United States
Department of
Agriculture

Forest Service

Pacific Southwest
Research Station

# FIRE
## in the Sierra Nevada

Joint Fire Science Program

## . . . what are the benefits?

Up until the mid 1800s, travelers in the Sierra Nevada saw a forest that most people today wouldn't recognize. Beneath uncluttered trees of all ages, native grasses and wildflowers grew. Patches of brushy areas and meadows intermixed with forested areas providing more than enough habitat for many species of plants and animals. The unhealthy buildup of forest litter (woody materials such as fallen pine needles and dead branches) that we see today was not present. The forests looked so different then because fire was burning through them frequently. Lightning strikes are common in the Sierras and were historically the main source of fire ignition. Native Americans have been using low intensity fire, much like those caused by lightning, for centuries to manage for food production (such as black oak for acorns), protection from wildfire, improved grazing, and many other aspects of their culture.

Because fires in the past were often low intensity, forest litter, brush, and small trees were removed while mature trees generally survived. The large fires that we see today probably only occurred occasionally during periods of drought. Given that natural fires have moved across the land for millions of years, forest plants and animals are generally well adapted to survive fire, and many even require fire to grow and flourish.

# Suppressed fire . . .


*Fire suppression has occurred for many years, as illustrated by this fire engine from 1926 in North Fork, CA.*

In 1910 a combination of drought and wind led to a series of fires that burned with high intensity across large expanses of the western and interior United States. Infrequent, high-intensity fires were the norm in at least some of the areas that burned, but the ecological role of fire was not understood at that time. Land managers and the public began to view fire as the enemy despite its historic occurrence. Without the proper scientific evidence, people believed that fire was not only threatening human life, but that it was hurting the forests. The government launched a nationwide effort to suppress all fires, a policy that enjoyed strong public support. This massive fire suppression effort lasted for nearly a century, and dramatically changed our forests.

## *Unsafe conditions . . .*

*Fire fuel ladder*

*Homes not cleared of vegetation are hard to save and put firefighters at risk during wildfires.*

Trees are now found in areas that previously contained native grasses, annual plants, shrubs, and other types of vegetation. White fir and other shade-loving trees are replacing the sugar, Jeffrey, and ponderosa pines that once dominated parts of the Sierra forests. These smaller, more flammable trees and undergrowth provide a "fuel ladder" for wildfires to reach into the tops of the larger trees, usually killing them.

Wildfires are extremely costly, both economically and in terms of risk to human life and property. Human communities continue to expand adjacent to federally managed lands where fire was historically common, producing what is known as the "wildland-urban intermix" zone. Not only are homes and other human assets now more vulnerable to fire, the reintroduction of fire to these lands is often hindered by the concerns of landowners about prescribed fire escaping.

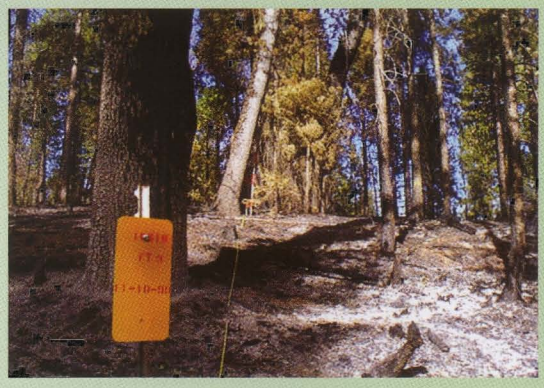
# Research on fire effects . . .

## before...

*A site in the Sierra National Forest, badly in need of fire.*

## after...

*The same site immediately after a prescribed burn was lighted in the fall.*



# Prescribed fire . . .

In 2001 Congress directed the federal land management agencies to work with the Governors on a "national, long-term strategy for the restoration of fire-prone ecosystems." Out of this directive came the National Fire Plan, implemented by the USDA Forest Service and the Department of the Interior. Communication and teamwork among all levels of government and members of the public is helping to protect communities, natural resources, and most importantly, human life.

One of the most effective ways to reduce the harmful effects of wildfires is to reduce their intensity. Reintroducing low-intensity fire into the forest can do this by decreasing the fuels built up over time as a result of fire suppression. The goal is to return the forest to a historic condition in which the period between fires is anywhere from 8 to 10 years for pine forests and somewhat longer for mixed conifer forests. Today land managers believe that the most successful way of "cleaning up" the forests is by using prescribed fire. Prescribed fire managers determine the desired conditions, the goals for a site, and how much material needs to be removed to reach those goals. Burn prescriptions are developed that direct managers to light prescribed fires only under a specific range of conditions. By considering the optimal interval between fires, the season of the burn, fuel moisture, air temperature, relative humidity, and wind speed, fire managers can minimize the chance of a fire escaping while producing the desired fire effects most beneficial to the forest. Thanks to well-trained personnel, the vast majority of prescribed fires do not escape. Instead, they help protect against damaging wildfires in the future.

