Chapter 6—Beetles among us: Social and economic impacts of the MPB epidemic

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Introduction

Healthy forest ecosystems provide many goods and services that are vital to human well-being. When forest ecosystems are impacted by disturbances, such as the widespread mountain pine beetle (MPB) epidemic, the services provided by these ecosystems are also affected. Likewise, management in response to large-scale forest disturbances impacts both the natural and human environment. These management actions are costly in terms of the amount of taxpayer dollars required to carry them out and in terms of their opportunity costs, especially in areas lacking economically-viable uses of beetle-killed timber. In the budget-constrained environment of land management agencies, more money spent dealing with dead and dying trees often means less money spent on services like building trails, improving wildlife habitats, and ecological restoration.

To date, management responses to the MPB epidemic have focused on public safety, with hazardous tree removal around public campsites, roads, and infrastructure given high priority. However, the MPB epidemic has numerous social and economic impacts beyond human safety. For example, the MPB epidemic affects consumptive uses of the forest, such as timber and biomass production, as well as non-consumptive uses, such as tourism and recreation. The MPB epidemic can also impact other services that the forest provides to humans, such as water quality or quantity and soil stability. Property values can also be impacted by increased risk of wildfires and/or the loss of scenic beauty.

The widespread nature of the MPB epidemic—affecting large portions of Colorado, Idaho, Montana, and Wyoming—exacerbates social and economic costs since both more area and more people are affected. For example, the MPB attack might have decimated favorite nearby recreation sites as well as farther-flung recreation areas, leaving people without alternatives. The extent of the epidemic makes it impossible to mitigate all hazards everywhere. Land management agencies must use a triage approach to prioritize hazardous tree removal and fuel treatments.

The social and economic impacts of the MPB epidemic are many, but research on this topic is limited. Such research is necessary to understand the tradeoffs associated with management options and to help land managers allocate limited budgets to address public concerns. Additionally, insight into the benefits and costs provided by various management options can be communicated to

stakeholders to enhance the public understanding and support of the unavoidable tradeoffs that must be made.

Research highlighted in this webinar focused on areas where research is available concerning the social and economic effects of the MPB epidemic. These efforts focused on (1) opportunities and challenges for utilizing beetle-killed trees for woody biomass, (2) impacts of pests on non-market values, and (3) public perceptions of forest management following the MPB epidemic. Land managers from Bitterroot National Forest in Montana and the Arapaho-Roosevelt National Forest in Colorado also provided thoughts and insights about socio-economic impacts of the MPB.

Research findings

Research finding #1: The availability of forest industry infrastructure greatly affects the cost of tree removal and, therefore, the amount of mitigation and hazard removal that can be accomplished.

Management Implications

- The feasibility of selling woody material to offset treatment costs depends on hauling distances, transportation costs, market prices, and prices of alternatives (*e.g.*, natural gas).

Forest-industry infrastructure is crucial for dealing with the MPB epidemic. States with robust forest-products infrastructure, such as Montana, can finance

