

Seeking Hope Amid the Ashes

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A young science teacher told me recently that her students want to learn about ways they can find hope when their future is menaced by changing climate. This spring, that menace was felt more keenly as April's Tunnel Fire rapidly destroyed peoples' homes, adding to the long list of increasingly severe wildfires that are reshaping our lives. Why do these fires keep coming? The reasons are familiar to most residents of northern Arizona: drought, wind, and dense forest fuels. Useful actions such as the Four Forests Restoration Initiative (4FRI) are critically important but even they cannot completely eliminate big fires.

Finding hope for the future starts with realistic assessment. We know a lot about forests—Fort Valley Experimental Forest is the oldest research forest in the U.S. Forest Service and forest science has deep roots in Flagstaff. The science of tree-ring analysis, developed by Andrew Douglas in Flagstaff over a century ago, shows the strong links between climate, growth, and fires. So, we know that future forests in our region are likely to change very quickly under current climate warming.

A pervasive myth about climate change is that it happens slowly. If average temperature inches upwards by fractions of degrees per decade, why worry? Our current drought, estimated to be the most severe in 1,200 years, is causing slow declines in tree growth, greater vulnerability to insect attack, and death from lack of water. But drought also leads to fast changes when parched landscapes burn in a matter of days to weeks. Warming climate is not just a slow change in average conditions, but greater variability and extreme conditions, flipping from drought to fire to flood.

Future climate isn't fixed in stone. The Earth is warming, but how far it goes depends on human actions. To what extent and how quickly will the world's societies move away from fossil fuels? Even in the "best-case" scenarios envisioned by climate scientists, the Southwest will continue to warm and experience many dry La Niña-type winters in the coming years. Widespread species such as ponderosa pine may not disappear immediately but are likely to become sparse in the 7,000-8,000 ft elevation range. If you want to envision Flagstaff around 2040, think of Prescott today. High-elevation ecosystems such as aspen, spruce, and fir, and their associated plants, animals, and microbes, are less likely to persist.

Adaptation to warmer and drier conditions is inescapable. In a sense, severely burned landscapes are actually adapting by eliminating plant species that requires cooler, wetter conditions. A visit to burned areas northwest of Flagstaff, such as the footprints of the 1996 Horseshoe fire off Highway 180 or the 2010 Schultz fire on the east side of the San Francisco Peaks, reveals that pine regeneration is so limited that the forest is unlikely to return. On the Rodeo-Chediski fire that burned 20 years ago, the sprouting alligator juniper and Gambel oak that dominate the regrowing landscape are likely to support fire again soon. But adaptation-through-wildfire has

high costs as lives, homes, and habitats are threatened and the topsoil that has built up for millennia washes away to fill reservoirs.

The most hopeful thing we can do is take action, based on the best knowledge available. The 4FRI project and similar efforts are vital: clear evidence shows that tree thinning and prescribed burning reduce the effects of wildfire. Many Native American communities are leading the way in the reintroduction of fire, including the Hualapai Tribe's now 60-year-old restoration of fire and the San Carlos Apache Tribe's management of landscape-scale fires. Grand Canyon National Park and our southwestern National Forests have also been leaders in fire restoration. Scientists at NAU and elsewhere are studying the characteristics of different genotypes and species of trees that are adapted to warmer conditions. Some species that range to the south and into Mexico are being evaluated for use in replanting when native trees die out. Support for all forms of action to reduce greenhouse gas emissions from the local to the global level are also essential to have any hope of a "best case" outcome. Future generations will need forests too. Thoughtful, persistent stewardship is required to help us and all ecosystems adapt to the warming world.

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Spotlight on Climate is sponsored by the
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