Treatment—Economics

Social Sciences and the Economics of Moderation in Fuels Treatment

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Abstract—*Fuels management is conducted in the context of the social sciences, which bring the science of the human element into the analysis. Of the social sciences, economics addresses the enhancement or improvement in the human condition by improving our ability to allocate scarce resources. The current fuels treatment situation suggests very ambitious ends in the context of limited means. Scarce resources mean that we will not have all of the fuels treatments that we would like. Therefore we will have to choose wisely among alternative treatment options. Socially desirable treatment programs will recognize both the costs and benefits of treatments to seek desired treatment levels. Further, social science investigations will reveal unintended side effects of fuels treatment policies. The challenge upon us is to combine the information on treatment standards, ecology, and technology into line with the social sciences to attain socially desirable treatment systems.*

This page marks a transition in the conference proceedings from the physical and ecological perspectives to considerations of the social sciences. Also, the following papers primarily address the results of specific case studies. This shift in focus is fundamental, so a few contextual remarks regarding the social sciences and their role in fuels treatment are appropriate.

Social sciences use the scientific method to address laws and hypotheses of human values and behavior. Of the social sciences, economics addresses the connection between resource allocation and social welfare. By social welfare, economists mean improving the human condition, or making people better off. We benefit in many ways from fuels treatments, but they are also costly. In a world of scarce resources and limited budgets, difficult choices are required. Resource allocation has long been an important consideration in fire management. As stated by fire historian Steven Pyne et al. (1996):

> "Economic theory has long enjoyed special privilege as a mechanism of reconciling fire management's limited means with its ambitious ends."

Papers in these proceedings, recent studies by the U.S. Government Accounting Office, and the President's National Fire Plan are among many indicators that the ends may never have been so ambitious relative to the means. The potential for substantive contributions from the social sciences may also have never been greater.

Fuels management for purposes of ecosystem preservation, maintenance, restoration, and wildfire suppression are conducted in a context of scarce resources. Scarcity means that we cannot have all of the things that we would like. This pervasive condition applies as well to ecosystem restoration promoted by fuels treatments. In a world of scarce resources, choices are imperative and many choices can be difficult and frustrating.

For federal programs, budget limitations are a practical reflection of scarcity. Each of the fuels management activities noted above is subject to limited budgets that require difficult choices. These choices all require the careful consideration of the treatment benefits versus treatment costs. Such consideration suggests a principle of moderation. The principle is simply stated as: "When

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there are both benefits and costs of an endeavor, there is typically a socially optimal level of the activity." Extreme solutions are impractical and wasteful. For example, social scientists have long known that a pristine environment is economically and socially undesirable. It is too expensive. It would detract from the achievement of too many other things that society values thereby reducing overall social welfare. As a society, we have chosen to accept a less than pristine environment in exchange for other goods, services and opportunities. The hard question and the relevant question is "What is the level of environmental quality that will best benefit society?" Ecologists, engineers, and economists have been hard at work on this problem for years.

Adoption of the 10 AM policy in 1936 cast aside the principle of moderation expressed in the 1916 and 1925 works of Headly and Sparhawk. The works of Headly and Sparhawk were the first expressions of the tradeoff between fire management costs and fire damage. These works sought a balance between the two costs that would minimize total cost. The 10 AM policy stipulated fire control by 10 AM the morning following the report of a fire. It was an extreme response to extreme conditions. As such, it disregarded costs, lacked moderation, and was therefore socially undesirable. Pyne et al. (1996) compared the policy to panic legislation promulgated by savage droughts in the early 1930s.

Concerned that costs were spiraling out of control, the early economic works of Headly and Sparhawk were summoned to advance a more cost-responsive policy. The Forest Service replaced the 10 AM policy in 1978 by what became known as "cost plus net value change" or C+NVC. Like the early works, C+NVC embodies the tradeoff between the costs of wildfire management and its benefits (Rideout and Hesseln 2001). It therefore directly embodies the notion of scarcity and seeks to promote an optimal extent of wildfire management and resource damage. This shift from an extreme and reactionary policy to a thoughtful recognition of tradeoffs marked a fundamental advancement in wildfire policy.

The fully restored ecosystem over a broad scale is potentially analogous to the 10 AM fire suppression policy. Such restoration would seem to preclude the notion that treatments, including fuels treatments, are conducted in the context of scarcity. While full ecosystem restoration may be desirable, in a world of scarce resources we are ultimately forced to focus on optimal restoration. If, for example, funds are available to only treat 5 or 10 percent of the problem, as many federal land managers have suggested, then how are those funds best allocated? Which lands would be best to restore and to what level? How to design optimal treatments for different ecosystems and social conditions will address many of the key questions of this era.

Ecosystem restoration through fuels treatment can be viewed as a project in environmental quality. The basic economic model of restoration is shown in figure 1 and is identical to the correctly formulated theory of C+NVC. When the benefits of restoration are considered in context with the costs, the principle of moderation is illuminated. The principle suggests an optimal level of restoration consistent with R* in figure 1. Here, the marginal cost of restoration equals its marginal benefits. The extreme response of full restoration on a broad scale would be at the right-hand edge of the figure where costs are excessive relative to benefits.