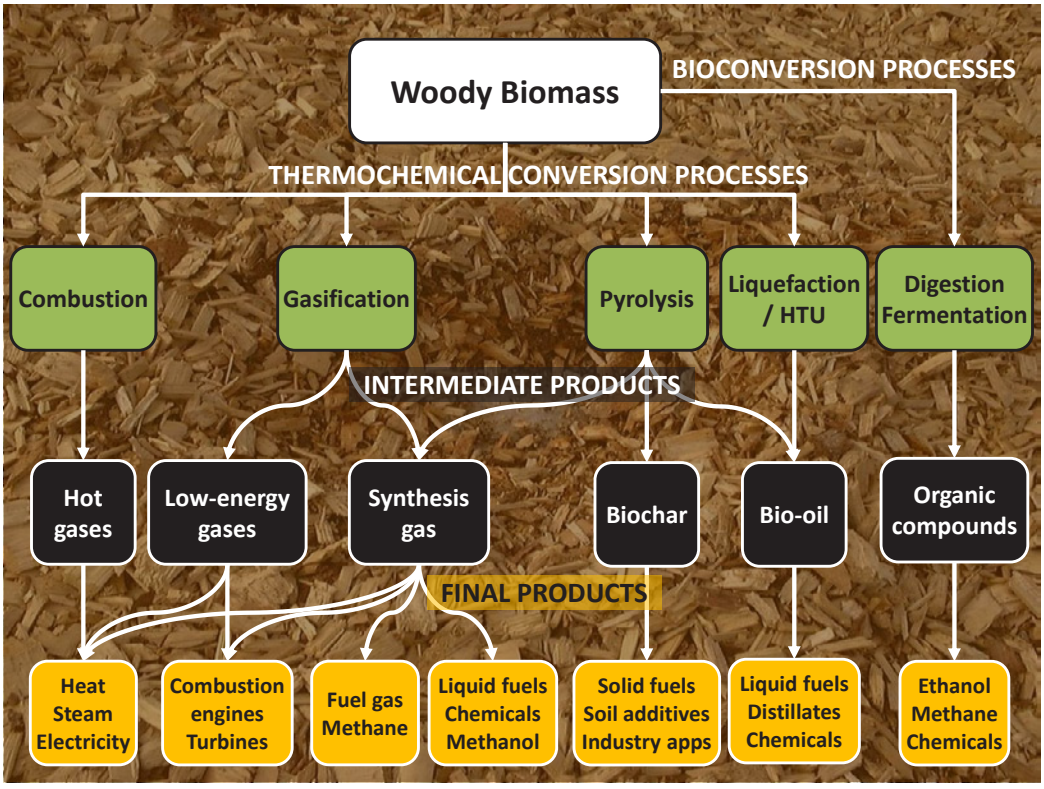

Figure 6.1. Several technological approaches are available for converting biomass into different forms of bioenergy (adapted from McKendry 2002).

