

A NATIONAL STUDY ON THE CONSEQUENCES OF FIRE AND FIRE SURROGATE TREATMENTS FOR FUEL REDUCTION IN DRY FORESTS

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Compared to pre-settlement times, many dry forests of the U.S. are now more dense and have greater quantities of fuels. Widespread treatments are needed in these forests to restore ecological integrity and to reduce the risk of uncharacteristically severe fires. Among possible treatments, however, the appropriate balance among cuttings, mechanical fuel treatments, and prescribed fire is often unclear. Resource managers need better information on the comparative effects of alternative practices such as prescribed fire and mechanical "fire surrogates." An integrated national network of 13 long-term research sites has been established to address this need, with support from the U.S. Joint Fire Science Program and the National Fire Plan (Weatherspoon 2000). Four alternative treatments will be applied in replication at each site: (1) cuttings and mechanical fuel treatments alone; (2) prescribed fire alone; (3) a combination of cuttings, mechanical fuel treatments, and prescribed fire; and (4) untreated controls. Response to treatment will be determined through the repeated measurement of a comprehensive set of core variables at each site, including aspects of fire behavior and fuels, vegetation, wildlife, entomology, pathology, soils, and economics. The experiment is designed to facilitate inter-disciplinary analysis at the site level, and meta-analysis for each discipline at the national level. The inter-disciplinary nature of the study will provide managers with information on how their practices affect whole ecosystems, while meta-analysis will provide insight on which responses are general, and which are dependent on specific environmental conditions. At present, two sites have collected post-treatment data, five are in the midst of treatment application, and the remaining six have collected all pre-treatment data and are poised to apply treatments.

To illustrate the kind of information the study will provide, we present an economic analysis at Hungry Bob (NE Oregon; McIver et al. 2000), one of the 13 sites in the Fire-Fire Surrogate study. The analysis offers insight on how managers can meet restoration objectives in dry forests at a more affordable cost. A primary challenge for forest managers is to reduce fuels in small diameter stands that have low value. Federal forest managers can use the timber sale as an instrument to help accomplish restoration objectives, but the value must be high enough to attract a buyer. This is commonly done by including higher value saw timber in the sale, along with the requirement to reduce fuels to a prescribed level. The ratio of saw logs removed to fuel reduction creates the classic break-even analysis with market prices and operating costs driving the equation.

Predictive equations were derived from the Hungry Bob study (Coulter 1999) to construct an economic model that calculates total treatment cost and revenue per acre and ton for a variety of material removed, and for different harvester-forwarder combinations. The model was validated using data from two other fuel reduction studies conducted recently in northeastern Oregon (Brown and

Kellogg 1996; Drews et al. 2001; Matzka and Kellogg 2000). We made the following assumptions in constructing the model:

1. No profit and risk factored into costs.
2. No transportation costs (costs and gross revenues are stump to truck).
3. Market value \$400/mbf (\$60/ton) for saw logs, \$20/ton pulp wood.
4. Stand conditions and utilization rates of material removed at Hungry Bob.
 - Live: 12" average diameter; 85% saw logs, 10% pulpwood, 5% cull.
 - Standing dead: 10" average diameter, 40% saw logs, 50% pulpwood, 10% cull.
 - Downed wood: 8" diameter, 10% saw logs, 70% pulpwood, 20% cull.
5. Owning and operating costs per hour for harvester: Average ~\$135/productive machine hour.
6. Owning and operating costs per hour for forwarder: Average~ \$115/productive machine hour.
7. Layout, loading, and support vehicles were a fixed cost at \$200/acre.
8. Prescribed fire cost \$50/acre.

Results indicate that:

1. with the sawlog component of the timber sale held constant, managers can prescribe the removal of seven times as much fuel if operators use the most efficient harvester-forwarder combination;
2. with the fuel reduction requirement held constant, an operator would need to harvest nearly three times as much sawlog material to break even, using the least efficient harvester-forwarder combination; and
3. under certain conditions, mechanical treatment can be used in tandem with prescribed fire to achieve desired fuel reduction at the lowest cost.

This last result is of particular interest to managers faced with restoration of stands that have enough sawlog value to attract a buyer, but require fuel reduction to levels that cannot be accomplished by mechanical means alone. Thus, mechanical harvest is used to lower fuels to levels at which prescribed fire can be applied, and to pay for treatment application in total. The prescribed fire is applied after the mechanical treatment, and is used to accomplish ecological objectives that require burning, and to lower the fuels to desirable levels at a lower per acre cost than mechanical treatment.

LITERATURE CITED

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