The Blue Mountains Natural Resources Institute: Partnerships that Demonstrate the Role of Silviculture in Forest Management

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Abstract.—The research program of the Blue Mountains Natural Resources Institute (BMNRI) aims to understand the ecological effects of current management practices. In forest systems, this amounts to silvicultural research. We describe how the BMNRI fosters partnerships to carry out and showcase silvicultural research leading to information that allows assessment of economic/environmental tradeoffs. We also describe how partnerships are fostered not only to undertake research, but to encourage adaptive management. The BMNRI plays a unique role as a facilitator of relationships among managers, scientists, and the public, and has a structure ideal for demonstrating the role of silviculture in forest management.

INTRODUCTION

Although silviculuture has evolved into a multidisciplinary practice, to much of the public it still implies a focus on tree growth and timber production (O'Hara et al. 1994). While wildlife biologists have acknowledged the central role of silviculture in maintaining habitat (Thomas et al. 1979), reflecting the view that silviculture is the primary tool for objectives that require active management, many professionals in the Forest Service and elsewhere remain suspicious of a tree-focused agenda of silviculturists when it comes to making forest management decisions. The best way to change these perceptions is to demonstrate on the ground the role played by silviculture for implementation of a variety of management objectives. With an agenda to research the effect of management practices on ecological processes, the Blue Mountains Natural Resources Institute (BMNRI) is ideally poised to demonstrate this role.

The BMNRI was chartered in 1991 with a mission to "enhance the social and economic benefits derived from natural resources in the Blue Mountains in an ecologically sustainable manner." A small professional staff employed by the U.S.D.A. Forest Service is given advice by an approved Federal Advisory Committee, consisting of 24 members representing local, state, and federal government, academia, industry, environmental groups, and private citizens/ landowners. The BMNRI carries out its mission by brokering natural resources information through research, demonstration, and education. The staff relies heavily on its 80 partner organizations to accomplish its objectives—partners participate in planning or carrying out projects, circulating information, or conducting research. It is assumed that better scientific information has considerable value in dispelling myth and in providing a more solid foundation from which natural resources decisions are made. Issues that have information needs are first identified by the advisory committee and then are classified by the staff as needs that: 1) are a question of perceptions and/or values; 2) can be met by pulling together existing information; or 3) require new research. Value issues are best met by bringing people with opposing views together into forums, conferences, seminars, or workshops that illustrate the causes of people's perceptions. Information issues can in some cases be resolved by gathering information that already exists into syntheses or by simply making that information more available to the public and to land managers. If little or no information on a given issue can be obtained from the current literature, new research is fostered to fill the knowledge gap. This paper describes how partnerships are used to facilitate interaction among scientists and managers in undertaking operational research. The primary audience for BMNRI research is land managers, although the same information is made available to any interested group.

Once a knowledge gap is identified, research is planned that seeks information gathered in a management context, and that is integrated well enough to provide managers with the opportunity to explore tradeoffs. A strong technology transfer element completes the formula, because it is argued that for many contentious issues, managers require information in a more timely manner than is typical for most scientific publications. The BMNRI is currently involved in three main lines of research: relations between forest management and bird population viability, improved cattle distribution practices, and forest fuel reduction. We will illustrate the style and process of BMNRI research by focusing on how partnerships are fostered to facilitate research on fuel reduction. We hope to make it clear that not only is silvicultural expertise central to our fuel reduction research, but that the style the BMNRI uses to carry out the research is ideal for illustrating the role and value of silviculture.

