Social Science Informing Forest Management—Bringing New Knowledge to Fuels Managers

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ABSTRACT

To improve access, interpretability, and use of the full body of research, a pilot project was initiated by the USDA Forest Service to synthesize relevant scientific information and develop publications and decision support tools that managers can use to inform fuels treatment plans. This article provides an overview of the work of the Social Science Core Team. Team members synthesized social science research to improve fuels management on the topics of collaboration, communicating with homeowners, assessing social acceptability, aesthetics of fuels management, and impacts of wildland fire on communities.

Keywords: wildland–urban interface, collaboration and wildfire, communicating with homeowners, social acceptability, aesthetics, wildfire impacts, wildfire and communities

When asked what is the greatest challenge they face in performing their day-to-day responsibilities, many resource managers will respond, "Working with the public." This is as true for the manager working to reduce hazardous fuels as for someone developing trails, improving wildlife habitat, or certifying forestland management. Millions of dollars have been invested in research to help managers work more collaboratively with the public and to help them better incorporate public values in their decisionmaking. A glance through journals such as *Society and Natural Resources, Human Ecology Review,* and *Environmental Hazards* will illustrate the range and depth of this research. The challenge is to move new knowledge generated by research from the academic world to the world of the manager. The Applied Wildland Fire Research in Support of Project Level Hazardous Fuels Planning Project (or Fuels Synthesis Project) took on this challenge (McCaffrey and Graham 2007). The Fuels Synthesis Project is a multiagency effort to accelerate the delivery of research information to fuels specialists and others involved in project planning in four areas: (1) wildland fire behavior and forest structure, (2) environmental consequences of fuels treatments, (3) economic uses of material and costs of fuels treatments, and (4) social understanding and behaviors related to fuels management. The origins and purpose of the Fuels Synthesis Project are described in an earlier issue of this journal (McCaffrey and Graham 2007). This article focuses on the charge given to the Social Science Core Team to synthesize social science information relevant to fuels management in such a way that it is accessible to managers.

In addressing our charge, the Social Science Core Team began by thinking about fuels treatment projects as consisting of three phases: (1) planning, (2) implementation, and (3) monitoring and evaluation. We formed questions relevant to these three stages that could be answered by social science. Guidance in this effort was provided by a number of fire program documents and reviews including those done for the National Fire Plan, Joint Fire Science Program, the Western Governors' Association's (2001) 10-year comprehensive strategy, and by Machlis et al. (2002). We also consulted with managers and other social scientists. We synthesized research that contributes to answering one of five questions:

1. What information and tools are available

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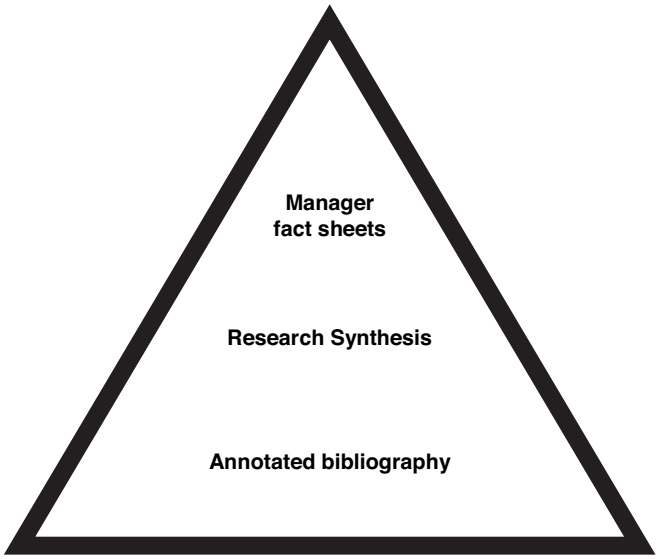

Figure 1. Tiered approach to exchanging information contained in each synthesis, with an annotated bibliography supporting the synthesis and each synthesis supporting four to six manager fact sheets.

to help land managers and communities collaborate in developing fuels treatment programs?

