Chapter 1—Overview of the Future Forest Webinar Series

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Background of the Future Forest Webinar Series Proceedings

The Future Forest Webinar Series was created to facilitate dialogue between scientists and managers about the challenges and opportunities created by the mountain pine beetle[1] (MPB) epidemic. A core team of scientists and managers from the USFS Rocky Mountain Research Station and the Northern and Rocky Mountain Regions worked together to develop the format and content of the series and written proceedings. The core team facilitated six webinars (from October 2011 to December 2012) covering the ecological and social dimensions of the MPB epidemic. Webinar recordings are available online through the Rocky Mountain Research Station (http://www.fs.fed.us/rmrs/presentations/).

These written proceedings represent a synthesis of material presented during the webinar series. Many webinar participants indicated that written proceedings would add value to the series by providing a reference document and resource for informing future management decisions. Each chapter was authored by webinar presenters and members of the webinar core team, and the entire document was reviewed by independent experts from the Rocky Mountain Region of the Forest Service, Colorado Forest Restoration Institute, and University of Wyoming. The purpose of the proceedings is to relate information shared during the webinar series rather than to summarize all available research on implications of the MPB epidemic. These proceedings represent a snapshot of relevant scientific and management concerns related to this epidemic. In the coming decades, additional research and lessons learned by managers will continue to deepen and broaden our understanding of the future of post-epidemic forests.

Goals of the Future Forest Webinar Series

The concept for the Future Forest Webinar Series grew out of the work of the Rocky Mountain Research Station, Colorado Forest Restoration Institute, and other partners in 2009 and 2010. The goal was to assess the general information needs of managers regarding the MPB epidemic[2] (Colorado Forest Restoration Institute 2010). At that point in time, the MPB epidemic was already well underway throughout the Intermountain West. Scientists and managers recognized that relatively little could be done to stem the beetles' progression, but there was still a clear and pressing need to understand implications of this disturbance for post-epidemic forests. RMRS research scientists and others had been conducting research on the ecological and social consequences of the extensive tree

[1] *See appendix A for scientific names of insect, plant, animal, and fungi species referenced in this document.*

[2] *The term epidemic refers to the continental-scale MPB event, and the terms infestation or outbreak refer to local-scale events.*

Table 1.1. The Future Forest Webinar Series consisted of six webinars spearheaded by a member of the webinar core team, a group of researchers and managers from the Rocky Mountain Research Station (RMRS) and Northern and Rocky Mountain Regions of the Forest Service tasked with designing the webinar series.

Webinar date	Title	Core team lead
October 18, 2011	Post-epidemic fire risk and behavior	Kevin Ryan (RMRS, Fire, Fuel and Smoke Program Area)
January 10, 2012	Forests in transition: Post-epidemic vegetation conditions	Mike Battaglia (RMRS, Forest and Woodland Ecosystems Program Area)
March 6, 2012	Ecological consequences of the mountain pine beetle epidemic for wildlife habitats and populations	Vicki Saab (RMRS, Wildlife and Terrestrial Ecosystems Program Area)
August 28, 2012	Beetles among us: Social and economic impacts of the mountain pine beetle epidemic	Megan Matonis and Jan Engert (RMRS, Science Application & Integration)
October 30, 2012	Small bugs with large-scale impacts: Ecosystem and watershed-level responses to the mountain pine beetle epidemic	Rob Hubbard (RMRS, Air, Water and Aquatic Environments Program Area)
December 11, 2012	Moving forward: Responding to and mitigating effects of the mountain pine beetle epidemic	Claudia Regan (USFS Rocky Mountain Region) and Barry Bollenbacher (USFS Northern Region)

mortality, and managers were eager for preliminary findings and peer-reviewed results.

The Rocky Mountain Research Station convened a group of scientists and managers from the Northern and Rocky Mountain Regions of the Forest Service to develop a webinar series about the MPB epidemic. An overarching goal of the webinar series was to bring research scientists and resource managers together to exchange information about post-epidemic forests.