THE FUEL REDUCTION ISSUE

Forest fuel reduction is currently a key objective for Forest Service managers in the inland West, primarily because fuel has increased due to 90 years of fire suppression (Everett 1993; Agee 1996). The concept is that if fuel of intermediate size classes (3-20 inches in diameter) can be reduced, the spread of wildfire and its intensity on any given site will also be reduced. Furthermore, because fuel levels are considered to be a problem for large areas of public land in the inland West (Gast et al. 1991; Quigley et al. 1997), fuel reduction needs to be accomplished at landscape scales, and this can realistically be done only with landscape prescribed fire (underburning) and by mechanical means (single-grip harvesters and their like). Although considerable research has focused on ecological effects of both of these practices (U.S.D.A. 1979; Kellogg et al. 1992; Monleon & Cromack 1996), and their relative costs are generally understood (Rich 1989; Kellogg et al. 1992),

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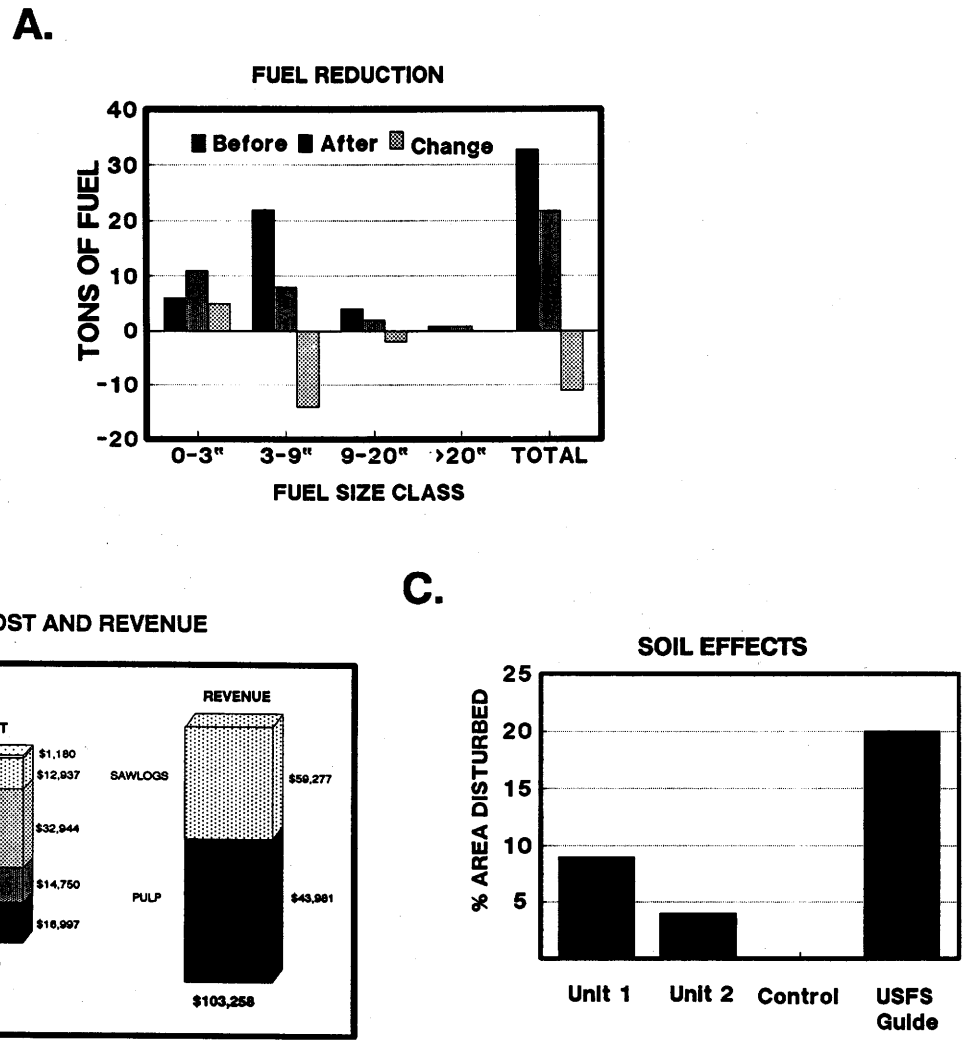

Figure 1.—Extent of fuel reduction, logging costs and revenue, and soil effects of the Deerhorn Harvest, July- August 1994.

few studies have measured both economics and environmental effects simultaneously under the same stand conditions. Only studies that are integrated in this way can provide information allowing assessment of economic/ environmental tradeoffs associated with either method, or that allows direct comparison of the two methods. The fuel reduction research program of the Blue Mountains Institute is designed to provide this kind of integrated information on comparative tradeoffs, such that managers will be able to better assess the relative benefits of alternative fuel reduction methods. In this essay, we will discuss a sequence of three fuel reduction projects that illustrate not only the style of integrated research used by the BMNRI, but the role of silviculture as well.