2. What information and tools are available to encourage more active involvement of private property owners in the fuels management process?
3. What information and tools are available to evaluate the social acceptability of fuels treatments?
4. What information and tools are available to describe and evaluate the aesthetic impact of fuels treatments?
5. What information and tools are available to help us understand and evaluate the impacts of wildfire on communities?

Reaching Managers

The Social Science Core Team produced five syntheses—one for each of the aforementioned questions. We spent a significant amount of time brainstorming the most effective way to transfer information contained in each synthesis to managers. Rather than relying on one document (the synthesis) to answer each question, we developed a tiered approach for sharing knowledge (Figure 1). Our goal with this approach is to capture a manager's attention with some interesting and relevant piece of information taken from a synthesis and provide a way for the manager to drill down through a series of documents to obtain increasingly detailed information.

We anticipate that a manager's attention might be captured initially by one of our managers' fact sheets (top of the pyramid in Figure 1). Each fact sheet focuses on one key finding contained in a synthesis and is written with minimal jargon in a format that is easily accessible. Fact sheet titles that illustrate the types of topics addressed include "Strategies for Managing Fuels and Visual Quality," "Considering the Social Acceptability of Fuels Treatments," "The Importance of Acting Locally," and "Keys to Successful Collaboration." Fact sheets are available online at www.fs.fed.us/rm/pubs/rmrs_rn021.HTML, and hardcopies have been distributed at conferences, workshops, and training sessions.

Managers who have a deeper interest in one of the findings contained in a fact sheet can learn more about the broader topic in the relevant research syntheses (www.ncrs.fs.fed.us/4803/focus/fire/fuels_mgt/). Each synthesis reviews the science pertinent to answering the synthesis question and discusses the implications of this research for fuels management. Finally, the synthesis is supported with an annotated bibliography (the base of the pyramid in Figure 1). The bibliography allows managers seeking more information to identify the research supporting a particular fact sheet or finding in the synthesis and to read the original research report, journal article, or proceedings.

Synthesis Development

For each synthesis question a working group was formed to identify research relevant to their question. Each team received a budget to use at their discretion (to hire staff, purchase library services, and cover other costs). The team was given 6 weeks to write a synthesis and put together the annotated bibliography. The synthesis is not a literature review, but it provides insight as to how the research discussed fits into the broader discipline and how it is relevant to fuels management. Although the Fuels Synthesis Project focuses on dry forests of the inland western United States, we made a decision early in the process not to limit the social science research considered for the syntheses to research conducted in that geographic area. We felt that answers to the questions being asked could be valuable regardless of the geographic location of the research contributing to the answer. In addition, we felt that research addressing the human dimensions of a variety of management objectives could be applicable to fuels management. For example, we assumed that information and tools developed in Minnesota to bring together communities and agencies to address watershed management collaboratively, across boundaries, are potentially applicable to fuels management in Washington.

When the syntheses were completed, they were given to an individual who facilitated review for each synthesis. This was a double-blind review—the reviewers did not know the authors of the synthesis they were reviewing, and the authors did not know the names of the reviewers. The facilitator and reviewers were paid for their time. The team leaders worked with the authors to respond to the reviewers' comments. After the syntheses were reviewed and rewritten, our writer/editor developed fact sheets for each synthesis.

New Knowledge for Fuels Managers

The highlights provided in this section are a summary of just one portion of each synthesis. They are offered to illustrate the type of information obtained in the syntheses and to whet the reader's appetite for more information on the topic.

Collaborating to Manage Fuels and Wildland Fire. Collaboration is not a new idea for public land managers; wildland fire professionals at the local, state, and federal levels have a long tradition of collaboration for fire suppression. However, in this synthesis the focus is on knowledge and tools to improve collaboration among citizens, managers, and policymakers for wildland fire and fuels management projects (Sturtevant et al.

2005). Although there are many definitions of collaboration, in general, we can say that collaboration is a process that helps people achieve goals that they could not achieve independently.

