UI Extension Forestry Information Series II
Fire No. 6

Fire in Forest Ecosystems of the Inland West

Yvonne C. Barkley

Fire in the forest! Though a natural part of the ecosystems of the Inland West, wildfire is one of the most feared, most fought, and most controversial components of our physical environment.

Idaho is part of a multi-state region termed the Intermountain or Inland West. Encompassing a large portion of the interior western United States, this area was born and raised by fire. Characterized by wet, cloudy winters and dry, sunny summers, the landscapes of the Inland West were shaped by volcanic eruptions and frequent wildfires. Forests in the Inland West are mainly coniferous. Vegetation patterns are complex and variable, responding to soils that have moderate to low productivity potential, are nitrogen limited, and are commonly shallow. In the Northern Rockies, rugged topography and differences in microclimates increases this complex mosaic of conditions.

Our recognition of fire's role in an ecosystem come from studies of past vegetation, identification of charcoal layers in soil profiles, fire scars on trees, the even-aged character of some forests, and records of explorers. Up until the beginning of the last century, fire frequented the forests of the Inland West at regular intervals and was a natural component of what are termed fire-based ecosystems. The historical benefits and uses of managed fire included hunting, grazing for domestic livestock, clearing of forest for agriculture, producing ash to fertilize fields, favoring certain plants species over others, assisting in the harvesting of crops, and eliminating undesirable plant species.

Fire is one of the few disturbances that regularly kills mature plants and plays an important role in structuring plant communities and providing new openings that have the potential for vegetation change. Fire has complex effects on plant survival, growth, and reproduction. Many species are stimulated by fire, which enhances sprouting, flowering, and seed germination. For other species, post-fire conditions create excellent situations for seedling establishment by providing a combination of open space, increased light, nutrients, and moisture, and temporarily reducing the numbers of small, seed-eating mammals. Many plant species that depend on fire for reproduction can be driven to extinction if fires are suppressed. The plant community that occupies

your forest today is one that is constantly in transition, with each species responding to changes in the local environment in their own particular time and manner.

Fire varies in terms of how often it occurs (frequency), when it occurs (season), and how fiercely it burns (intensity). Combinations of these elements define an area's fire regime. A fire regime is a generalized description of the role fire plays in an ecosystem. Systems for describing fire regimes may be based on the characteristics of the disturbance, the dominant or potential vegetation of the ecosystem in which ecological effects are being summarized, or the fire severity based on the effects of fire on dominant vegetation.

Natural fire regimes provide a multitude of benefits to the forested ecosystems of the Inland West. Natural fire regimes help species that are best suited to a particular ecosystem maintain a competitive advantage over less suited species. Less competition reduces stress, which in turn reduces outbreaks of insects and disease. Fire stimulates understory vegetation, which is important to wildlife and biodiversity, and helps maintain or provide opportunities for some niche-dependent species. Natural fire regimes also provide a stimulus for the reproductive cycle for many plants while preparing suitable seedbeds for new seedlings. The Inland West, with it's slow rates of decay and decomposition, also depends on wildfire for recycling biomass and nutrients by redirecting carbon and nutrients back into forms usable by growing plants.

Two general fire regimes are recognized. A stand maintenance fire regime consists of low to moderate intensity surface fires at short intervals (2-25 years). This type of fire regime maintains an ecosystem of relatively uniform, possibly all-aged stands of dominant tree species, and is typical of conifer forests dominated by ponderosa pine and western larch. This type of fire regime kills competing vegetation, consumes small to moderate amounts of surface fuels, and, with little or no accumulation of fire-killed materials, reduces fuel loads. A stand-replacing fire regime is one that has moderate to high-intensity fires that occur at long intervals (50-500 years) and is typical of coniferous forests dominated by species such as lodgepole pine. With stand replacing fires, practically all vegetation is killed to the ground and most surface fuel and varying amounts of crowns are consumed. Accumulations of fallen, fire-killed trees can become a serious fire hazard for several decades. A radical change in species composition is possible. Successive burns at short intervals may convert the area to fire-adapted species or shrubs, and a mosaic of different ages and species compositions is common.

Fire regimes that are unaffected by suppression are extremely rare today. Today's fires are

Ground fire.

Crown fire.

very different from those in the past. Today we must take into consideration what fire will do to our altered ecosystems. The Fire Effects Guide (sponsored by the National Wildfire Coordinating Group Prescribed Fire and Fire Effects Team) recognizes that a natural fire regime cannot be perpetuated in unnatural communities. The introduction of exotic insects, diseases, and plants, the alteration of the characteristics and processes of traditional plant communities, and the conversion of increased acreages to agricultural and urban use have all changed the environment surrounding and influencing our forests and rangelands.

When fire is suppressed for periods of time that are greater than the natural fire regime, changes in forest structure and function occur. Large amounts of live and dead organic matter begin to accumulate, resulting in dangerous fuel accumulations which may result in catastrophic fires. When stand-replacing fires occur in areas that evolved with stand maintenance fires, a number of negative effects can occur. The magnitude of rain-on-snow events increases, which, in turn, increases erosion and soil-mass movements. Catastrophic fires increase the incidence of windthrow, while excessive heat transmitted to roots, cambium, and/or crowns further reduce a tree's resistance to insect and disease problems, drought stress, and nutritional imbalances.

Fire suppression can increase the number of more shade tolerant species (such as Douglas-fir and true firs) in a stand, which replace more adapted and shade intolerant species such as pines and western larch. By changing the immediate environment, these shade tolerant species begin to alter traditional plant communities. Where there once was a savanna-like ponderosa pine forest, interspersed with clumps of aspen and deciduous shrubs, you now have a thick Douglas-fir/grand fir forest. Competition for light, nutrients, and moisture increases, not only because of increased stand densities, but because shade-tolerant species tend to require and use more moisture and nutrients than the species they replaced.

When shade tolerant species replace shade intolerant species you begin to see other forest health problems. Douglas-fir and grand fir are not as well adapted to drier sites as ponderosa pine, and consequently suffer physiological stress when subjected to the hot, dry summers of the Inland West. Stressed trees are more likely to succumb to insect and disease problems, such as root rot and bark beetles. Insect outbreaks can reach epidemic proportions and spiral out of control when less adapted species provide increased food to sustain insect populations.

Forest ecosystems are extremely resilient and in the Inland West are historically adapted to disturbance by fire. It's natural. From the standpoint of a fire-based ecosystem's structure and function, fire is a good thing. After a burn, there is nothing to fix. The forest will follow it's own course towards a new structure. On the other hand, man has greatly altered forest ecosystems by suppressing fire, changing species compositions, and living in or adjacent to the forest. When homes, property, and sometimes even lives are lost, wildfire becomes an issue. When it comes to fire in the forest, some see the time after the burn as the end of a good book, while others see it as the beginning of the next chapter.

This information first appeared in Woodland NOTES, Vol. 14, No. 1. Fall/Winter, 2002-2003.

About the Author: Yvonne Barkley is an Associate Extension Forester at the University of Idaho.