Integrated Research

The value of integrated research is well illustrated by the Deerhorn case study, which explored the economics and soil effects of implementing a fuel reduction prescription in a lodgepole pine stand growing on flat ground. Coordinated by the BMNRI, Deerhorn was a collaborative effort involving the La Grande Ranger District (prescription), Louisiana-Pacific (owners of the land), Eagle Trucking (yarding equipment), McClaren Logging Co., Oregon State University (operations and research), and the Forest Service PNW Station (fuel research). The prescription was designed to maintain overstory stand structure, significantly reduce fuel (down wood) in the 3-15 inch size classes, and still allow sufficient removal of material to keep the project economically feasible. A further constraint was that to adequately protect sensitive soils, a skyline yarder was used to retrieve material cut by a single-grip harvester. The flat ground at the Deerhorn site, coupled with the fuel reduction objective, placed considerable pressure on the silviculturist for a prescription that balanced all the needs. Undertaken over a 2-month period in summer 1994, the project resulted in significant fuel reduction in the 3-9 inch size class (Figure 1a), was economically viable (Figure 1b), and caused soil impacts well within the standards imposed by the Forest Service

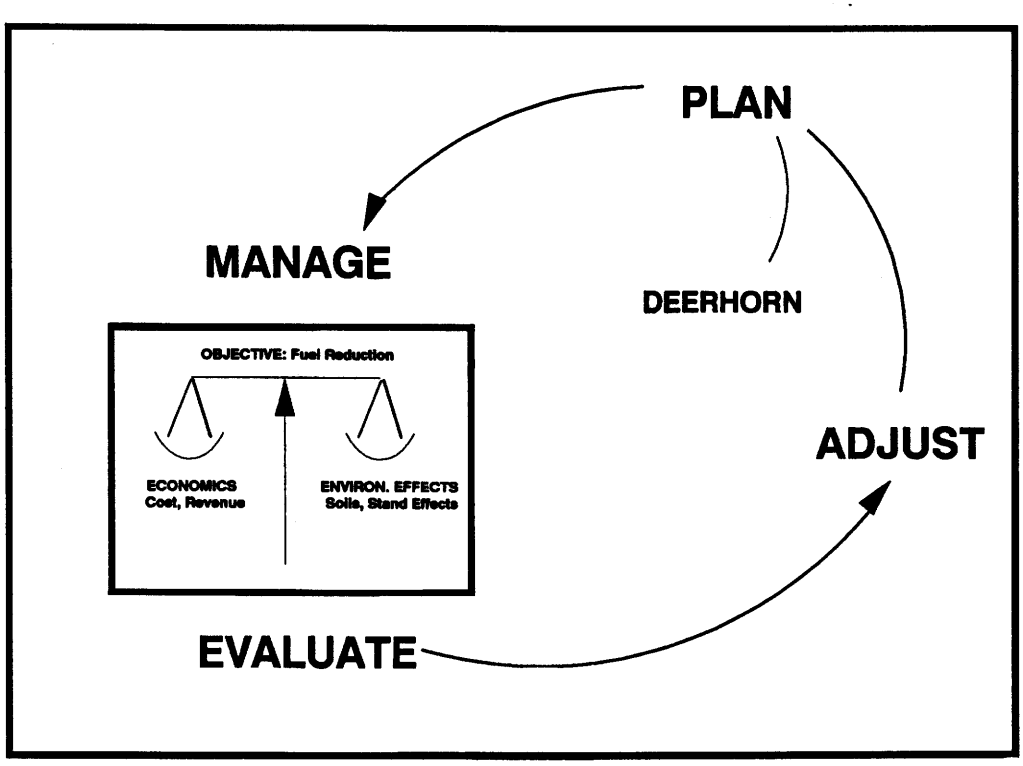

Figure 2.—Adaptive management cycle using an integrated management experiment as example of new information.

