RMRScience

April 2005

USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO

Guides for Fuels Managers

In 2003, the USDA Forest Service initiated a project called Fuels Planning Science Synthesis and Integration (more commonly known as the Fuels Synthesis Project) to provide fuels specialists and others involved in project planning with the most up-to-date research information available. The project was initiated because fuels treatment planners often found the challenge of integrating diverse scientific findings into the design of their projects a barrier to timely decision-making. With an increased emphasis on treating fuels to reduce wildfire impacts, the need for well-documented, accessible scientific information has become ever more crucial.

The geographic focus of the Project, a joint effort between the Rocky Mountain, North Central, and Pacific Northwest Research Stations and the agency's Fire and Aviation Management staff, is on the dry forests of the Western United States. Goals include developing accessible analyses, protocols, and tools; writing peer-reviewed documents that synthesize and integrate the ecological and social science relevant to fuels treatments; and delivering these in a user-friendly format. Target audiences include fuels management specialists, resource specialists, National Environmental Policy Act planning team leaders, line officers in the USDA Forest Service and the Department of the Interior, community leaders, and educators. Information derived from this effort is applicable to Categorical Exclusion documents, Environmental Impact Statements, Environmental Assessments, and NEPA documents.

The Fuels Synthesis Project is organized around four key science topics: 1) forest structure and fire hazard; 2) environmental consequences of fuels treatments; 3) economic uses of material and costs of fuels treatments; and 4) public understanding, beliefs, attitudes, and behaviors related to fuels management. Teams of scientific experts from public agencies, their management counterparts, and university researchers from across the U.S. have been engaged in compiling and synthesizing information available on these topics.

The initial series of easy-to-digest one-page fact sheets has been completed. They, along with future fact sheets, are available only on the Rocky Mountain Research Station's website at www.fs.fed.us/fire/tech_transfer/synthesis/synthesis_index. Following is a brief overview of available Fuels Planning: Science Synthesis and Integration fact sheets:

Economic Uses Fact Sheets

#1 - Mastication Treatments and Costs (Research Note RMRS-RN-20-1-WWW). Mastication, or mulching, is a mechanical fuel treatment that changes the structure and size of fuels in the stand. This fact sheet describes the kinds of equipment available, where mastication should be used, and treatment factors affecting cost.

#2 - Log Hauling Cost (Research Note RMRS-RN-20-2-WWW). Knowing the cost of fuel reduction treatments and associated activities, such as hauling cut trees, is essential for fire and fuels planning. This fact sheet explores the main factors that determine the cost of hauling cut trees, and points the user to an interactive tool that can help plan for those and other expenses.

Mechanically treating ladder and surface fuels to reduce wildfire hazard.

#3 - Economic Impacts of Fuel Treatments (Research Note RMRS-RN-20-3-WWW). With increased interest in reducing hazardous fuels in dry inland forests of the American West, agencies and the public will want to know the economic impacts of fuel reduction treatments. This fact sheet discusses the economic impact tool, a component of My Fuel Treatment Planner, for evaluating economic impacts.

#4 - My Fuel Treatment Planner (Research Note RMRS-RN-20-4-WWW). In the face of rapidly changing public and political attitudes toward fire and fuel planning, one thing remains constant – the fuel planner is ultimately responsible for making decisions on the land. This fact sheet discusses the options for fuel treatments, and the need, development, and use of the MS Excel-based tool, My Fuel Treatment Planner.

#5 - NEPA and Economics (Research Note RMRS-RN-20-5-WWW). The National Environmental Policy Act (NEPA) is the law that requires Federal agencies to consider the environmental impacts of their actions, involve the public in the decision-making process, and disclose information, starting at the initial stages of planning. Fact Sheet 5 discusses when you should consider economics in the NEPA process, when to do an analysis, whether or not to use an economist to conduct the analysis, and other statues, such as the Clean Air Act, you should be aware of.

#6 - Selection Criteria Analysis (Research Note RMRS-RN-20-6-WWW). Confidence in decision-making can often come from knowing if others in similar circumstances would choose the same management strategy. Researchers at the Pacific Northwest Research Station and the University of Saskatchewan have developed a Selection Criteria Analysis for answering this very question. This fact sheet discusses factors affecting the choice of treatment, such as site characteristics and management objectives, and how the Selection Criteria Analysis balances the factors in the decision-making process.