Figure 2 illustrates the tradeoff between the costs and benefits of restoration in a budgeting context. The optimal restoration budget would correspond with the budget provided by the area under the MC curve up to point R*. (Ignoring fixed costs for the moment does not alter the overall point.) A presumption that restoration is limited by the budget is perhaps correct, but it may ignore the social issue of moderation. Anecdotal evidence often suggests that budgets are consistent with the level indicated by B^1. They are too low

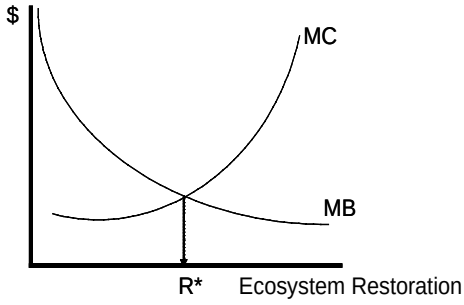

Figure 1—Optimal ecosystem restoration.

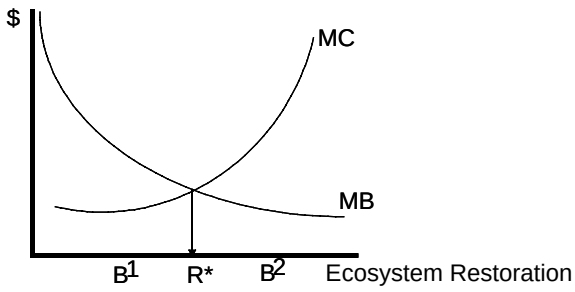

Figure 2—Optimal ecosystem restoration and a budget.

relative to benefits. Unfortunately, the dearth of social research has made it difficult to confirm this suggestion. Likewise, the excessive budget resulting in level B^2 has not been soundly rejected with the current level of research in the social sciences.

The principle of moderation embodied in figures 1 and 2 would suggest that a different set of questions need to be addressed if we are to advance the fuels treatment paradigm beyond the equivalent of the 10 AM policy. Many of these questions address what economists would refer to as the intensive and extensive margins of fuel treatments.

The *intensive* margin suggests questions regarding how fully ecosystems are restored. For example:

- Is full restoration always necessary or desirable?
- What is the design criteria for less intensive treatments?
- What are the beneficial and detrimental ecological effects of partial treatment or restoration?

Questions regarding the *extensive* margin would include:

- Which ecosystems are best suited for full and partial restoration?
- In a given ecosystem and / or ecosystem condition, how many acres should be treated?

Ecological studies that have focused on extremely intensive treatments from small case-study sites provide valuable information and effectively benchmark the full-treatment option. However, ecological research could add much to the field by further addressing the implications of managing the intensive and extensive margins. While the questions above provide a sample of the relevant questions suggested by social considerations, clearly they are interrelated. For example with limited budgets, treating fewer acres means that acres that are treated can be treated more intensively.

The literature and research on fuels treatment has been largely biocentric. For example, in their chapter on fuels treatment and in their section on fuel management, Pyne et al. (1996) contains no discussion of the social sciences. (This is provided as evidence of the lack of research in the field and not as a comment on the book or the authors.) With a biocentric history in fuels research, it should come as no surprise that fuels management and policy searches for cohesive social paradigm.

Non-market benefits, including those associated with ecosystem restoration, can be problematic to assess on a broad scale. In effect, the location and shape of the marginal benefit curve in figure 1 may be impractical and too costly to accurately estimate. While this does not detract from the philosophical strength of the model, it suggests that measures of treatment effectiveness, such as acres changing condition class, may need to be introduced as surrogates for benefit data. This is another area where research in the social sciences has the potential to enhance the fuels treatment paradigm.

Social scientists are trained to reveal unintended side effects of new programs and initiatives. For example, federal standards required air-bags in automobiles with the intent of improving highway safety, but early data showed that fatality rates were unresponsive. Why? Because drivers increased their speed and took more risk knowing that their level of protection had improved.

Similarly, extensive fuels treatments in the wildland urban interface will have unintended social side effects. We are just learning about the unintended side effects of intensive treatments in the interface. For example, as we lower the risks of living in the interface, its desirability will increase. More homes will be built and people will build more expensive homes. The value of property to protect may increase partly as a result of treatment efforts. Just as there are still fatalities on the highway, there will still be homes that burn in the interface. This is the principle of moderation of treatment at work—like a pristine environment, a fail-safe highway is simply too expensive and so too is a fail-safe interface.

So this morning I offer a challenge. Can we combine information on treatment standards and technology with the social sciences to manage the problem in a socially desirable way—in a way that recognizes that we live in a world of scarce resources with diverse public opinions and dynamic social values? Only by integrating the ecology of treatments with the social sciences can we properly address the problems of fuels treatments in ways that will advance societal welfare. The papers that follow on the social sciences will explain the results of studies on cost analysis, social values of fire, recreation, big game, collaboration, community involvement, optimal treatment location, and more.

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Acknowledgments

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