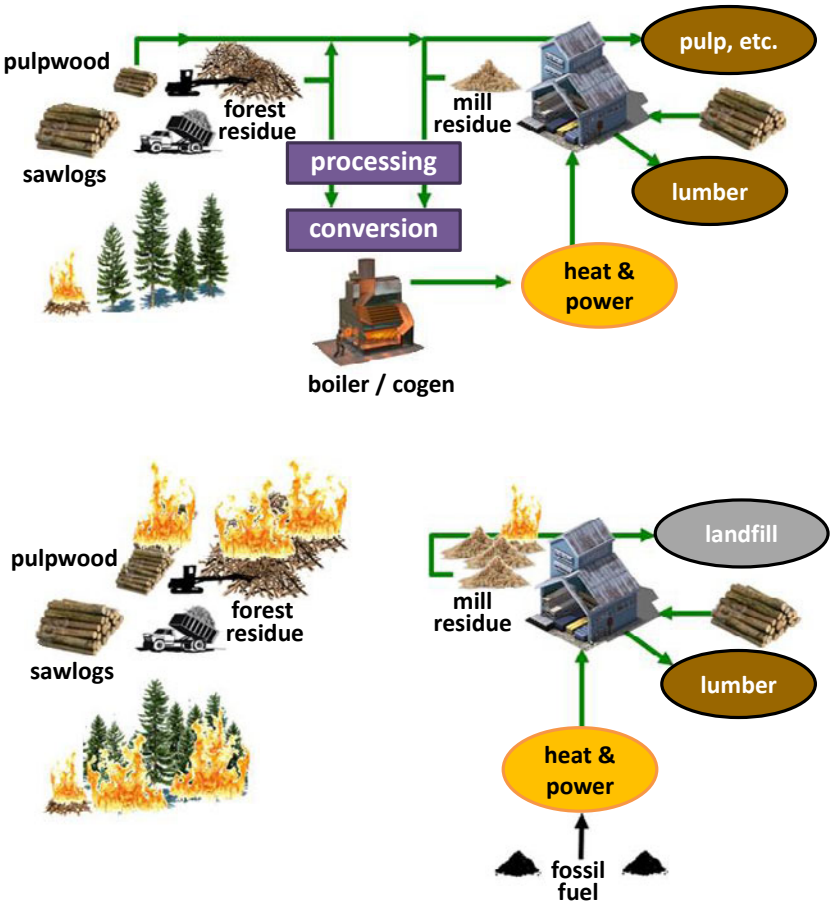

Figure 6.2. Fully integrated wood processing infrastructure (top) enhances the ability of industry to utilize timber and biomass removed from forests. In contrast, the absence of an integrated wood processing infrastructure (bottom) leaves management agencies with fewer or no options for offsetting treatment costs. Woody material is often left on-site or piled and burned (figure by Nate Anderson, USDA Forest Service).

at least some of their management costs by selling some or all of the material. Various technologies for converting biomass into energy are available (Fig. 6.1), but there are significant challenges involved. When a fully-integrated wood processing infrastructure exists, the ability to utilize the timber and biomass removed as a result of treatments is greatly enhanced. In places where such infrastructure is sparser, like in Colorado, the material is often piled and burned in the woods, offsetting none of the costs of treatment (Fig. 6.2).

Additional and new types of wood-processing infrastructure are needed in many areas of the country. However, there are significant challenges to developing the capacity of private industries to utilize woody biomass. Uncertainty in feedstock availability over time can reduce the willingness of investors to develop new facilities or update old facilities. The removal and use of woody biomass is economically infeasible in many areas due to high transportation costs to haul timber or biomass from infested forests to far-away mills. Transportation costs increase with the distance that material must be hauled to the processing facility (Jones and others 2013).

The economic feasibility of selling the material also depends on the price that the material receives on the market. Market prices for material and the price of diesel fuel are volatile factors that make the economics of biomass removal uncertain over time (Fig. 6.3). Prices that people are willing to pay for woody material is highly influenced by the end use of the material (lumber, posts poles, fuel) and the price of alternatives. For example, the price of natural gas and other conventional