Why should fuels managers collaborate? "Collaboration can lead to better decisions that are more likely to be implemented, and at the same time, better prepare agencies and communities for future challenges" (Wondolleck and Yaffee 2000, 23). Research has identified nine benefits of collaboration (Jakes and Esposito 2006a):

1. Increases efficiency. Collaboration can create relationships and agreements that increase efficiency by facilitating the sharing of personnel, equipment, and data; leveraging of resources to attract grant moneys; and mobilizing of citizen volunteers.
2. Increases agency awareness of changing values. Public values are changing and becoming more diverse. In addition, attitudes, values, and beliefs about wildland fire and fuels management are changing. Through collaboration land managers can better identify, understand, and respond to these changes.
3. Builds trust. Local residents may distrust a government agency, but they tend to trust individual employees of the agency. When federal employees participate in collaborative activities as individuals, trust builds between them and residents and may eventually expand to include the agency.
4. Promotes landscape-level management and planning. Although fuels mitigation may be planned and implemented at the local level, to be effective, it must contribute to and support a broader landscape-level strategy for fuels management. Several case studies of collaborative groups show the positive results of joint resource management planning across a broad geographic area.
5. Motivates private landowners. One of the major challenges of fuels management is motivating private landowners to take responsibility for necessary mitigation actions on their land. Studies show that collaborative projects have promoted personal responsibility and motivated landowners to reduce their vulnerability to fire.
6. Supports science. Scientific truth is being debated publicly and contentiously these days. Collaboration among agency, university, and community scientists can facilitate a shift from relying on agency expertise toward emphasizing shared learning and responsibility. This can anchor a project in the community, while meshing traditional science with local knowledge.
7. Produces intangible benefits. Many of the benefits of collaboration are intangible or "invisible successes."
8. Builds community capacity. Collaborative projects build the abilities of residents, community organizations, and leaders to meet local needs and expectations. They bring people together not only as stewards of public and private land but also as empowered citizens—enabling them to sustain wildfire and fuels management programs and other community projects on their own into the future.
9. Builds agency capacity. Collaboration can increase an agency's ability to meet its mission and goals, expanding the scale and complexity of its projects, available technical expertise, and project support.

One of the highlights of this synthesis is nine minicase studies that focus on specific examples of communities and agencies working together collaboratively to reduce fuels and improve the health of their forested ecosystems.

Communicating With Homeowners about Fuels Management. To collaborate effectively with private landowners and other stakeholders, public land managers need to be able to communicate effectively. Many believe that if we wish to change people's attitudes and behaviors, we only need to educate them. Although providing information is necessary to change behavior, it is rarely sufficient. A successful communication effort is a complicated process. Campaigns must be coherent and collaborative, convey credible, understandable, and appropriate information for the intended audience, and complement existing values (Monroe et al. 2005).

The first step in any communication effort is to understand your audience. Rarely are you interested in reaching only one audience. There are many audiences that vary by education, age, gender, and ethnicity. In addition to these demographic differences, there are differences in experience, values, and attitudes. For this reason, successful programs seldom can be transported directly from one locality to another. It is important that the content of the communication program address important contextual issues, such as regional architectural preferences, cultural aspects of fire or fuels management techniques, and local wildland fire experience.

Basically, there are eight "laws" of effective communication projects (Jakes and Esposito 2006b):

1. Be clear. Complicated interrelationships (such as the link between fuels levels and fire risk) must be explained clearly in nontechnical terms. Fuels or wildland fire technical experts generally can not accomplish this; therefore, hire people who have communication skills to work with the experts to craft words that the public can understand and relate to.
2. Use varied sources. Different people trust different information sources. For this reason, information must come from varied sources including authorities, technical experts, scientists, and other sources familiar to locals. Ideally, information is developed and disseminated by multiple sources.
3. Present consistent information and repeat often. The information that people receive should be consistent, and when that information changes, those changes must be explained to avoid confusion.
4. Use a steady stream of information. Communication works best when there is a steady stream of information through diverse media.
5. Tell people what to do, do not assume that they know. The most important information you can give people is to tell them what they can do before, during, and after an event.
6. Support people in their search for more information. If a communication effort is working, people will want to talk it over with others and will seek out more information. Expect it. Encourage it. Support it.
7. Place additional information throughout the community. To encourage this search for more information, place additional information where people will look for it, and tell them where they can find it.
8. Use words and great graphics to convey your message. Clear information works best, so use simple language supported by attractive graphics.

