Prescribed Fire Applications: Restoring Ecological Structure and Process in Ponderosa Pine Forests

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The decision to include the fire process as part of a restoration treatment for a particular forest site is most logically made in conjunction with the decision for a silvicultural treatment. In other words, forest managers do not typically wait to visually or quantitatively evaluate the post harvest site before deciding whether or not to apply fire. Each phase of the restoration effort can effectively relieve only certain aspects of forest problems. So, silviculture and fire are complementary.

Several common silvicultural objectives have been presented. Likewise, it is important to establish specific fire effects objectives so that the proper fire prescription can be developed and applied. Following is a short list and description of some typical fire effects goals that are meant to correct undesirable forest conditions.

The first and most common goal is to reduce the unusually high levels of accumulated organic matter to lessen the potential for severe wildfire (Mutch and others 1993). A conflict may arise because this organic matter may be viewed as an important carbon and inorganic nutrient reserve. However, it is also a forest fuel; and in an environment that has a high probability of wildfire because of climate and fuel type, it should be maintained below some hazard threshold. Applied fire is the most effective and efficient means of achieving and maintaining fuels at low hazard levels.

A second fire effect goal is to reduce the typically high numbers of conifer seedlings and saplings that not only contribute to the wildfire hazard, but also contribute to the forest health problem brought on by severe competition for limited resources (Habeck 1994). Thinning can be useful for removing larger trees, but it is not practical if it is necessary to eliminate thousands of small trees per acre. Again, prescribed fire is quite cost effective and highly efficient in removing most of this undesirable conifer layer. Some trade-offs occur with the loss of sapling thickets that have wildlife value as hiding and thermal cover.

A third goal is the stimulation of vigor in shrubs and herbaceous plants (Wright 1978). These plants were once significant components of the forest understory but have become stressed and decadent because of overmaturity and competition with high numbers of trees. After the competition for soil resources and light has been relieved with tree thinning, these plants typically respond with vigorous sprouting, following top-killing or litter removal by fire. Interestingly, many plants will not respond to either a burn or reduced competition alone. Both are required. Wildlife forage values usually improve quickly following burning.

A fourth fire effects objective is the partial consumption of the forest floor horizon, resulting in mineral soil seedbeds that are generally required for natural regeneration of seral species (Harrington and Kelsey 1979). Mechanical scarification is sometimes used, but the possibility of soil compaction exists. Another benefit of fire for seedbed alteration is that with combustion, mineralization of organically bound nutrients frequently leads to increases in their availability.

Even though fire can be a valuable tool for restoring unhealthy, hazardous forests, the application of fire is quite challenging. It takes experience and knowledge to develop and carry out a fire application plan that achieves the objectives (Kilgore and Curtis 1987) because treatment goals are generally linked in some way. For example, while achieving the goal of reducing the wildfire hazard, too much forest fuel may be consumed too quickly, leading to severe fire injury to the already stressed forest components. On the other hand, the over-cautious approach occurs when fire is applied under conservative conditions and much effort and expense yield little in the way of accomplishments.

In conclusion, fire is an ecologically sound treatment to consider for restoring altered forests that depended on fire in the past. A strong set of achievable goals must be established by fire effects experts and closely linked to silvicultural goals. Finally, it is important that fire be applied by those experienced in fire behavior and management to reduce the chance of undesirable fire effects.

References

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