U of I-Led Study: Forest Fire Smoke Transports Living Microbes

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MOSCOW, Idaho — Nov. 20, 2018 — Forest fire smoke contains living microbes, and the types of microbes living in smoke differ from the types in nearby non-smoky air, according to a team of scientists led by University of Idaho Associate Professor Leda Kobziar.

"Fires have probably been moving microbes around for millions of years, but we've never quantified it," Kobziar said. "Our study indicates that fire may play a significant role in the distribution of microbial life on earth. Fire could be influencing biodiversity in ways we've never considered."

Kobziar and her team published their findings in the journal Ecosphere.

Airborne microbes can benefit or harm human and plant health and can influence ecosystem processes where they land. Researchers have previously found that large wind events like wind storms and dust storms can transport living microbes but didn't know whether they moved with forest fire smoke the same way.

To test whether fire transports microbial life through smoke, Kobziar and her colleagues grew microbes extracted from forest fire smoke. The team sampled smoke from three prescribed burns in the University of Florida's Austin Cary Forest near Gainesville, and from burned vegetative materials taken off the forest floor at the U of I Experimental Forest. The team included U of I College of Natural Resources undergraduate Shelby Green and former U of I postdoctoral fellow Melissa Pingree, as well as colleagues at the U.S. Forest Service and UF.

The researchers grew and identified 70 types of microbes from the smoke samples, including some fungal and bacterial species that cause diseases. The microbial community in the smoke varied depending on the material being burned in Florida but not in Idaho. In both locations, the types of microbes in the smoke differed from the types of microbes in nearby non-smoky air.

;It's important to remember that many microbial organisms, whether they are beneficial for ecosystems or perhaps pathogenic, are in the air all the time, but it seems fire moves unique groups of them into the atmosphere in a concentrated and rapid way," Kobziar said.

The study could have implications for forest management, Kobziar said. Where smoke deposits either beneficial bacteria, like those that provide trees with nitrogen, or harmful fungi, like the species that causes white pine blister rust and threatens the endangered whitebark pine, could inform forest conservation decisions. In addition, forest managers may want to evaluate whether burning diseased trees, as is common in forests infected with sudden oak death, spreads the pathogen to healthy trees, according to the study.

The study suggests additional research should investigate how differences in season, environmental conditions, fire behavior and location affect the transport of microbes through smoke. Further research will also be able to determine whether smoke-borne microbes influence human health, a question especially important for wildfire personnel.

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