



Forest Service
U.S. DEPARTMENT OF AGRICULTURE



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

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Prickly Questions: What is fire's place in the Sonoran desert scrub community?

The desert is hot, dry, and prickly . . . the perfect combination for wildfires. So, shouldn't desert plants be used to fire? It turns out that Sonoran desert scrub communities, home to the iconic saguaro cactus, are vulnerable to frequent large or severe wildfires and may not recover for centuries, if at all. Recent publications by Rocky Mountain Research Station ecologists discuss how desert plants respond to fires, and how big, how often, and how hot fires burn in this ecosystem. The [Fire Regime Synthesis](#) about Sonoran desert scrub communities and associated Species Reviews are published in the Fire Effects Information System (FEIS)—an [online searchable database](#) of research syntheses about how fire affects ecosystems and individual species.

In Sonoran desert scrub communities, fires were historically rare, small, and patchy. Many of the dominant long-lived plants are easily killed or injured by fire and are not adapted to regenerate after fire. Nowadays, we are seeing more fire in these communities leading managers to wonder what to do.

After a series of fires from 2018 to 2020 that burned thousands of acres of Sonoran desert scrub, Mary Lata, fire ecologist in the Tonto National Forest, began an effort to learn more about fire in these systems and says, "I started poking hard at the regional office and saying, hey, who knows what about this?" When FEIS staff put out the call for requests for Species Review needs from land managers, the Tonto responded.

Along with the Sonoran desert scrub Fire Regime Synthesis, Species Reviews in this effort include saguaro, yellow paloverde, buffelgrass, Sahara mustard, and several desert riparian species. They describe how these individual species respond to and affect fire.

The iconic saguaro is easily damaged and often killed by fire and its ability to regenerate may be low, especially when the cover of mature saguaro and its seedlings are reduced. In contrast, nonnative invasive species, like buffelgrass, often survive and spread readily after fire. Buffelgrass is a huge concern because it increases fuel loads and the continuity of fine fuels. On some sites, buffelgrass fills the gaps between native plants, increasing the likelihood of more severe and widespread wildfires. One of the synthesis authors, Kris Zouhar, says: "What's novel about the Sonoran situation is one of the invasives is buffelgrass, which is a perennial. So, these perennials add a whole different level of management to the situation; the fuel is always there." Before buffelgrass invasion, fires likely spread through small patches and only during very wet years that supported native annuals (plants that only last for one year). Now we have buffelgrass, which lasts for years.

In 2020, the Bush Fire burned over 190,000 acres and killed more than 80,000 saguaros on the Tonto National Forest. The growth of nonnative grasses played a factor in one of the largest fires in Arizona's history. USDA Forest Service photo by Mary Lata.



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On December 8, 2023, the Tonto National Forest's revised Land Management Plan was signed. Mary Lata noted that new considerations of fire and fuel management from the FEIS Syntheses had been included by incorporating fire ecology research more completely throughout the plan. Lata says: "It's here and it's not going anywhere, and so like it or not, the fire regime has changed. It is different in many places; it will continue to be a frequent fire regime."

Further Reading

Zouhar, Kristin. 2023. [Fire regimes of Sonoran desert scrub communities](#). In: [Fire Effects Information System \[online\]](#). U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer).

Innes, Robin J. 2022. [Pennisetum ciliare, buffelgrass](#). In: [Fire Effects Information System \[online\]](#). U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer).

Helmy, Olga. 2021. [Carnegiea gigantea, saguaro](#). In: [Fire Effects Information System \[online\]](#). U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Missoula Fire Sciences Laboratory (Producer).

Lead Scientists

Mary Lata is a Fire Ecologist in the Tonto National Forest.

Kristin Zouhar specializes in synthesizing information from the scientific literature on fire and nonnative invasive species for use by managers and the public. She edited Volume 6 in the Wildland Fire in Ecosystems (Rainbow) series: [Fire and Nonnative Invasive Plants](#). Kris mapped terrestrial ecosystems (soils and plant communities) in the Southwest and studied fire effects on soil nitrogen dynamics in ponderosa pine stands in western Montana.

Heather Leach is the author of this Science You Can Use in 5 min.



The Bullet Fire burns in Tonto National Forest in 2023. Photo courtesy of Rigo Flores, Forestry Technician, Tonto National Forest.

Key Findings/Management Implications

- Few of the dominant, long-lived woody and succulent plants in Sonoran desert scrub communities are adapted to survive fire or regenerate in the postfire environment, and many are killed or injured by fire, such that even low-intensity fires may have severe effects.
- Frequent, large, and severe fires in Sonoran desert scrub are attributed mostly to increased human access and subsequent human-caused ignitions, and increases in receptive fine fuel loads and continuity caused by nonnative plant invasions.
- Rapid recovery of herbaceous fuels—especially nonnative grasses—may lead to repeated fires on a site. Repeated and/or large patches of high-severity fire can lead to vegetation type conversions that may persist indefinitely.
- In Sonoran desert scrub communities, fire prevention may include fuels management by reducing cover of nonnative invasive plants.
- The Fire Effects Information System provides comprehensive, peer-reviewed syntheses that help managers make informed decisions about ecosystems and fire and fuels management.

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/rmrs/>.

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