The communication synthesis closes with lessons learned from efforts to communicate about reducing fuels management and preventing wildland fire.

Evaluating the Social Acceptability of Fuels Treatments. Managers routinely assess the potential ecological impacts of a fuels treatment project that they intend to implement. Although this is a process most managers accept without challenge, they may not be as prepared to evaluate the social impacts of a fuels treatment project (with the exception, perhaps, of the costs of the project). One measure of social impact is social acceptability. Social acceptability is based on value judgments by people—their notions of "goodness" or "betterness." Managers are confident that they can measure various biological indicators of treatment impacts, e.g., a reduced number of stems/acre, but most do not know how to measure the "goodness" of a treatment. In general, a trained social scientist is necessary to ensure data quality and relevance when assessing social acceptability. This synthesis is a primer for social acceptability assessment (Daniel et al. 2005). It presents six questions that help define the social assessment process and can form the basis of discussion between managers and social scientists:

1. How will the fuels treatment be defined?
2. How will the fuels treatment be represented to people?
3. Whose opinion is being sought?
4. How will people be contacted?
5. How will people express judgments?
6. How will the data be analyzed and synthesized?

Assessments of social acceptability seek to answer questions such as "Do stakeholders judge treatment *X* to be more acceptable than treatment *Y* for reducing hazardous fuels?" "Is it more socially acceptable to manage for fuels reduction or ecosystem restoration?" This synthesis introduces some of the more commonly used assessment methods and their advantages and disadvantages in various contexts.

Aesthetics of Fuels Treatments. The public's acceptance of forest management practices, including fuels reduction, is heavily based on the visual appearance of the forest. Fuels managers can improve the public acceptability of their fuels reduction projects by incorporating aesthetic considerations into management decisions.

In the synthesis of aesthetics and fuels management (Ryan 2005), four elements of aesthetically pleasing forested landscapes are identified (Jakes and Esposito 2006c):

1. Large trees. Many studies have shown that people prefer large mature trees. Forests with many closely spaced small trees often receive lower scenic ratings than more open spaces.
2. Herbaceous groundcover. People find low, smooth-looking herbaceous plants on the ground level of a forest aesthetically pleasing.
3. Open midstory canopy. How far people can see into a forest significantly affects their landscape preferences. One study found that the ability to see into a forest—or the amount of "visual access"—more strongly predicts scenic beauty than other physical measures of forests, such as number of downed trees and number of small trees in a stand.
4. Vistas and topography. Many studies have shown that people find vistas with varied topography, such as mountains, to be scenic. However, topography provides a challenge for visual resource management because hillsides and steeper areas are more visible from multiple vantage points.

Obviously, fuels managers can not control all four elements when they plan fuels management projects. However, a visually preferred landscape can be the natural outcome of fuels treatment if managers understand the important characteristics that shape the people's preferences.

Impacts of Wildland Fire on Communities. Understanding the type and magnitude of the potential impacts of wildland fire on communities can be overwhelming. One way to organize these impacts in a way that helps us manage the situation is to think of wildland fire as an event and to focus on three different time periods that frame the event: before the fire, during the fire, and after the fire. By studying the decisions made in each time period, we can understand how impacts develop in response to the decision throughout the three time periods.

