USDA Forest Service
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Postfire Stabilization and Recovery

The frequency and severity of wildfires has increased in recent years. Hotter, drier conditions associated with changing climate make this problem more acute. U.S. Department of Agriculture (USDA), Forest Service research helps inform the efforts of land managers working to keep forests and grasslands healthy. By providing state-of-the-art knowledge and tools, Forest Service scientists help land managers and private landowners select the best strategies to ensure that forests recover quickly from wildfires and other disturbances.

Immediate Postfire Stabilization

Major concerns after wildfires are increased water runoff and soil erosion due to the loss of protective soil structure and forest floor plants. Wildfires can also create soil conditions that repel water, which increases the risk of flooding. Examples of Forest Service research that informs land management strategies to reduce postfire soil erosion and flooding include:

- Developing online soil erosion prediction tools to allow for better postfire land management decision-making and testing them in field studies throughout the Western United States.
- Investigating the effectiveness of mulch treatments (agricultural straw, wood strands, wood shreds) to reduce erosion following wildfire. These treatments can be effective even for heavy rainfall events.
- Measuring prefire fuels and vegetation, active-fire behavior, and postfire effects. Scientists on the fire behavior assessment team then use these measurements to inform postfire recovery and Burned Area Emergency Response activities.
- Discovering that strategic placement of fuels reduction treatments on the landscape can effectively reduce fire spread and severity, even under severe fire weather conditions.

Reseeding and Replanting

Forest Service scientists study patterns in how forests naturally regrow after a wildfire or other major disturbances to develop the best practices for revegetation and tree planting, both naturally and through tree replanting. Seeding an area after a fire is a common strategy for restoring damaged ecosystems, controlling erosion, and suppressing invasive grasses like cheatgrass. The spread of invasive plants, especially grasses, has dramatically increased the spread of wildfire. Forest Service scientists have developed the following place-based seed and planting guidelines and tools to identify plant species with the highest likelihood of successful establishment:

- The climate-smart restoration tool helps land managers match seeds with geographic areas, or "seed zones," under current and projected conditions, while native seed mix research helps land managers choose the right seed mix for postfire rangeland restoration and to suppress invasive plants.
- Postfire regeneration of conifers is not happening in many forest types where high-severity patches are large and surviving trees are absent. Tools like the climate-wise reforestation toolkit can assist managers in prioritizing areas for reforestation based on species of interest and the likely absence of natural regeneration.
- Some forests do not need to be replanted after some types of fire; for example, lodgepole pine, aspen, and oak can regenerate naturally after high-severity fire, while shortleaf and longleaf pines have prolific natural regeneration after low-severity or prescribed fire.
- Prescribed fire is often used to reduce wildfire risk, manage fuel loads, create wildlife habitat, and maintain resilient forest ecosystems.

Many oak species, like this bur oak on the Black Hills National Forest, can naturally regenerate, even after high-severity fires. USDA Forest Service photo.

Postfire Restoration

Wildfire effects can be very long lasting. Loss of vegetation can expose underlying soils to erosion; subsequent rainfalls can lead to runoff, flooding, and landslides that threaten communities, roads, and water supplies. These negative impacts can continue for years after the fires are extinguished. Forest Service scientists have developed resources to help land managers plan and execute long-term landscape restoration strategies. These include:

- The newly published postfire restoration framework for national forests in California report presents a framework that land managers can use to guide the development of postfire restoration.
- The after fire toolkit includes guidance and tools that communities, private landowners, and resource managers can use to plan for and implement postfire management actions to reduce risks associated with erosion and flooding.
- Fire drives ecosystem structure, selecting for species that survive burning from those that cannot. While measuring postfire tree survival on the Ouachita National Forest in Arkansas, scientists found that, despite the dry, hot weather when the fire began, most overstory trees survived. This illustrates that some managed fires may help to restore more open conditions that will be more resilient to the next wildfire.
- Forest Service research shows that local communities typically invest in enhanced wildfire suppression, emergency response, and education after a wildfire. Despite these investments, land use planning changes and regulations that could reduce the severity of future fires rarely occur, reinforcing the need to engage our partners and stakeholders in both prefire and postfire planning. Lack of changes may lead to increased human population density in the wildland-urban interface.

Salvage logging

Postfire logging, or "salvage logging," is the practice of cutting and removing dead or damaged trees after a large natural disturbance, such as a wildfire. Salvage logging is often used in the Western United States to recover economic loss from burned timber and to make planting activities safer. Forest Service scientists are evaluating impacts of wildfire on postfire salvage options and management scenarios involving stream buffers, hillsides, and wildlife habit and sharing information that land managers can use. This includes:

- In unburned forests, best management practices for logging call for leaving undisturbed buffers along streams. However, research on postfire salvage logging near streams shows that these buffers need to be at least twice as wide as, or wider than, unburnt buffers.
- With wildfire frequency expected to increase, land managers are challenged with managing an increasing number of acres comprised of dead, dying, and living trees. A new model helps forest managers predict tree mortality and plan for salvage and other management activities.
- U.S. forests are home to many woodpeckers that use the dead and dying trees found in recently disturbed forests, such as those impacted by wildfire and beetle outbreaks, for food and nesting. Until recently, managers couldn't be certain where suitable woodpecker habitat was located and whether the salvage logging would negatively impact the population. A new habitat mapping tool enables managers to locate probable woodpecker habitat within a given area.
- Scientists found that, while postfire logging created a temporary pulse of increased small- and medium-sized fuels shortly after harvest, in the long-term, woody fuel loadings were lower in salvage-logged stands. In fact, their study found that coarse woody fuels were reduced by postfire logging for nearly 40 years, though this does not guarantee a reduction in future fire severity.

Hairy woodpeckers are one of many species benefiting from dead and dying trees that may be considered for salvage logging. Habitat mapping tools help land managers make informed decisions by identifying areas important to wildlife. USDA Forest Service photo.

About Forest Service Research and Development: The Research and Development (R&D) arm of the Forest Service works at the forefront of science to improve the health and use of our Nation's forests and grasslands. Research has been part of the Forest Service mission since the agency's inception in 1905. The organization consists of 7 research stations and 81 experimental forests and ranges. Forest Service R&D partners with other Federal agencies, States, Tribes, nongovernmental organizations, universities, and the private sector. Today, more than 400 Forest Service scientists work in a range of biological, physical, and social science fields to promote sustainable management of the Nation's diverse forests and rangelands.