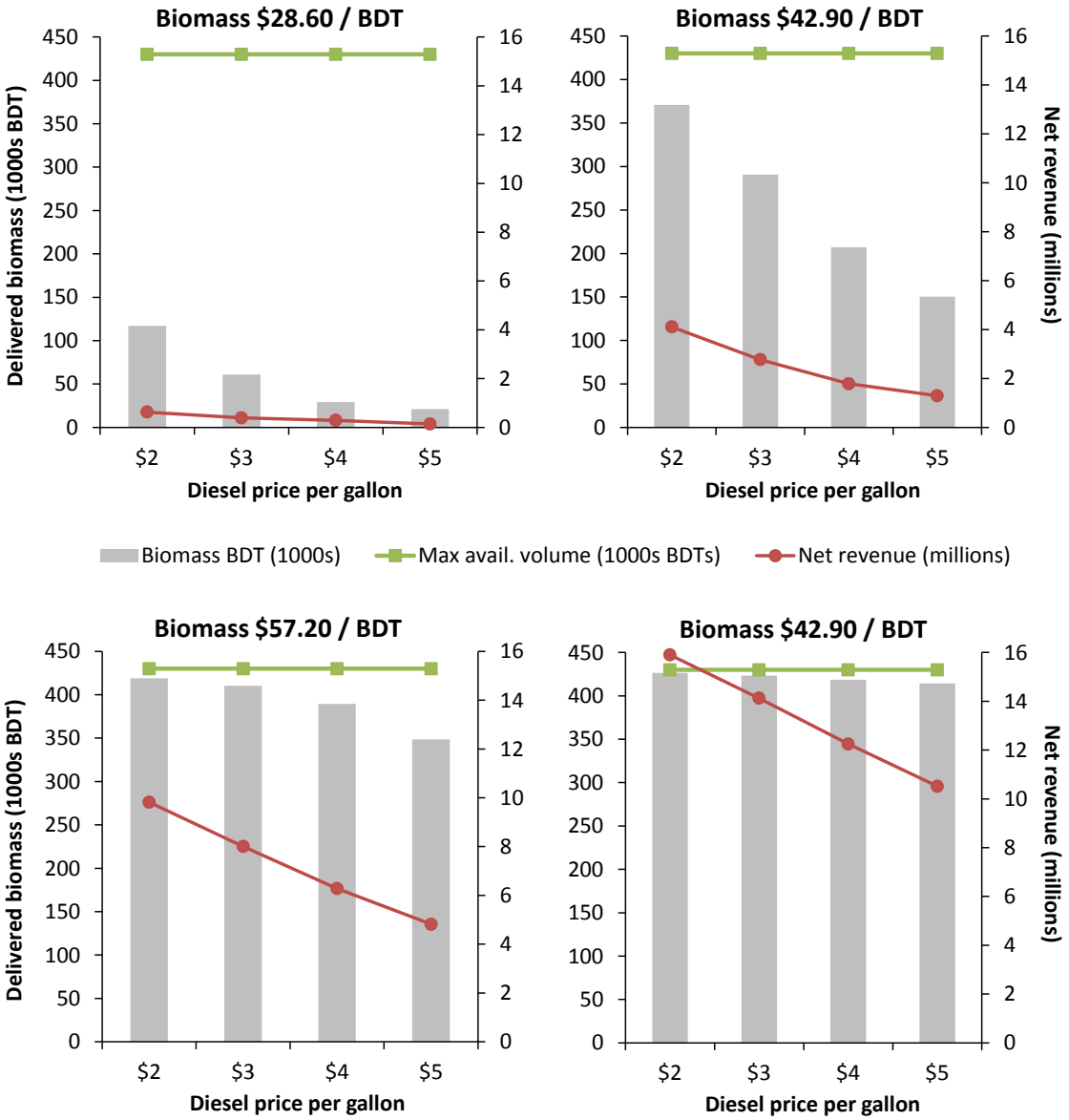

Figure 6.3. The amount of biomass (BDT = bone dry ton) that is economically feasible to deliver depends on biomass prices and diesel fuel costs (modified from Jones and others 2013).

fuel types will influence the purchase price for biomass: the lower the cost of natural gas, the lower the price purchasers are willing to pay for biomass.

Research finding #2: Forest biomass use can replace fossil fuels and reduce emissions relative to piling and burning.

Management Implications

- Piling and burning biomass emits large quantities of carbon dioxide and particulate matter without offsetting the use of fossil fuel.
- Where infrastructure is available, utilizing biomass for thermal energy can reduce greenhouse gas and particulate matter emissions and offset fossil fuel use.

Scientists at the Rocky Mountain Research Station compared emissions from (1) piling and burning forest residues onsite vs. burning natural gas for energy,

(2) piling and burning forest residues onsite vs. burning #2 distillate oil for energy, and (3) burning forests residues in a boiler for thermal energy (Jones and others 2010a,b). They found that burning forest residues (including trees killed by the MPB that can no longer be used as saw timber) in a boiler emitted levels of carbon dioxide similar to piling and burning woody material. However, total emissions are lower for burning biomass in a boiler for thermal heat because it replaces the need to burn fossil fuels (Fig. 6.4). In addition, burning biomass in a boiler emits far less particulate matter (Fig. 6.5) and methane than piling and burning biomass. Emissions were lower for biomass utilization even after accounting for transportation of the material by truck.

These results show that the utilization of biomass (including that produced from beetle-killed trees) can produce several benefits, including meeting energy needs and reducing greenhouse gas and particulate matter emissions. This may be particularly advantageous in areas where air quality standards restrict burning.