The series consisted of six webinars from October 2011 through December 2012 (Table 1.1) with presentations by well-known managers and scientists from the USFS Rocky Mountain Region, Northern Region, Southwestern Region, and Rocky Mountain Research Station. Partners from Colorado State University and the University of Wyoming, who have first-hand experience in beetle-killed forests, were also included. The webinar series served as an avenue for informing managers of peer-reviewed research, and an opportunity for dialogue between scientists and managers about applications of the scientific information. It also allowed scientists to share research information with managers in the interim between data collection and publication, and created the opportunity for managers to influence future research questions and approaches.

Context of the MPB epidemic

The current MPB epidemic began in 1996, and as of 2012 had affected approximately 23 million acres of forestland across the western United States, severely impacting forests in Colorado, Wyoming, South Dakota, Montana, Idaho, and beyond (USDA Forest Service 2013). The MPB primarily attacks lodgepole pine, but also affects ponderosa, whitebark, Scots, and limber pine, and occasionally foxtail, bristlecone and pinyon pines. The MPB is native to the forests of western North America, and many smaller (endemic) outbreaks have occurred in the

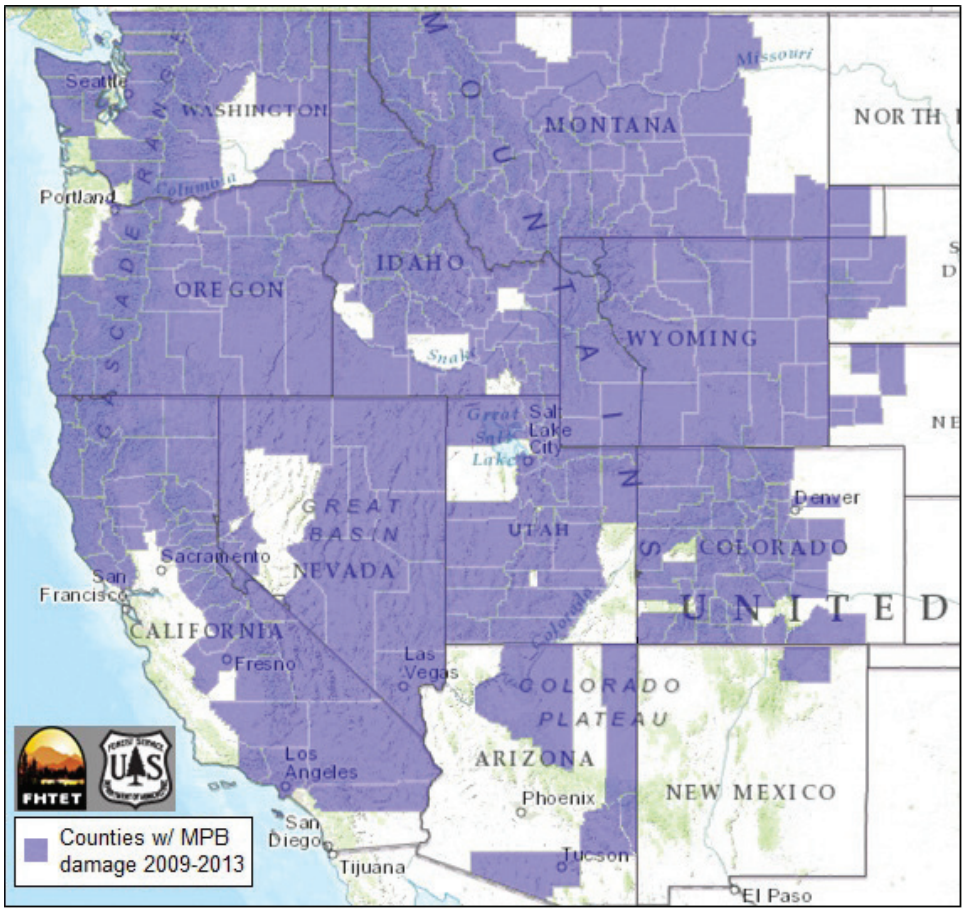

Figure 1.1. Counties reporting MPB activity from 2009 to 2013 (USDA Forest Service, Forest Health Technology Enterprise Team).

past. However, the scale of the current epidemic is historically unprecedented (Fig. 1.1). There is no clear consensus on exactly why the recent epidmic has grown to such an epidemic scale, but it is hypothesized that contributing factors include: (1) a severe drought in the mid-1990s to early 2000s that stressed forests, leading to increased vulnerability (Bentz and others 2010); (2) warmer temperatures, especially in November and April, that decreased beetle mortality and increased MPB populations (Bentz and others 2010); and (3) previous management practices, including a history of fire suppression, which led to large swaths of dense forests (Fettig and others 2007).

