Fuels Planning: Science Synthesis and Integration[1]

Rachel White[2] and Sarah McCaffrey[3]

Abstract

A century of fire suppression has created heavy fuel loads in many U.S. forests, leading to increasingly intense wildfires. Addressing this problem will require widespread fuels treatments, yet fuels treatment planners do not always have access to the current scientific information that can help guide their planning process. The Fuels Planning: Science Synthesis and Integration project was launched to compile relevant fuels treatment information for managers. Products include syntheses on various topics, a guidebook on silvicultural prescriptions, a set of models and information databases on possible environmental effects of fuels treatments, and a financial analysis tool for estimating costs and revenues of fuels treatments. The Fuels Planning project provides an example of how collaboration between managers and scientists can improve the utility of scientific findings. It is currently forming partnerships with several National Environmental Policy Act (NEPA) interdisciplinary teams who will use these decision support tools in planning fuels reduction projects starting in the summer of 2005.

Introduction

Even with increasing expenditures devoted to fire suppression in the US, the frequency, intensity, and annual acreage of wildfires continue to grow, due in part to heavy fuel accumulations after a century of aggressive fire suppression. Addressing this problem will require widespread, ongoing fuels treatments. But information overload makes it challenging for fuels treatment planners to integrate diverse scientific findings into their projects. The need for well-documented, accessible scientific information is crucial. To address this concern the Fuels Planning: Science Synthesis and Integration project was established to synthesize research findings relevant to fuels treatments, and to provide it to managers in a useful and accessible format. This information is of immediate need to managers, and the project staff worked to develop these products at an accelerated pace. Although the fire ecology and economics information was developed for application in the dry inland forests of the West, the social science findings are applicable to fuels planning activities throughout the US.

The tools produced by this project are designed to help field planning teams

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[2] Science Writer, Pacific Northwest Research Station, USDA Forest Service, P.O. Box 3890, Portland, OR 97208.

[3] Research Forester, North Central Research Station, USDA Forest Service, 1033 University Place, Suite 360, Evanston, IL 60201.

utilize current information without the burden of collecting and synthesizing disparate and rapidly emerging scientific findings. Target audiences include fuels management specialists, resource specialists, National Environmental Policy Act (NEPA) planning team leaders, line officers in the USDA Forest Service and the Department of the Interior, community leaders, and educators. Products developed will allow planners to quantify parameters and achieve greater consistency in their analyses by standardizing outputs. Information derived from the various tools can be used in environmental analysis processes such as Environmental Impact Statements, Categorical Exclusion documents, Environmental Assessments, and NEPA documents.

Products

The project divided into teams organized around four key topic areas: social science, forest structure and fire hazard, environmental consequences, and economics. Each team is publishing a complete synthesis of their topic in a peer-reviewed document and, where appropriate, developing decision support tools related to their topic area. In addition, each team has written a series of simple and approachable two-page fact sheets highlighting key information. All of these tools and publications are available on the project's website: http://forest.moscowfsl.wsu.edu/fuels/htm

Team Products

Social Science Team

Fire and fuels management projects must respond to complex social forces. Although research directly related to social implications of fuels management practices has only fully developed under the National Fire Plan, there are numerous areas where related research can provide managers with useful information. The social science team compiled and synthesized social science information relevant to fuels management in five key areas: (1) social acceptability of fuels treatments, (2) collaboration, (3) aesthetics, (4) communicating with the public about risk, fuels treatments, and defensible space, and (4) the social impacts of wildfire. Key findings from each of these five areas have been compiled in five individual GTRs (e.g., see Sturtevant et al. 2005), which will also be summarized in a manager oriented GTR. All the publications, including the team's fact sheets, are available at the project's website (see above).

Forest Structure and Fire Hazard Team

The forest structure team has published a GTR demonstrating how different silvicultural prescriptions would affect fire hazard and forest structure in dry forests of the western US, and highlighting ecological principles associated with managing forest fuels and vegetation for specific conditions (Peterson et al. 2005). Quantitative results are presented in tabular format for pre-and post-treatment effects for potential fire behavior attributes, such as crowning and torching potential, fire type, canopy base height, and canopy bulk density. Computer-based landscape simulations provide pre- and post-treatment images that help users visualize stand and landscape conditions, the effects of different management treatments, and fuel changes over time. This publication (another GTR on the science basis for changing forest structure) (Graham et al. 2004), and the team's fact sheets, are available at the project's website (see above).

Environmental Consequences Team

The environmental consequences team developed a set of models and information databases to assist managers and project planners in assessing the diverse possible environmental effects of fuels treatments.

- The Understory Response Model provides a comparative evaluation of treatment impacts to understory plants, including invasive species. It is a species-specific computer model that predicts qualitative changes in total species biomass for grasses, forbs, and shrubs after thinning, prescribed fire, or wildfire at one-, five-, and 10-year intervals.
- The Wildlife Habitat Response Model is a web-based computer tool that provides qualitative estimates of treatment impacts on the habitats of most vertebrate animals in the interior West. Using data gleaned from the scientific literature, the model identifies important habitat elements for a species, and displays expected suitability of the post-treatment environment.
- The *Armillaria* Response Tool helps to identify areas potentially susceptible to *Armillaria* root rot after stand treatment. This model can indicate how some fuels management activities may exacerbate root rot within high-risk stands, and helps determine an appropriate fuels management plan for reducing further damage from the disease.