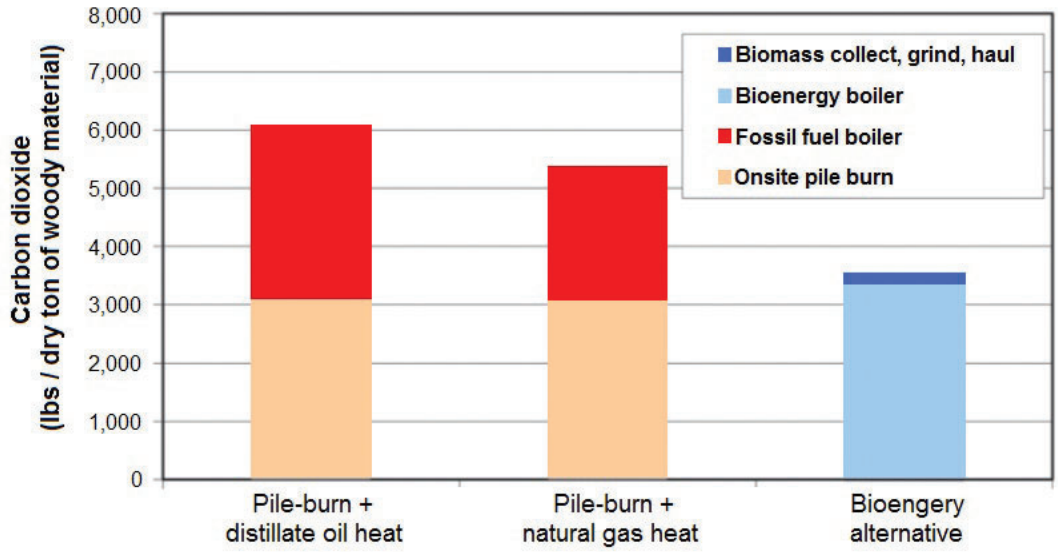

Figure 6.4. Burning biomass in a boiler or in piles emits similar levels of carbon dioxide (lbs CO2 / dry ton of woody material). However, total emissions are lower for burning biomass in a boiler for thermal heat because it replaces the need to burn fossil fuels (Jones and others 2010a,b).

