Scientists examine impact of high-severity fires on conifer forests

April 27 2017

The 2002 Biscuit Fire in the Klamath region reburned the area of the 1987 Silver Fire. Shrubs and hardwood trees are evident in the new growth Credit: Photo by Thomas Link

The ability of some Western conifer forests to recover after severe fire

may become increasingly limited as the climate continues to warm, scientists from the Smithsonian Conservation Biology Institute (SCBI) and Harvard Forest found in a new study published today in *Global Change Biology*. Although most of these cone-bearing evergreen trees are well adapted to fire, the study examines whether two likely facets of climate change—hotter, drier conditions and larger, more frequent and severe wildfires—could potentially transform landscapes from forested to shrub-dominated systems.

As part of the study, which was funded by the National Science Foundation, scientists examined conifer forests in the richly diverse Klamath region of northern California and southwestern Oregon. The Klamath region is a botanical hotspot, home to 29 species of conifers and a suite of plant species that exist nowhere else on earth.

The researchers sampled sites that burned severely in wildfires between 1987 and 2008. They found that, after fire, hardwood trees and shrubs quickly established by either re-sprouting from surviving root systems or growing rapidly from seeds that persisted in the soil. These plants dominated the vegetation for at least the first few decades after fire. Most conifers, on the other hand, were slow to compete, relying on establishment of new seedlings borne by trees in less severely burned patches or from outside the fire perimeter.

As a result, conifers had only a few years to establish before the regenerating hardwoods and shrubs grew dense enough to suppress them. "If they miss that window there's much less chance of successful establishment and their growth will be slower," says study author Kristina Anderson-Teixeira, a forest ecologist at SCBI and the Smithsonian Tropical Research Institute. In fact, the study found that the longer the interval between the fire and the conifer's establishment, the slower the tree's growth.

"The Klamath ecosystem is an important transition zone separating the shrubs of the California chaparral from the Pacific Northwest's temperate rainforest," says Jonathan Thompson, a Senior Ecologist at Harvard Forest and co-author on the study. "Our work suggests climate change will push the chaparral north at the expense of the Klamath's existing conifer forests."

Because most conifers depend on seed dispersal from surviving trees, larger patches of high-severity fire could put a growing portion of the landscape at risk of poor post-fire conifer regeneration. The study suggests this trend could be even more pronounced because under drier conditions more abundant seed sources are needed to support conifer seedlings at densities sufficient for forest recovery. In addition, previous research by Thompson and others suggests the young, shrub-dominated vegetation that develops after severe fire tends to burn more severely in subsequent fires than older conifer forests, meaning that once severe fire converts a conifer forest to a shrub-dominated system, the non-forested vegetation could be perpetuated almost indefinitely through a cycle of repeated burning.

"We see climate change affecting the system from two directions," says Thompson. "First, it is slowing conifer growth, keeping them low to the ground and more vulnerable to future fires for a longer period of time. Second, climate change is making fire more frequent. This phenomenon, which researchers call the 'interval squeeze,' threatens to transform this and other arid, fire-prone forests worldwide."

Still, portions of the landscape may be relatively resilient. For example, conifers were able to regenerate in wetter sites, even amid relatively large high-severity patches with few surviving trees. "The Klamath region has supported conifers for thousands of years," says Thompson. "Some patches will surely survive no matter what climate throws at them."

The researchers hope these findings could help provide information needed to prioritize management efforts. "Our study helps to identify the places that are at greatest risk of forest loss, where managers could either target management to promote post-fire forest recovery, or accept that we're going to see some degree of landscape transformation in the coming decades and learn to meet ecological objectives under the new climate and disturbance regimes," says Alan Tepley, a forest ecologist with SCBI and the study's lead author.

These findings could also be applied in a broader context to other forest ecosystems. "There are concerns for much of the western U.S. and other similar landscapes that under climate change, forests may be less likely to regenerate," says Anderson-Teixeira. "And that can then reduce forest cover on the landscape and result in big losses of carbon storage." According to Anderson-Teixeira, the fate of the Klamath region depends in part on societal carbon emissions, where increased emissions lead to more warming, which ultimately could result in more forest loss.

Provided by Harvard University

Citation: Scientists examine impact of high-severity fires on conifer forests (2017, April 27) retrieved 23 April 2024 from https://phys.org/news/2017-04-scientists-impact-high-severity-conifer-forests.html