The MPB typically has a one-year developmental life cycle at lower elevations and a two-year life cycle at higher and colder elevations. However, milder winter temperatures at higher elevation attributed to a shortened one-year life cycle for beetles during the current epidemic. This phenomenon has led to faster population growth rates and contributed to the rapid expansion of the epidemic, especially between 2004 and 2008 (**Chapter 5**).

The primary mode of tree death is not directly through the burrowing activity of the MPB, but rather via the introduction of a blue-stain fungus that it carries (**Chapter 7)**. The MPB burrows into the inner bark of trees, laying its eggs and carrying the fungal spores directly into the tree. The fungus then grows and blocks the xylem cells, eliminating the tree's ability to transport water. A healthy tree may be able to resist a MPB attack by releasing large quantities of resin to push burrowing beetles out of the bark. A clear sign of a tree undergoing attack

Figure 1.2. Pine trees produce large quantities of resin and terpenes as their natural defense against MPBs. Trees can occasionally survive a MPB attack by pitching the bugs in their galleries or pushing them out entry holes in the bark (photo courtesy of the National Park Service).

is the appearance of "pitch tubes," or small popcorn-like areas of sap, on the trunk of a tree (Fig. 1.2).

If trees are drought-stressed and/or MPB populations are particularly large, a tree's typical defense mechanisms may be insufficient to resist infestation. Within days of being infested, transpiration halts and affected trees begin to die (**Chapter 4**). Foliar moisture content immediately decreases, leading to increased needle flammability (**Chapter 3**), but the tree typically does not show visible signs of mortality (*i.e.*, green needles turning red) until several months to

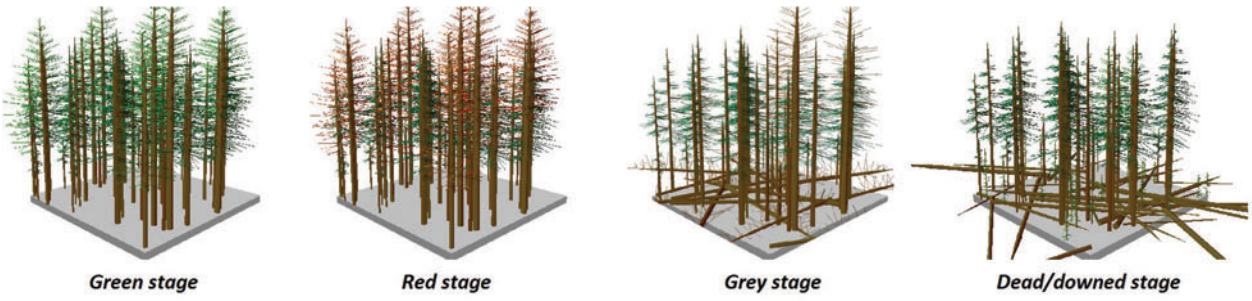

Figure 1.3. Trees succumbing to MPB attack go through four stages that have different physical characteristics and implications for fire hazards, wildlife habitat, and human safety. (1) Dying trees with green needles are in the "green stage"; (2) dead trees with dry, red needles are in the "red stage"; (3) standing snags that have lost their needles are in the "gray stage"; and (4) snags that have fallen to the ground are in the "dead and downed stage" (adapted from Schoennagel and others 2012).

about a year later. Within several years after this “red phase,” the tree will drop all its needles and enter the needleless “gray phase.” These dead snags will fall to the ground over the course of years to decades (Fig. 1.3).

The epidemic has slowed in recent years. According to the Forest Health Protection unit of the USFS, the MPB epidemic only affected an additional 2.4 million acres across the western U.S. in 2012. This is down from 3.8 million acres in 2011 and 8.8 million acres in 2009 (USDA Forest Service 2013). Decreased levels of infestation suggest that the MPBs are running out of new pine forests to infect.

Management challenges introduced by the MPB

Resource specialists and managers are struggling with challenges presented by the extensive tree mortality caused by the MBP. Conversations have turned to moving forward and managing for future forest conditions. Resource managers are especially concerned with:

- identifying issues of concern that may affect public safety or hamper agency response to safety concerns;
- developing management approaches that will develop a more resilient forest; and
- providing for the sustainability of wildlife and fish habitat.