(Figure 1c) (McIver 1995). Results also indicated that fuel reduction of intermediate size classes may typically be associated with increases in the small diameter "flashy" fuel (< 3 inch) due to logging activity, thus increasing fire risk in the short term. Heavy soil impacts were all associated with gouging in the yarding corridors, due to inadequate log suspension during retrieval. Additional intermediate supports would be required to mitigate this type of damage. Finally, economic viability in this project was clearly associated with the percentage of the more valuable sawlog material removed, thus making the silvicultural prescription a critical link in the planning process (Brown & Kellogg 1996). This last point makes it clear that in order to implement a management objective that involves removal of low-value material, the role of the silviculturist is fundamental, especially under circumstances where both economics and environmental effects are of concern.

Adaptive Management

Results at the 50-acre Deerhorn site encouraged the La Grande Ranger District to move forward with plans to conduct fuel reduction at a larger scale. Deerhorn thus contributed to a cycle of adaptive management (Figure 2) in which lessons learned from one operation were used directly to plan the next operation. Because there is so much uncertainty surrounding the fuel reduction issue, and because many of the lands upon which fuel reduction is needed lie within municipal watersheds, information on how best to reduce fuels is at a premium. These are the kinds of circumstances within which adaptive management can best function. Decisions facing the La Grande Ranger District serve as a case in point. It has been estimated that in 1997 over 40,000 acres of the District required immediate treatment of low-value material to reduce the intensity and spread of wildfire. The highest-priority project turned out to be on Limber Jim ridge, a string of mixed-conifer/lodgepole pine stands on the divide between the Upper Grande Ronde River to the southwest and the Beaver Creek Drainage on the northeast, the latter being the principal watershed for the city of La Grande, Oregon. The idea was to create a "shaded fuel break," centered on the logging road that split the two watersheds, that could serve as an anchor point to station fire fighters in the event of a wildfire in the area. The fuel break would be about 7 miles long and 1000 ft. wide on either side of the road, with non-treated corridors in the draws to allow movement of forest-dependent wildlife. The challenge was to reduce fuel to less than half of the observed loadings by removing both standing and down dead wood, and to remove some of the smaller-diameter green trees to create growing space for the residual stand. Fuel reduction had to be accomplished economically, and without damaging the residual soils or stand, because the District wanted to demonstrate sensitive and feasible logging practices for fuel reduction on a larger scale.

Previous findings at Deerhorn and elsewhere had indicated that while the skyline retrieval system was ideal for protecting sensitive soils, it was expensive compared to more commonly used ground-based systems, especially on flat ground. Hence the BMNRI, working with the La Grande Ranger District, and a group of scientists at Oregon State University, the University of California, and the PNW Research Station, designed a fully replicated study to compare skyline retrieval of the low-value material at Limber Jim with an articulated, rubber-tired forwarder. The challenge for the silviculturist was to create a prescription that adequately balanced needs for wildlife and for fuel reduction, while providing enough sawlogs and pulp material to make the project economically feasible as a timber sale. Moreover, because stands differed substantially in species composition and structure, prescriptions had to be uniquely crafted to meet the fuel reduction objectives. The general guideline was that the only material removed would be down and standing dead material less than 15 inches in diameter, leaving at least 40 pieces per acre of residual down woody material.

Fuel reduction prescriptions were first implemented with a single-grip harvester in each of three stands at Limber Jim. Logs were cut to 16-foot lengths and stacked at regular intervals along corridors spaced 60 feet apart (the single-grip could reach 30 feet into the stand on either side of each corridor). Each unit was paired such that logs on one side were retrieved by skyline yarding, and on the other side by rubber-tired forwarding; efficiency (tons of logs retrieved per unit time) was compared for the two techniques. Fuel loads and soil bulk densities were measured both pre- and post-treatment; soil biota and residual stand damage were measured post-treatment. Although results are still preliminary, it is clear that fuel was reduced by between 50 and 80 percent, and forwarding appears to be the most economically feasible and environmentally attractive means to reduce fuel.