#7 - Markets and Log Prices (Research Note RMRS-RN-20-7-WWW). Markets and prices for logs vary widely across the West, fluctuating from place to place in response to regional variables and hauling costs. This sheet covers those variables, locality of log markets, markets for low-value logs, and caveats to consider when using My Fuel Treatment Planner.

#8 - Prescribed Fire Costs (Research Note RMRS-RN-20-8-WWW). Although the use of prescribed fire as a management tool is widespread, there is great variability and uncertainty in the treatment costs. Given specific site variables and management objectives, how much will it cost to use prescribed fire? This paper describes the FASTRACS database, a tool that has been developed to aid managers in addressing this question.

Social Issues Fact Sheets

#1 - Developing Personal Responsibility for Fuels Reduction: Building a Successful Program to Engage Property Owners (Research Note RMRS-RN-21-1-WWW). In the course of work as a land manager, you will no doubt be involved in developing programs to achieve various objectives, including the improvement of fuels management on private lands. This sheet describes six steps that will help you plan and conduct a successful program.

#2 - Developing Personal Responsibility for Fuels Reduction: Types of Information to Encourage Proactive Behavior (Research Note RMRS-RN-21-2-WWW). Fuels management responsibilities may include providing local property owners with the information for taking responsibility for reducing fuels on their land. This fact sheet discusses three different types of information that may be useful in programs to engage property owners in fuel reduction activities.

#3 - Developing Personal Responsibility for Fuels Reduction: More Ways to Catch and Hold People's Attention (Research Note RMRS-RN-21-3-WWW). Other fact sheets discuss the different types of information that are useful in explaining to property owners the importance for fuels management on their land. However, for some, new information is not enough - they may need more information in order to understand that change is necessary. Fact Sheet 3 covers ways to catch and hold people's attentions so that they become (and stay) engaged in fuels reduction activities.

Describing fuels reduction strategies to local landowners.

#4 - Three Critical Topics to Cover When Talking About Hazards (Research Note RMRS-RN-21-4-WWW). The amount of science applicable to the management of wildfire hazards is increasing daily. In addition, the attitudes of landowners and policymakers about fire and fuels management are changing. This fact sheet discusses three critical keys to communicating about wildfire hazards.

#5 - The Importance of Working Locally (Research Note RMRS-RN-21-5-WWW). People who evaluate their actions in terms of what others think are often said to be guided by community norms. With respect to fuels management, this means that when you are "selling" a property owner on taking steps to reduce fuels, you are not just "selling" to one person, but to a network of people. Fact sheet 5 discusses three tools to help you focus wildfire hazard education and communication on the local area.

The "Three Critical Topics" fact sheet discusses keys to communicating with landowners about wildfire hazards.

#6 - Important Considerations for Communicating About Hazards (Research Note RMRS-RN-21-6-WWW). Effective public education and communication campaigns about wildland fire and fuels management should have clear objectives, and use the right techniques to achieve these objectives. This sheet lists seven important considerations for planning or

#7 - The "Laws" of Effective Public Education about Fire Hazards (Research Note RMRS-RN-21-7-WWW). Within the past 10 years, breakthrough research has identified factors that are most important for effectively communicating about wildland fire hazards. Here, seven laws of effective public communication that should be considered in any state-of-the-art education campaign are discussed.

#8 - The "Golden Rule" and Other Lessons on Communicating About Hazards (Research Note RMRS-RN-21-8-WWW). Other fact sheets identify considerations for communicating about hazards, talk about the importance of working locally, and discuss the seven laws of effective hazard communication. This one introduces the "Golden Rule" of hazard communication and shares some final lessons from hazard educators.

Forest Structure and Fire Hazard Fact Sheets

#1 - Forest Structure and Fire Hazard Overview (Research Note RMRS-RN-22-1-WWW). Many managers and policymakers guided by the National Environmental Policy Act process want to understand the scientific principles on which they can base fuel treatments for reducing the size and severity of wildfires. The Forest Structure and Fire Hazard fact sheets discuss how to estimate fire hazard, how to visualize fuel treatments, and how the role of silviculture can help in managing forests to reduce crown fires.

#2 – Fire Hazard (Research Note RMRS-RN-22-2-WWW). Fire hazard reflects the potential fire behavior and magnitude of effects as a function of fuel conditions. This fact sheet discusses crown fuels, surface fuels, and ground fuels and their contribution and involvement in wildland fires.