Post-epidemic forests have different fuel loads and fire hazards than unaffected forests. This increases concern for the safety of firefighters, water supply facilities, interstate electricity transmission lines, and communities at the wildland-urban interface (WUI). Falling of beetle-killed trees presents a hazard to natural resource managers, recreation visitors, permittees, and contractors. Wildlife populations have also been affected by the MPB epidemic. Post-forest conditions have improved habitats for some species, such as woodpeckers, but reduced habitat suitability for others.

Managers are addressing these changes by reducing fuel loads and removing hazardous trees in some locations. They are also exploring methods to increase forest resilience. Managers and the public alike are aiming for adequate forests regeneration. The nature of management responses is influenced by timing of disturbance events, risk management objectives, organizational inertia, and pre-existing management goals across the landscape. A suite of management options are possible in areas where managers anticipated MPB-related issues (Fettig and others 2014). Research can help managers understand social and ecological consequences of the MPB epidemic and inform management activities in post-epidemic forests.

Outcomes of the webinar series

The webinar series was widely attended and well received by managers and researchers alike. Participation ranged from 70 to over 180 people, with the entire series reaching about 500. Roughly half of the webinar attendees were affiliated

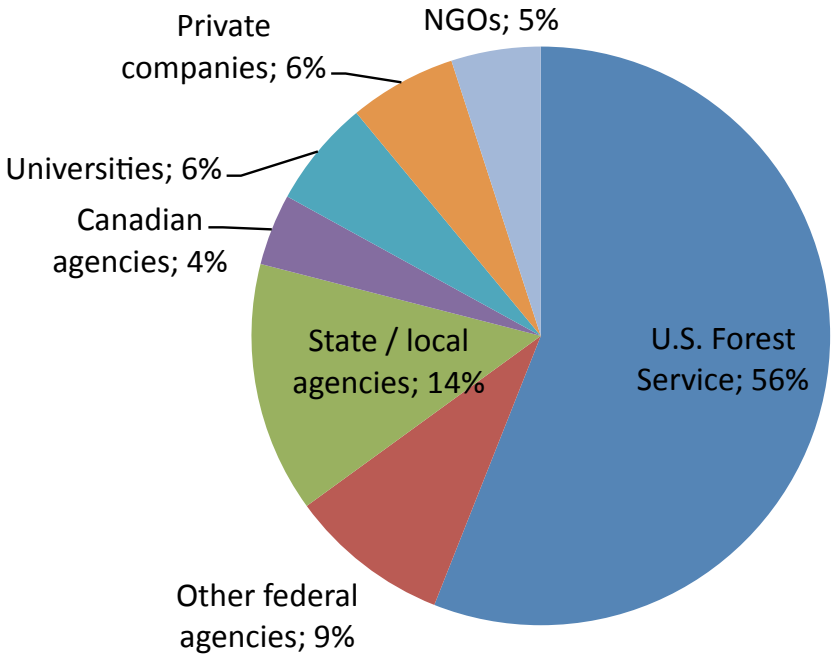

Figure 1.4. The Future Forest Webinar Series was attended by 500 different individuals representing a variety of governmental agencies, universities, non-governmental organizations, and private companies.

with the Forest Service, and about a quarter worked for other federal, state, and local agencies. The remaining participants represented 15 different universities, 25 private companies, and 14 non-government organizations (Fig. 1.4).

The core team solicited feedback from webinar attendees by distributing a survey at the end of the series. About 40 participants submitted responses, most of which were positive about the format and outcomes of the series. About 90 percent of respondents agreed or strongly agreed that the Future Forest Webinar Series was a useful forum for discussing research findings and management implications. In addition, over three-fourths of respondents agreed or strongly agreed that information from the series has better prepared them for future management decisions regarding the MPB epidemic. Respondents were generally satisfied with the level of detail provided by researchers and the amount of time allocated to questions and discussions.

Over half of the respondents thought that the series should have included more "take home" messages from researchers and on-the-ground observation from managers. To address this, **Chapter 2** summarizes the entire webinar with an emphasis on management, and the chapters that follow pair research findings with management implications wherever possible.

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Meet the chapter authors

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