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Rocky Mountain Research Station

Science You Can Use *(in 5 minutes)*

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Fall Fires Bring Many Microbes and Surprise Guests: Fall prescribed burns can build healthy ecosystems on sagebrush rangeland

Rangelands worldwide are essential for carbon sequestration, water retention, and habitat to name a few critical benefits. Prescribed fire is used to benefit vegetation and soil and reduce fuels on rangeland sites. What hasn't been clear is how burning on rangelands may affect microbes in the soil, which are responsible for breaking down woody material. Also missing was an understanding of how the insects that typically call rangelands home respond to these burns.

To begin digging into these unknowns, a team led by the Rocky Mountain Research Station (RMRS) studied the impact of fall prescribed burns on plants, insects, and soil conditions in high-elevation sagebrush-steppe rangeland on the Caribou-Targhee National Forest in southeastern Idaho. They found encouraging results for managers in the study areas.



Pine and aspen stakes were used to investigate the decomposition rate of organic matter due to microbial activity after a fall prescribed burn. USDA Forest Service photo by Debbie Page-Dumroese.

After the Burn

According to Debbie Page-Dumroese, a Research Soil Scientist with RMRS, "Not much is known about how fall burns alter microbial communities and insect activities. But we found that these burns are pretty gentle. There was a nice mosaic of burned and unburned areas in the study area. We didn't detect any big changes in soil nutrition, and we actually found more insects in the burned plots, which migrated over time into the unburned plots. There really were no detrimental impacts, so this study validates the current management practice of fall burning."

In the spring following the fall burn, the amount of grass cover was greater in the burned plots.

The effects on insect diversity were evaluated in a field collection campaign about 3½ years after the prescribed burn. The total number of insects was essentially the same in the burned and unburned plots, except that beetles were more abundant in the burned plots.

To evaluate the effect of burning on the decomposition of organic matter, the mass loss from an array of wood stakes (loblolly pine and aspen) was used as an index of the decay rate. As expected from other studies, decay was faster in the burned areas, indicating more microbial activity and healthier soil.

Surprised to See You Here, Termites

The study turned up one quite surprising result, however: termites! Beginning in the second year after burning, termites were found on the wood stakes in



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the burned area, and by the end of the 5-year study period, termites were also found in the unburned areas. Of course, the termite activity accelerated the decay rate. “My first reaction was to think this must be climate change—the termites are moving up from Utah into Idaho,” said Page-Dumroese, “but our coauthors who are termite scientists were more cautious, because we don’t know if termites were there before the burn. But we haven’t been able to find any documentation of termites in these high-elevation sagebrush areas.”

Benefits of Fall Burns

Even though the presence of termites raises new questions, Page-Dumroese advocates fall burns: “They’re a lot easier on the soil than spring burns, and higher soil moisture in the fall means better responses for vegetation in the spring. We were able to confirm that fall burns are a great way to change forage or understory conditions or to achieve other restoration goals, such as creating pollinator habitats. The diversity of insects, the increase in decay, the termites that we found—I think that all shows we’re building a healthy ecosystem.”

PROJECT LEAD

Deborah S. Page-Dumroese is a Senior Research Soil Scientist with the Forest and Woodlands program at the [Rocky Mountain Research Station](#).

Jane Andrew is the author of this Science You Can Use in 5min.

KEY MANAGEMENT CONSIDERATIONS

- Fall burning is a successful way to build diversity and change forage or understory conditions in sagebrush rangelands.
- In burned plots in high-elevation rangeland sites, soil conditions were largely unchanged, grass cover increased, insect populations improved, and decay rates increased.
- Insect populations that developed in burned plots (termites in particular) spread to unburned plots over the course of the study.



In a surprising discovery, termites were found on wood test stakes in burned plots in an Idaho sagebrush-steppe rangeland after a fall prescribed burn. Over the course of the 5-year study, termites migrated from the burned to the unburned test plots. It is unknown whether termites were present in this ecosystem before the study. USDA Forest Service photo by Debbie Page-Dumroese.

FURTHER READING

Page-Dumroese, Deborah S.; Cook, Stephen P.; Kard, Bradford M.; Jurgensen, Martin F.; Miller, Chris A.; Tirocke, Joanne M. 2023. [Prescribed burning alters insects and wood decay in a sagebrush-steppe rangeland in southwestern Idaho, United States](#). *Rangeland Ecology & Management*. 90: 134–145.

Jurgensen, Martin F.; Miller, Chris A.; Page-Dumroese, Deborah S. 2020. [Wood decomposition after an aerial application of hydromulch following wildfire in a Southern California chaparral shrubland](#). *Frontiers in Forests and Global Change*. 3: 93.

Kard, B.M.; Page-Dumroese, D.S.; Cook, S.P.; Jurgensen, M.F., Tirocke, J.M. 2022. [Termite feeding on aspen and pine stakes on a high elevation sagebrush-steppe rangeland in southeastern Idaho](#). *Southwestern Entomologist*. 47(3): 565–574.

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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