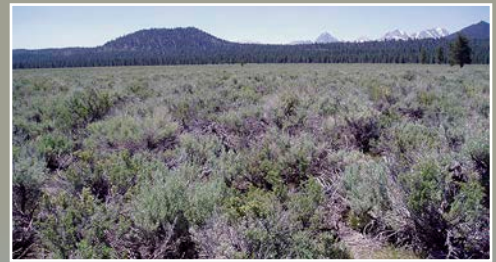




Forest Service  
UNITED STATES DEPARTMENT OF AGRICULTURE

Pacific Southwest Research Station | General Technical Report PSW-GTR-270 | February 2021

# Postfire Restoration Framework for National Forests in California



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Cover Photos: Upper (panoramic): Burned forest landscape one year following the 2015 Rough Fire showing a mixture of fire effects. Giant Sequoia National Monument, Sequoia National Forest. Photo by Marc Meyer. Lower Left: Resprouting manzanita (*Arctostaphylos glandulosa*) six months after the 2017 Thomas Fire. Dry Lakes Ridge Botanical Special Interest Areas, Los Padres National Forest. Photo by Nicole Molinari. Lower middle: Monarch giant sequoia (*Sequoiadendron giganteum*) that burned at low to moderate severity two years after the 2015 Rough Fire in Grant Grove, Kings Canyon National Park. Photo by Marc Meyer. Lower Right: Big sagebrush (*Artemisia tridentata*) and bitterbrush (*Purshia tridentata*) before (top, 2010) and after (bottom, 2011) the 2016 Owens River Fire, Mono County, CA. Photo by Michele Slaton.

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# Postfire Restoration Framework for National Forests in California

Marc D. Meyer, Jonathan W. Long, and Hugh D. Safford, Editors

U.S. Department of Agriculture  
Forest Service  
Pacific Southwest Research Station  
Albany, California  
General Technical Report PSW-GTR-270  
February 2021



## **Abstract**

**Meyer, M.D.; Long, J.W.; Safford, H.D., eds. 2021.** Postfire restoration framework for national forests in California. Gen. Tech. Rep. PSW-GTR-270. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 204 p.

Increasing frequency and extent of high-severity wildfires pose a significant threat to California's ecosystems. This is evident in both tree- and shrub-dominated landscapes, where novel, human-driven fire regimes may result in large-scale alteration of terrestrial ecosystems and decline in the services they provide. Based on these trends and a broader consideration of sustainability, there is a growing need for a well-supported, science-based approach to postfire management. This report presents a framework to guide the development of postfire restoration on national forests in California. The framework is founded on a set of guiding principles and a five-step process that leads to the development of a restoration portfolio that can inform project planning and monitoring. We discuss the application of this approach to California's forest, chaparral, and sagebrush-steppe ecosystems. The restoration framework can inform future postfire management, monitoring, and research in California's diverse ecosystems.

Keywords: Ecological restoration, ecosystem resilience, ecological integrity, fire regimes, fire management, natural range of variation, wildfire, climate change, California.



## Executive Summary

We propose a science-based framework for ecological restoration interventions after major wildfires on USDA Forest Service lands in California. Changing fire regimes, interacting with other ecological disturbances and stressors, are threatening the ecological integrity and ecosystem services of California's forests, woodlands, and shrublands. The postfire restoration framework is guided by principles of ecological restoration and includes a landscape assessment process and tools, as well as a framework for decisionmaking to plan and implement restoration projects. Three case studies are included that focus on the following:

- Potential failure of conifer forests to regenerate following uncharacteristically large and severe wildfires
- Loss of key ecosystem services in chaparral ecosystems affected by repeated burning
- Invasion of sagebrush steppe landscapes by nonnative annual grasses following fire

Increased fuel loading and shifts in forest composition in forest or woodland landscapes following wildfires are other major concerns considered in the report. However, changes in fuel loads and shifts in species composition also arise from other causes of extensive mortality, including extended droughts, bark beetle outbreaks, and sudden oak death. As such, all these agents of change represent a growing concern.

The postfire restoration framework is rooted in six science-based guiding principles:

- Restore key ecological processes
- Consider landscape context
- Promote regional native biodiversity
- Sustain diverse ecosystem services
- Establish a prioritization approach for management interventions
- Incorporate adaptation to agents of change



The framework includes five steps that connect restoration goals, opportunities, and potential actions that serve as the foundation for future project planning, monitoring, and adaptive management:

- An interdisciplinary team of specialists identifies priority resources, desired conditions, and restoration goals.
- The team gathers and analyzes relevant spatial data and other information to evaluate current and potential future landscape conditions.
- The team uses a postfire flowchart to identify restoration opportunities.
- The team develops a list of potential management actions that are linked to these opportunities.
- The team builds a suite of potential restoration actions that support landscape restoration goals (“restoration portfolio”) by prioritizing actions based on feasibility and constraints.

Numerous analytical tools, approaches, and datasets are available to assist in evaluating landscape condition and trends in the postfire flowchart and restoration portfolio. Some of these tools and data may be broadly applied, but many are specific to individual ecosystem types or landscapes. For example, the postfire regeneration tools in appendix 3 are appropriate only for certain conifer-dominated ecosystems.

This report proposes a framework for developing landscape-scale postfire (and related) restoration plans on Forest Service lands in California. Selected restoration approaches are described in this report for illustrative purposes. The effectiveness of specific tactics are addressed in other publications, but continued long-term research and monitoring efforts are needed to evaluate the extent to which they effectively restore ecological integrity and sustain ecosystem services.

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