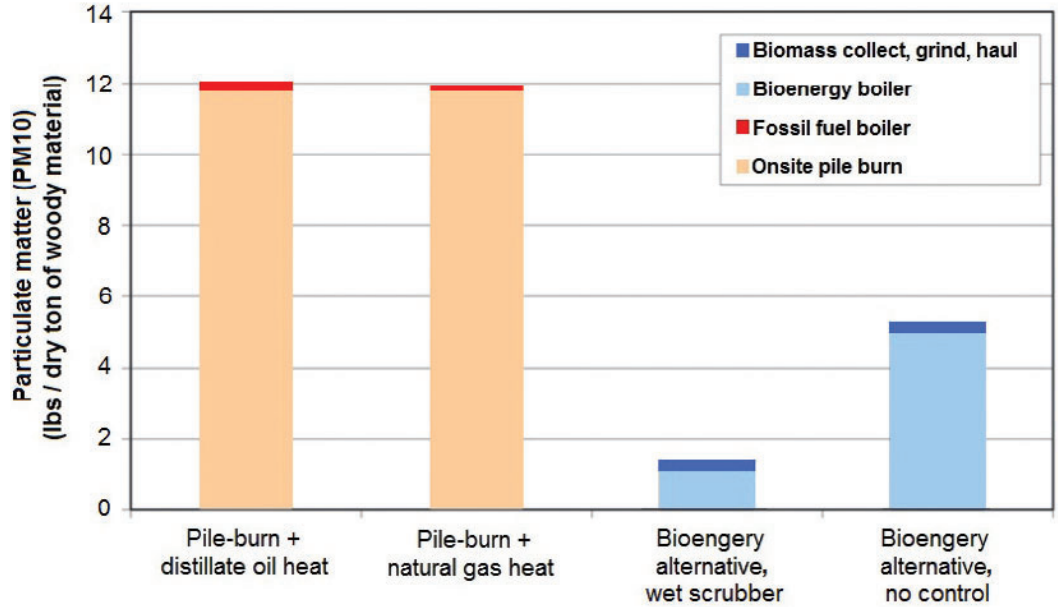

Figure 6.5. Burning biomass in a boiler emits far less particulate matter (lbs of PM10 [particulates <10 microns in diameter] / dry ton of woody material) than piling and burning biomass. This is true with or without wet scrubbers to remove particulates (Jones and others 2010a,b).

Research finding #3: The MPB epidemic has substantial impacts on both nonmarket and market values.

Economists evaluate the worth of market values based on prices set through supply and demand. Real estate, timber products, and forestry equipment are examples of market values. Non-market values are different from market values because they do not have price tags. Since there is no market for these values, it is harder to quantify their economic worth. Examples include scenic beauty, some recreation opportunities, and biodiversity. Very few researchers have evaluated the impact of the MPB on nonmarket values.

A review paper found 22 studies related to nonmarket valuation and forest insect pests, but only 8 of these studies measured the nonmarket values associated with MPB outbreaks (Rosenberger and others 2012). Seven of these studies were done in the Intermountain West and one was from the Northwest, and all but one were published from 1975 to 1991. The types of values estimated included effects on property values, recreation, and total economic value. All of these studies indicated there are substantial economic losses associated with MPB outbreaks.

Losses in recreation benefits were estimated to be approximately $2 million per year (in today's dollars) on the Targhee National Forest following a MPB outbreak (Michalson 1975). A study assessing the effect of beetle-killed trees on home prices in Colorado found that sale prices were decreased by $648 for every dead tree within 330 feet of a house. The average sale price was $276,000 and the average number of dead trees was four (Price and others 2010).

Impacts of MPB outbreaks on nonmarket values are an important social and economic issue. More research is needed to provide adequate information about the tradeoffs associated with management of MPB epidemics. Available research clearly demonstrates that the benefits forests provide to people are diminished by MPB outbreaks. These losses are not adequately captured by analyses of traditional economic markets.

Research finding #4: Citizens in northern Colorado and southern Wyoming generally favor the use of beetle-killed trees for wood products, but many are skeptical that forest managers are doing enough in response to the MPB epidemic.

Management Implications

- Public support for hazardous tree removal is high (in the region studied).
- Communicating management challenges and feasibility issues to the public is important for developing mutual respect.
- Closing roads and posting signs will not discourage some citizens from recreating in areas with hazardous trees. Some people are willing to accept a greater degree of risk.

Researchers at Colorado State University and their collaborators surveyed households in northern Colorado and southern Wyoming from 2011-2012 about their perceptions of the MPB epidemic (Czaja and others 2012). About 740 individuals

responded to the survey, representing a broad cross section of citizens in the region.

The majority of respondents (92 percent) agreed that land managers should use trees killed by the MPB for wood products and biomass. About three-fourths of respondents disagreed that beetle-killed trees should be left in the forest. A majority of respondents (96 percent) agreed that people who recreate in forests should accept some of the risk associated with falling trees, but about three-fourths of respondents agreed that some activities should be restricted or made inaccessible.

Several questions addressed the trust that respondents had in actions taken by land management agencies. Only 59 percent of respondents agreed that forest managers are doing everything they should in response to the MPB epidemic. In contrast, greater trust was put in the knowledge and skills of managers about prescribed burns and wildfires. A majority of respondents (82 percent) agreed that forest managers know how to effectively conduct prescribed fires, and 87 percent agreed that forest managers know how to respond to naturally-caused wildfires. A lower number of respondents (61 percent) agreed that forest mangers know how to effectively manage smoke resulting from prescribed fires. An important caveat is that these responses were collected prior to a fatal and destructive prescribed burn that escaped control lines in northern Colorado. This study indicates that the citizens are not convinced that managers have a well-defined strategic plan for responding to the epidemic. Greater dialogue between managers and the public might increase agency awareness of ecological, social, and economic implications of post-epidemic management options while also increasing stakeholder support for agency decisions.