#3 – Visualizing Forest Structure and Fuels (Research Note RMRS-RN-22-3-WWW). The software described in this fact sheet provides managers with tools for visualizing forest and fuels information. Computer-based landscape simulations can help visualize stand and landscape conditions and the effects of different management treatments and fuel changes over time. These visualizations can assist forest planning by considering a range of management options, as well as facilitate communication with

#4 – Role of Silviculture in Fuel Treatments (Research Note RMRS-RN-22-4-WWW). The principal goals of fuel treatments are to reduce fireline intensities, reduce the potential for crown fires, improve opportunities for successful fire suppression, and improve forest resilience to forest fires. This fact sheet discusses thinning and surface fuel treatments, as well as challenges associated with those treatments.

Prescribed burn in the Southwestern U.S.

#5 – Fuel Treatment Principles for Complex Landscapes (Research Note RMRS-RN-22-5-WWW). Appropriate types of thinning and surface fuel treatments are clearly useful in reducing surface and crown fire hazards under a wide range of fuels and topographic situations. This paper provides well-established scientific principles and simulation tools that can be used to adjust fuel treatments to attain specific risk levels.

Environmental Consequences Fact Sheets

#1 – Fire Effects Information System (FEIS) (Research Note RMRS-RN-23-1-WWW). The Fire Effects Information System (FEIS) provides accessible, up-to-date effects summaries, taken from current English-language literature, for almost 900 plant species, about 100 animal species, and 16 Kuchler plant communities found on the North American continent. Fact sheet 1 covers the development of FEIS and what is contained in the species summary.

#2 – First Order Fire Effects Model (FOFEM) (Research Note RMRS-RN-23-2-WWW). FOFEM 5.2 is a simple, yet versatile computer program that predicts first order fire effects using text and graphic outputs. It can be used in a variety of situations including: determining acceptable upper and lower fuel moistures for conducting prescribed burns; determining the number of acres that may be burned on a given day without exceeding particulate emission limits; comparing predicted fuels reduction for alternative prescribed burn scenarios; and predicting the effects of wildland fire. This fact sheet describes what inputs are needed to run FOFEM, the outputs that are produced, and how to download a copy from the Internet.

#3 – Structure Fires in the Wildland-Urban Interface (Research Note RMRS-RN-23-3-WWW). National Fire Protection Association (NFPA) data indicate that wildfires destroyed approximately 9,000 homes between 1985 and 1994 in the United States. The loss of homes to wildfire has had a significant impact on Federal fire policy. This sheet discusses the causes of home ignitions in the wildland-urban interface, home ignition zones, how to reduce home ignition potential, responsibility for reducing home ignition potential, and management consequences of the home ignition zone.

#4 – Wildlife Responses to Fuels Treatments: Key Considerations (Research Note RMRS-RN-23-4-WWW). Managers face a difficult task in predicting the effects of fuels treatments on wildlife populations, mostly because information

#5 – Prescriptions and Fire Effects (Research Note RMRS-RN-23-5-WWW). While our understanding of the causes for variation in postfire effects is increasing, burn prescriptions may not always include parameters that control the long-term heat pulse from fire. This sheet discusses: fuel consumption and fire effects; prescription design considerations; and planning a prescribed fire.

#6 – Wildland Fire Use: The "Other" Treatment Option (Research Note RMRS-RN-23-6-WWW). Fire suppression has reduced acres burned to an average of 2 million acres per year. An unfortunate result of this has been the accumulation of even more above-normal fuel loads in many areas. This fact sheet covers: the important ecological role of fire; using fire as a fuels treatment; and the benefits and risks of fire.

Ponderosa pine stand in which the fuels were treated to decrease both wildfire intensity and severity if a wildfire were to occur.

#7 – Fire and Weeds (Research Note RMRS-RN-23-7-WWW). Weed infestations cause an economic loss of $13 billion per year, even though $9.5 billion is spent per year on weed control measures. In addition to these economic costs, weeds are replacing native species, altering native plant and animal communities, affecting ecosystem health and function, threatening biodiversity and Threatened, Endangered, and Sensitive (TES) species, altering fire behavior and fire regimes, and reducing wildland productivity. This paper discusses: where weeds are found; what promotes weed invasions; and how to incorporate weed management into fuel treatment activities.

