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Introduction to the Special Northwest Science Issue The George Fahnestock Memorial Fire Symposium

The papers in this special issue of *Northwest Science* resulted from the George Fahnestock Memorial Fire Science Symposium held in March, 1990, at the Northwest Scientific Association Annual Meeting in Corvallis, Oregon. George Fahnestock was a leader in wildland fire research, and a tribute to his accomplishments and contributions was published last year in *Northwest Science* (Vol. 63, No. 1). The symposium addressed a wide variety of current fire issues. A majority of the papers were submitted for publication in this special issue, but all of them are mentioned to provide proper context for the symposium.

Fire has been a dominant ecological process in Northwestern ecosystems for millennia. Land managers have realized that attempts to totally strangle fire from the landscape are futile, and in fact, usually result in declines in resource values and increased fire control problems. Concurrently, land managers have recognized that the use of fire may contribute to the achievement of land management goals. A paper by Stephen Arno and James Brown (not included in this issue) addressed the strategies available to managers on lands managed for different values—nature reserves, the urban-wildland interface, and a large set of multiple-use wildlands. The use of fire, including prescribed ignitions and prescribed natural fire, together with fire control, complement each other in an integrated fire management strategy.

Decisions about the need to burn depend on management objectives, ecosystem characteristics, and an evaluation of the costs and benefits of burning. "To burn or not to burn" has been a resources management version of Shakespearean drama since the 1920's. The use of fire has been debated from the driest of rangelands to the wettest temperate conifer forests. Evaluation of windstorm-created "blowdown fuels" by Christiansen and Pickford suggest that fuel treatment (such as

salvage logging or slash burning) may not be necessary as fuel hazards decline rapidly after such events in the moist Douglas-fir forests of northern Oregon. Omi and Kalabokidis show that the 1988 Yellowstone fires had more severe tree mortality effects in the undisturbed fuels of mature lodgepole pine forests than in areas dominated by young trees where prior timber salvage for bark beetle mortality had occurred. What we consider "natural" disturbance from wind or fire may, from a fuels management standpoint, be acceptable or not depending on the disturbance, the unique climate and biota of the ecosystem, and the management context in which it occurs.

When burning is done in natural or manipulated landscapes, off-site factors are becoming critical decision criteria. The major offsite effect, under most conditions, is air pollution, and slash burn management has focused on reducing smoke during burns. Hall's paper reports on experiments using mass ignition as a means of rapidly consuming fine fuels while preventing large fuels from smoldering.

One of the largest sources of air pollution originates from smoldering combustion of duff, that partially decomposed organic horizon beneath the surface leaf litter. Duff consumption may also create lethal temperatures at the soil surface, killing fine roots, mycorrhizal fungi, and the cambial tissues of trees and shrubs. Frandsen's laboratory experiments are helping to develop a general physical model of duff consumption. The duff burning experiments of Martin and Scott (not included in this issue) provided field data that will empirically support such a model.

Decades of fire suppression have resulted in ecological changes in rangeland and forest ecosystems: altered structure, different species composition, and higher fuel loads. A paper by R. F. Miller (not included in this issue) documented the

landscape changes in eastern Oregon, in particular the dramatic invasion of western juniper into bunchgrass prairie previously maintained by frequent burning. The paper by Sapsis and Kauffman summarizes the initial effects of reintroducing fire into these juniper and sagebrush dominated rangelands, and emphasizes the importance of fire characteristics in different seasons in predicting fire effects.

Many plants have evolved special adaptations to survive the fire regime characteristic of their environment. The paper of Kauffman and Martin, separately submitted to the journal but included in this issue, reports how heat and stratification influence shrub seed germination.

The "ancient forest" preservation controversy in the Pacific Northwest has to date overlooked the importance of past fire disturbance in creating and maintaining old growth forest characteristics. A paper by Andrew Gray (not included in this issue) evaluated the effects of single and multiple burns on the age spans of Douglas-fir regeneration in

southern Washington. Such research will help us to explain the very long regeneration lags found in some Douglas-fir forests following historical burns. Agee's paper on Douglas-fir forests of the Siskiyou Mountains shows that these drier forests have experienced multiple fires during their development to old-growth conditions. This frequent fire return interval is in striking contrast to more moist Douglas-fir forests of the Olympic Peninsula and the Cascade Range, with much longer fire return intervals and stand replacement fires.

Humans have had a long and complex association with fire. Our ability to deal with wildland fire is limited by our cultural biases, lack of knowledge of the ecological role of fire in ecosystems, myriad management objectives, and the difficulties of controlling and using fire. Fire is an inextricable component of Northwestern wildlands. Research in basic and applied aspects of wildland fire, as illustrated by this special issue of *Northwest Science*, is essential if our society is to successfully coexist with these inevitable flames in our wildlands.