Manager perspectives

The public is concerned about the impact of the MPB on recreational opportunities and aesthetics.

Management Implications

- Managers should be proactive when facing increased risk of disturbance events. Reducing hazards associated with MPB outbreaks or wildfire can maintain aesthetic beauty and protect infrastructure better than post-disturbance mitigation projects.
- Communication among managers can improve decision making by sharing lessons learned from previous disturbances.
- Managers and the public should discuss inevitable tradeoffs posed by the epidemic and develop a triage strategy for hazardous tree removal. This might increase public trust that land management agencies are adequately responding to the MPB epidemic.

The personnel from the Bitterroot National Forest and Arapaho-Roosevelt National Forest shared their thoughts on the social and economic impacts of the MPB epidemic, which are summarized here.

Forest Service units within the footprint of the MPB epidemic have to balance concerns for human safety with the demands for beautiful and accessible

recreation facilities. Experiences with the epidemic on the Helena National Forest prepared managers of the Bitterroot National Forest for what was coming, allowing them to be proactive rather than reactive. As such, the managers of the Bitterroot National Forest were able to remove hazardous trees and promote scenic beauty at a popular campground before the MPB epidemic. Residual trees at the campground survived the MPB outbreak, and as a result there was little concern about the safety of campers after the outbreak (Fig. 6.6).

However, a proactive approach is not always possible or wise. For example, managers on the Arapaho-Roosevelt National Forest thinned trees around popular campgrounds, but they had to return several times as more trees succumbed to MPB infestations. Re-entry carries additional costs to land management agencies. Continual thinning of trees can lead to a lack of privacy and shade in campgrounds (Fig. 6.7), causing some people to go elsewhere or participate in different types of recreational activities.

The public is often quite familiar with wildfire and prescribed fire and generally trusts that the agency knows how to handle these activities (Czaja and others 2012). They have less trust regarding agency response to the MPB epidemic, making communication and education particularly important. Managers, stakeholders, and the public should frequently communicate about the future of post-epidemic forests. There needs to be better public involvement in discussions about likely impacts of management decisions, priority setting, and inevitable tradeoffs posed by the MPB epidemic. Clearly articulated goals can guide post-epidemic salvage operations and balance the ecological, social, and economic tradeoffs of management decisions.

Remaining Questions & Knowledge Gaps

- As the need for hazardous tree removal declines, is there an adequate supply of federal timber to support new and existing forest products infrastructure? Are unrealistic expectations being created about the feasibility of wood products industries?
- What opportunity costs are associated with management responses to the MPB epidemic (*e.g.*, using money from other programs and/or reduced capacity to undertake other management activities)? What effect will this have on future forests and the benefits they provide to people?
- To what degree are concerns about safety and/or diminishing aesthetic values changing forest visitation and use patterns? What effects will this have on forest recreation programs, budgets, etc.?
- What will campgrounds impacted by the MPB epidemic look like 5 years from now? 10 years from now? Is there a need for artificial structures to provide shade and screening?

Figure 6.6. Managers on the Bitterroot National Forest removed hazardous fuels and were able to protect residual trees and aesthetic beauty at a favorite campground during the MPB epidemic. The same picnic table is highlighted in both images (photos by Erica Strayer, USDA Forest Service).

Figure 6.7. Managers on the Arapaho-Roosevelt National Forest removed hazardous trees several times during the MPB epidemic, compromising privacy, shade, and aesthetic beauty at a popular campground. The same facility is highlighted in the two post-treatment images (photo by Erica Strayer, USDA Forest Service).

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