Decisions made before a fire occurs center on mitigation and preparedness. Mitigation activities eliminate or reduce the probability of a wildland fire or help to minimize its negative consequences. Wildland fire mitigation activities include creating defensible space, adopting landscaping and building codes, and creating shaded fuel breaks around towns or valuable properties. Preparedness actions are undertaken before a wildland fire to improve response and/or recovery. Wildland fire preparedness activities include planning evacuation routes, training professional personnel, and obtaining supplies and equipment. The ability of communities to engage in mitigation and preparedness activities is significantly affected by what residents know about wildfire.

Unlike most catastrophic events, wildland fires can burn for a long period of time—up to several months. Decisions made during a fire that can mitigate or magnify the fire's impact on a community include but are not limited to:

1. Suppression. These are actions directly related to the attack on the fire. The many strategic and tactical decisions made during a fire give communities seemingly countless opportunities to second-guess decisions of the fire suppression team.
2. Communication. Over the years, firefighting agencies have developed sophisticated communication strategies to keep information flowing smoothly among firefighters on the front lines, fire managers overseeing the operation, public affairs specialists monitoring the effort, and the public and media, whose cooperation is crucial to a safe outcome. However, as a fire develops, information needs change, and those in charge of communication need to be aware of the critical content, source, and media for any situation.
3. Evacuation. Evacuation or notification of possible evacuation is likely to be among the most disruptive aspects of a wildfire for a community. A better understanding of the evacuation process and its impacts can minimize negative impacts on individuals and families and potentially improve relationships between the community and public safety institutions.
4. Access restrictions. Restricting access to homes and businesses has a major impact on a community. Support for these restrictions can be enhanced if managers make explicit the criteria used to determine the areas to be closed.
5. Spending. A wildland fire can generate economic activity in a community, but it does so in abnormal ways. Strategic purchasing and hiring can help mini-

mize disruption and potential negative distributional impacts of increased spending related to the fire.

Finally, decisions made after control of a fire also affect the ultimate impact of wildland fires on communities. These postfire decisions include those related to

1. Assessment. The actions taken during a fire are all documented and evaluated by fire and emergency management professionals so that those involved can learn from their mistakes and build on successes. Communities have become increasingly important as contributors to these assessments and also have benefited from participating in the process.
2. Reconstruction and repair. This set of actions includes setting priorities for infrastructure reconstruction and repair, processing claims and payments, and potentially involving new agencies, such as the Federal Emergency Management Agency. A framework of community recovery is an example of a preparedness action that would help guide this effort.
3. Restoration and rehabilitation. Ecosystems are severely impacted during wildland fire, with an increased potential for erosion and flash floods. The public can provide valuable feedback on priority areas for restoration and assist in the many labor-intensive activities that go into rehabilitation.
4. Salvage. Burned trees and other resources still may be usable, and there is often great political pressure to salvage them or leave them alone. Timber salvage proposals can be contentious and divisive. A preparedness plan that includes criteria for determining whether or not to salvage resources would help shift some of the pressure to decide from a time directly after the fire when stress is high to a time when more thought and debate can be given to the decision.

Decisions that occur before, during, and after a fire are influenced by other decisions made in the same or another time period and by the biophysical and social contexts. Decisions at any one time lead to a number of consequences that occur across time and at different social and geographic scales. The use of an adaptive management and learning approach ensures that the actions taken and their subsequent evaluation will influence decisions made with respect to future fires. The primary focus of this synthesis is research addressing these consequences.

Conclusion

The goal of the Fuels Synthesis Project is to identify new knowledge for use in planning and executing fuels treatments. We drew this knowledge from the techniques, tools, and processes discussed in a wide range of literature, including that focusing on collaboration, aesthetics, communication, and social acceptability. A model for a tiered approach to knowledge transfer suggests different products that will reach different segments of the audience for which the syntheses are intended.

More information on the Fuels Synthesis Project may be found on the Web at www.forest.moscowfsl.wsu.edu/fuels/. Details on Social Science Core Team process and outcomes are at www.ncrs.fs.fed.us/4,803/focus/fire/fuels_mgt/.

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