The team also enhanced existing software to improve ease of use and applicability for fuels management. These products include:

- The Smoke Impact Spreadsheet--a smoke model that estimates particulate matter emissions, smoke production, and dispersion for comparison with appropriate federal or state air quality standards.
- The Water Erosion Prediction Project Fuel Management Tool--an erosion model that estimates the probability of sediment yield and flooding after a disturbance. It creates output tables that compare sediment generated for a variety of conditions (such as thinning, wildfire, undisturbed forest, etc.). These tables can be pasted directly into NEPA documents or similar analyses. (see Elliot 2004)

In contrast to almost all other tools currently used in fire management and planning, all these tools have been peer reviewed. This is one of the reasons they are valuable for NEPA and other science-based documents. These tools and related publications and fact sheets can be found at the project's website (see above).

Economics Team

The economics team developed a peer reviewed financial analysis tool called My Fuel Treatment Planner that assists managers in estimating costs, net revenues, economic impacts, and surface fuels associated with various fuels reduction treatments (see Biesecker and Fight in review). The planner provides insights on how to think through financial analyses, and interacts compatibly with existing planning tools. It was designed for fuels treatment planners, including those with little or no background in economics, forest management, or timber sales. It promotes common sense decision making by answering questions such as: what type of fuels treatment could pay for itself? What would it cost to treat this stand? Can I combine mechanical

treatments and prescribed fire to make treatments less expensive? Easily navigable, this spreadsheet application is simple to use, yet the information behind it comes from years of data gathered from the western US. This tool and the team's fact sheets are available at the project's website (see above). To go directly to My Fuel Treatment Planner, go to: http://www.fs.fed.us/pnw/data/myftp/home.htm

Collaboration and Validation

To ensure that information was provided to managers in a useful form, the project worked to ensure involvement of a wide variety of people. The effort involved the collaboration of scientific experts from the North Central Research Station, Pacific Northwest Research Station, Pacific Southwest Research Station, and Rocky Mountain Research Station, their management counterparts, and university researchers, and received financial and technical support from Fire and Aviation Management. The cooperation has both improved the applicability of this project's results to fuels planning activities around the country, and boosted credibility, trust, and understanding on both sides. Managers were involved in initial development of primary research questions and initial product development. As products were developed, several data trials and beta tests were held with on-the-ground fuels planners and fire managers for ground-truthing and feedback. The testing also has helped to fine-tune product packaging and delivery.

Management Applications

By synthesizing current information and presenting potential treatment effects through computer models, these products support fuels managers and project planners as they select and execute fuels treatments. With more complete access to relevant scientific information, and with tools for improved environmental analysis, managers have an improved capability to make informed, defensible decisions. Products will help managers consider a range of options, including no-action alternatives. By comparing predicted effects delineated by the computer models against a threshold of acceptability, a manager has a clear and thoroughly reviewed logic for evaluating a final decision for treatment. For example, the financial planning tool helps managers determine cost-effective approaches to fuels treatments, while the suite of environmental consequences models can help identify areas in need of habitat protection. The silviculture GTR can help managers visualize potential impacts of their fuels treatment activities over space and time, and can allow them to make better decisions based on a range of options.

So far, users who have tested the tools have responded favorably. One user commented that these tools will be "useful on the smaller categorical exclusion-type projects, where fuels Assistant Fire Management Officers could do much of the analysis themselves." "Great for a small project," said another user. Other types of projects sample users anticipated using the tools for include Environmental Assessments, Environmental Impact Statements, and Hazardous Fuels Reduction projects. The models also provide a way to present outcomes, to create a framework for understanding other fuels planners and managers, and to forge a common language. All these facets also make these tools particularly valuable when managers have to explain a fuels treatment plan to the public.

Ongoing Work

The project currently is forming partnerships with NEPA interdisciplinary teams who will use the decision support tools in planning fuels reduction projects starting in the summer of 2005. A recently established technology transfer team for the project will work with these teams to provide initial on-site training sessions and on-going support throughout the planning process. This process will both help raise awareness of the various products and enable further refinement of the tools and science delivery materials. My Fuel Treatment Planner also has been incorporated in the Fireshed Assessment process that has been developed in California. All national forests in the state are using this process so that managers can assess their progress toward meeting the hazardous fuel reduction goals of the National Fire Plan, the Healthy Forests Restoration Act of 2003, and national forest land and resource management plans. These assessments rely on My Fuel Treatment Planner to provide financial analyses of different scenarios.

The Fuels Planning project provides an example of how active collaboration between scientists and managers can help facilitate the delivery of relevant scientific findings to managers. As a trial effort in such work on a national scale, and one also at an accelerated pace, it required significant dedication on the part of both the scientists and managers. Hopefully, as such actions become more routine and normalized, the resource requirements, while still significant, will become less demanding.

Lead Scientists

- Project leaders: Russell T. Graham, Sarah M. McCaffrey, and Leslie Sekavec
- Environmental Consequences team: Elaine Sutherland and Anne Black.
- Wildland Fire Behavior and Forest Structure team: David Peterson and Morris Johnson
- Economics team: Jamie Barbour and Roger Fight
- Social Science team: Pamela Jakes and Susan Barro

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