*A drip torch is used to light prescribed fires, which burn with short flames and slow rates of spread.*

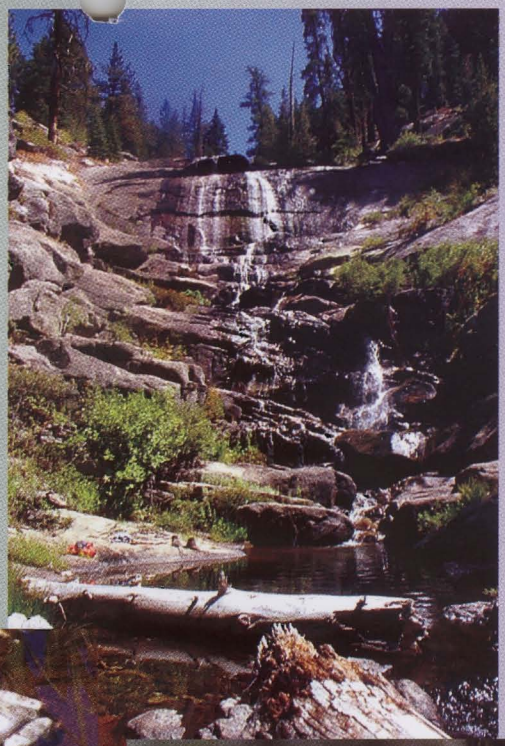
The two primary goals of prescribed burns are to invigorate a species or ecosystem that benefits from fire and to reduce heavy accumulations of dead wood and brush, which under drought conditions produce catastrophic wildfires. The goal of all fire managers is to protect human life, while at the same time benefiting ecosystems.


The Forest Service is committed to research and monitoring, which provide new information to resource managers and the public. The effects of prescribed fire on stream and watershed condition, nutrient cycling, forest birds, California spotted owl, fisher, and vegetation are being studied in the Kings River Project, Sierra National Forest. Research results provide guidance for future land management.

## one year after...

*A photo taken at the site about a year after the prescribed burn. Notice the greenery coming in around the bases of the trees. The large trees are still thriving, and new black oak seedlings are appearing. This is a successful underburn in a ponderosa pine forest with oaks.*

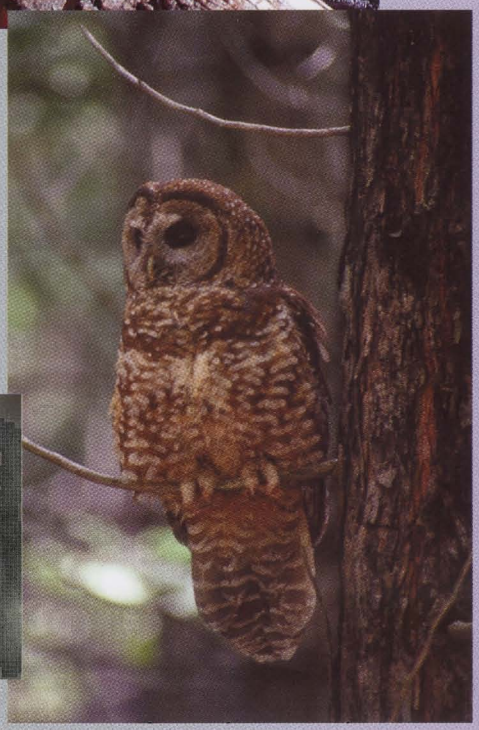
# Benefits of fire . . .



Historically, relatively frequent fire created a diverse landscape. By burning at low intensity in many areas, but at moderate to high intensity or not at all in other areas, fire leads to a puzzle-like mosaic of trees, shrubs, wildflowers, and grasses. Such a mosaic means that a wide variety of different habitats are present to provide for different plant and animal species with different needs.

Water is one of the most crucial resources provided by our forests. Wildfires can hinder absorption of water into the forest floor because the high intensity of such fires can change soil properties and create water-repellent layers. This can cause damaging erosion during winter storms. Prescribed fires are less likely to negatively alter the soil because of their low intensity. They may also lead to an increase in the amount of water in forest streams during the critical summer dry period because these fires reduce the number of small tress and shrubs using the water. This aspect of prescribed fires is currently under study.

Whether high- or low-intensity, human or naturally caused, fire has always been, and always will be present throughout Sierra Nevada ecosystems. However, we have the option to see fire as a partner in forest management and work with it, rather than fighting against it. While even prescribed fire can char vegetation and kill some trees, this "damage" is temporary. A closer look will reveal nature healing and rejuvenating itself, producing a healthier and stronger forest.



# Comments or questions?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