Publication Reviews

Postfire Mortality of Ponderosa Pine and Douglas-fir: A Review of Methods to Predict Tree Death
(RMRS-GTR-132)

This review focused on the primary literature that described, modeled, or predicted the probability of postfire mortality in ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*). The methods and measurements used tended to fall into two general categories: those focusing on measuring important aspects of fire behavior, the indirect by ultimate cause of mortality; and those focusing on tissue damage due to fire, the direct effect of fire on plant organs. Of the methods reviewed, crown scorch volume was the most effective, easiest to use, and most popular measurement in predicting postfire mortality in both conifer species. General Technical Report RMRS-GTR-132 is available from the Rocky Mountain Research Station or online at http://www.fs.fed.us/rm/pubs/rmrs_gtr132.html.

Managing the Unexpected in Prescribed Fire and Fire Use Operations: A Workshop on the High Reliability Organization
(RMRS-GTR-137)

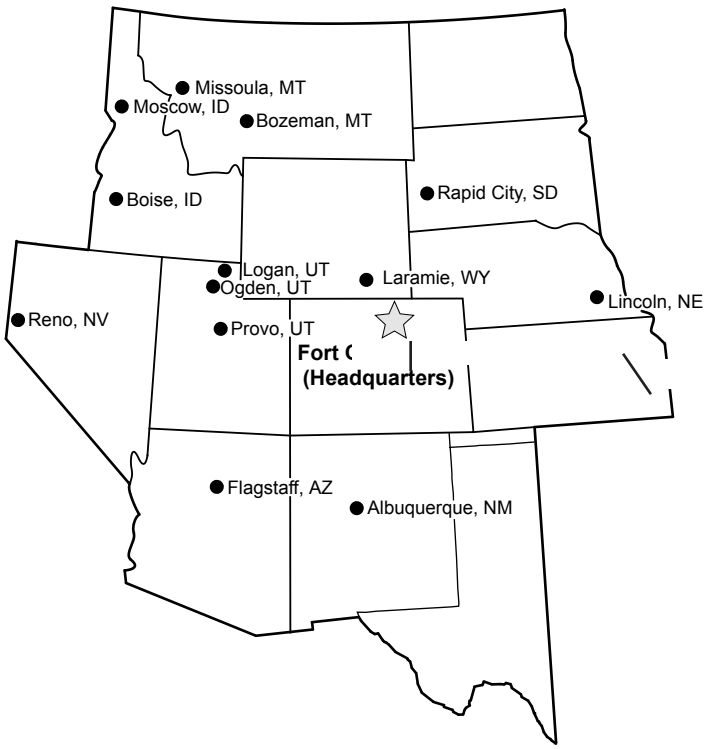
How do we organize for high performance in a setting where the potential for error and disaster can be overwhelming? In doing so, how can we best apply the High Reliability Organizing concepts into the prescribed fire and fire use arenas? And, to successfully achieve these outcomes, how can we personally and institutionally overcome our immunity to change? This report summarizes how these questions, and many others, were addressed through the activities, discussions, and lessons learned during the four-day Managing the Unexpected Workshop, held May 10-13, 2004, in Santa Fe, NM. Overall workshop intent was to introduce the latest social science to the prescribed fire and fire use management community. General Technical Report RMRS-GTR-137 is available from the Rocky Mountain Research Station or online at http://

RMRScience is a biannual report from the USDA Forest Service's Rocky Mountain Research Station. Each issue highlights on-going or recently completed research, and features findings useful to land managers and other natural resource specialists. To be added to the mailing list, free-of-charge, write *RMRScience*, Rocky Mountain Research Station, 2150A Centre Ave., Fort Collins, CO 80526; or e-mail rfletcher@fs.fed.us; or fax (970) 295-5927. Comments and suggestions are always welcome.

RMRScience
USDA Forest Service
Rocky Mountain Research Station
2150 Centre Ave., Bldg. A
Fort Collins, CO 80526

FIRST CLASS MAIL
Postage & Fees Paid
USDA-FS
Permit No. G-40

OFFICIAL BUSINESS
Penalty for Private Use $300



The USDA Forest Service's Rocky Mountain Research Station is one of seven units nationwide that make up the most extensive natural resource research organization in the world. Headquartered at the foot of the Rockies in Fort Collins, CO, the Station maintains 12 laboratories within a 14 state territory (see map). Scientists conduct studies nationwide, with emphasis on the Rocky Mountains, Great Basin, Great Plains, and Southwest. Research serves the Forest Service, as well as other federal agencies, international organizations, private groups, and individuals. For more information, visit our website at http://

http://www.fs.fed.us/rm