/>.

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