A Comprehensive Guide to Fuel Treatment Management Practices for Dry Mixed Conifer Forests in the Northwestern United States

Inventory and Model-Based Economic Analysis of Mechanical Fuel Treatments

Implementing fuel treatments in every place where it could be beneficial to do so is impractical and not cost effective under any plausible specification of objectives. Only some of the many possible kinds of treatments will be effective in any particular stand and there are some stands that seem to defy effective treatment. In many more, effective treatment costs far more than the value of treatment benefits. Understanding the scope of the fuel management challenges in these forests is the first step towards identifying fuel treatment approaches that are likely to be both effective and economically feasible (e.g., self-supporting) in reducing fire hazard.

Jain and others (2012) have conducted a landscape-scale analysis to predict costs and effectiveness of fuel treatments from key stand attributes such as descriptors of stand structure, slope, distance from the nearest road, and distance from processing facilities. Using the Forest Inventory and Analysis (FIA) BioSum framework, they assessed the effectiveness, costs, and potential returns from generic multi-purpose mechanical fuel treatment approaches that are commonly implemented in this region. Treatment
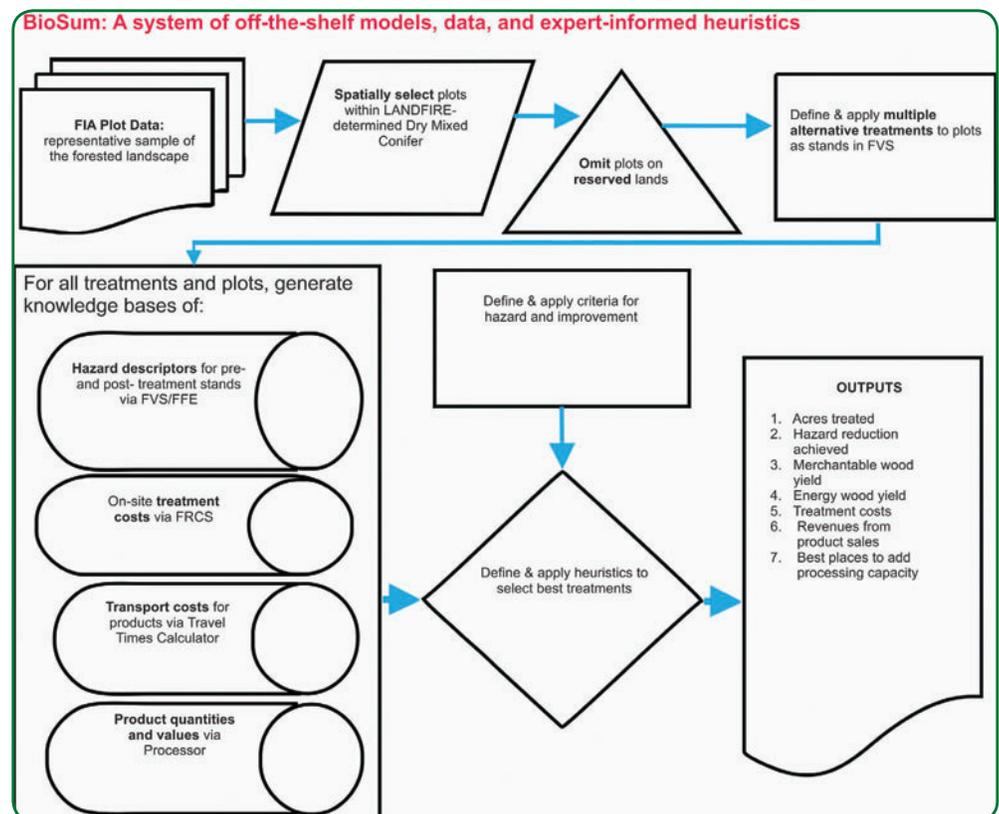

Figure 1—The BioSum framework integrates a suite of models to evaluate the economic feasibility of fuel treatments.

costs, yields, and gross revenues associated with merchantable and energy wood, costs of transporting wood to mills and bioenergy facilities, and net revenues (or costs) of treatment operations are all predicted and included in this modeling framework. BioSum was developed to combine several robust data sources and models to explore alternative landscape-scale treatment scenarios that achieve a variety of management objectives. Jain and others (2012) were able to model the entire dry mixed conifer forest using thousands of inventory plots that are statistically representative of this forested landscape. Supplemental information can be found in Appendix C of their report.

Fire Hazard Criteria and Evaluation

One product of the analysis is a massive knowledgebase of treatment outcomes. Product yields, costs, and revenues generated can be used to describe the "best" alternatives under a wide range of assumptions, objectives, and goals. In many cases, more than one hazard descriptor may be relevant. Treatments that lead to improvements in the crowning index, for example, often increase the hazard as indicated by torching index because the act of introducing greater separation among crowns also leads to greater surface wind speeds and fire intensity. Even with a single descriptor, one must decide on the threshold beyond which initial hazard is unacceptable and warrants some kind of treatment, assuming that some kind of treatment can be effective (for example, restoring the stand back to the safe side of the threshold).

Treatment Effectiveness and Economic Feasibility

According to the analysis, most dry mixed conifer forests currently have high fire hazard, but only a fraction of those forests can be effectively treated (at least by the fuel treatments currently relied upon in the dry mixed conifer region). While it might sound discouraging that prospects for effective treatment are limited to a relatively small subset of the forest, it does make the fuels management problem more tractable in that one can justifiably focus on treating the more limited area of the forest where success is attainable. It also suggests that on many other acres, there are few options for achieving significant hazard reduction.

Fuel treatments that are self-funding may ultimately be the most effective choices for mitigating fuel hazard, given the current and likely future Federal budget climate.

Selecting acres for treatment that are not genuinely hazardous, or that cannot be shown analytically to be economically viable for a fuel treatment program, may hinder gaining and maintaining public trust in fuels management. Using models such as BioSum and FFE-FVS provides managers with the decision support that can demonstrate treatment accomplishment (effectiveness and economics) objectively and provides a science basis for treatment choices.

Modeling Recommendations

Managers seeking the best choice for a particular stand may find it worthwhile to run models such as FFE-FVS and My Fuel Treatment Planner (www. fs.fed.us/pnw/data/myftp/myftp.shtml) on sample data collected from that stand. Using their own assumptions they can then understand the potential impacts and costs of alternative prescriptions in terms that are relevant to the challenges they face. Managers seeking to analyze entire landscapes in support of a fuel treatment management program should consider learning and using the BioSum tool that is scheduled for general release in early 2014 (software, data, tutorials, and user guide will be available at www.BioSum.info).

The FIA BioSum framework produces statistically reliable summaries of the proportions of the forested landscape in the dry mixed conifer region that would respond positively to treatment. The system can also estimate the costs, revenues, and product flows that could be associated with a comprehensive fuel treatment program. Model output includes reports of the area for which each kind of treatment would be most effective. Trade-offs between area effectively treated and net treatment cost can also be summarized in order to understand the effects of policies such as requiring sales of derived products to cover treatment costs.

Source

Jain, Theresa B.; Battaglia, Mike A.; Han, Han-Sup; Graham, Russell T.; Keyes, Christopher R.; Fried, Jeremy S.; Sandquist, Jonathan E. 2012. A comprehensive guide to fuel management practices for dry mixed conifer forests in the northwestern United States: Chapter 11. Gen. Tech. Rep. RMRS-GTR-292. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 331 p. Available online at www.treesearch.fs.fed.us/pubs/42150 [2012]. For a hard copy, contact Theresa Jain at tjain@fs.fed.us.

Citation

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