Although a primary objective of research at Limber Jim was to provide better information to managers on the efficacy of various logging systems for fuel reduction, it was equally important to demonstrate environmentally sensitive logging to the concerned public. Hence while operations and research were being carried out at Limber Jim, the BMNRI conducted several tours to demonstrate the efficacy of mechanical means to reduce excess fuel. Audiences included the general public; local, state, and national officials; environmental and industry groups; and land managers from the state agencies, BLM and the Forest Service. Additionally, a video illustrating the process of fuel reduction at Limber Jim, and the relationships among scientists, managers, and the public is currently being prepared.

The inclusion of a replicated scientific design within the Limber Jim project is one way in which adaptive management can be applied to accelerate learning. However, the kind of information needed to improve methods of fuel reduction is not only technical, but social as well. If the public is not confident of both the need for fuel reduction on federal lands, or the means to accomplish it, land managers will find it much more difficult explain and carry out their plans. Hence the BMNRI commissioned a study to survey the citizens of the Blue Mountains about fuel reduction needs and methods. Results indicated that of 560 citizens surveyed, most citizens felt that excess fuel needed to be treated, and the great majority were comfortable with the Forest Service using prescribed fire or thinning/removal to accomplish fuel reduction objectives (Shindler 1997).

Coordinated Silvicultural Research

The high degree of confidence expressed by the public for fuel reduction work motivated the BMNRI to acquire funds to carry out an ecological and economic comparison of prescribed fire and mechanical thinning/removal. The "Hungry Bob" project is designed to measure and illustrate how reduction of fuel by fire differs in quality and quantity from reduction by thinning and removal. The study will be carried out in ponderosa pine-dominated dry forest, where managers could conceivably use either method in any given situation. The project will require close interaction among several partners, including the Wallowa Valley Ranger District (which manages the site), scientists at Oregon State University and the PNW Station (labs in Corvallis, La Grande, and Seattle), and the contractor who buys the timber sale. At Hungry Bob, the challenge for the silviculturist will be to develop prescriptions for the thinning units that result in approximately the same levels of fuel as units that are underburned. This requires a close working relationship between the project silviculturist and the fire specialist. Measured variables include fuel levels, economics, soil effects (biology, chemistry, physics), and residual stand damage.

As for previous fuel reduction studies, the BMNRI will coordinate research, and serve as the liaison between research, management, and the public. Coordination of the players involved requires a substantial commitment of time and energy. Although coordination involves several activities conducted at key stages during the planning, undertaking, and reporting of a project (Table 1), the most important activities are raising funds to measure variables, and serving as the liaison between science and management. By taking over these two roles, the BMNRI can attract scientists to large-scale operational studies, which require substantial interaction with management and significant funding. By definition, research conducted within a management context will almost always generate information more useful to the manager, and thus the BMNRI plays an important role in applied silviculture research and adaptive management.

The approach described in this essay, in which relationships between managers, scientists, and the public are improved and tightened, is used for each project fostered by the BMNRI. Whenever managers and/or the public are allowed to identify and prioritize knowledge gaps themselves, and whenever scientists are encouraged to apply their expertise within a management context, the result will generally be that more useful information will be generated. Adaptive management in its more rigorous form can then become a reality, with its quicker turnaround of more reliable information.

Table 1.—Principal functions of BMNRI in coordinating integrated silvicultural research

FUNCTION	PLAYERS INVOLVED
Recognize information need	Managers, Partners, Public
Determine treatments/variables	Managers, Scientists, Public
Establish QA/QC measures	Scientists
Obtain funding to measure response variables	Scientists
Incorporate experimental design within timber sale contract	Managers
Liaison between managers and scientists	Managers, Scientists
Liaison between contractor and scientists	Contractor, Managers, Scientists
Oversee technology transfer, public relations	Management, Scientists, Public
Organize tours	Managers, Scientists, Partners, Public

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