Chapter 8—Moving forward: Responding to and mitigating effects of the MPB epidemic

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Introduction

The final webinar in the Future Forest Webinar Series provided an example of how managers utilized available science to address questions about post-epidemic forest conditions. Assessments of current conditions and projected trends, and how these compare with historical patterns, provide important information for land management planning. Large-scale disturbance events, such as the MPB epidemic, can change future vegetation conditions, disturbances and disturbance interactions, and habitat for wildlife species. This case study from the Beaverhead-Deerlodge National Forest illustrates the value of rapid assessments for conservation planning, and it provides a template for future science-management collaboration.

Lessons learned

Lesson learned #1: The involvement of diverse resource specialists can improve the focus and outcomes of rapid assessments and create opportunities for science-management partnerships.

The Beaverhead-Deerlodge National Forest experienced substantial tree mortality from the MPB epidemic, with approximately 50 percent of the forested area infested by 2009. At the same time, this forest is experiencing an outbreak of western spruce budworm. This widespread tree mortality created a management need for information on potential impacts of the MPB and alternative management responses.

A diverse team of experts convened to address these goals and information needs. Resource managers and specialists with the Beaverhead-Deerlodge National Forest contracted employees with TEAMS (Talent, Expertise, Agility, Mobility, and Simplicity) Enterprise to recommend silvicultural prescriptions and identify treatment areas. Managers and specialists with the Beaverhead-Deerlodge National Forest and Northern Region then formed an assessment team with the Ecosystem Research Group (ERG)[7] to build on these recommendations.

The rapid assessment was comprehensive, but also focused, due to the unique perspectives of different resource specialists regarding important ecosystem components. The team developed the following goals for the assessment:

[7] *ERG is a government contractor specializing in natural resource inventory and assessment.*

1. Evaluate long-term trajectories of vegetation conditions across the National Forest and broader landscape, with a focus on distributions of forest size classes, crown closure, and cover types.
2. Determine the scale and intensity of treatment impacts on wildlife habitats and species viability, especially for the northern goshawk, flammulated owl, black-backed woodpecker, fisher, elk, pileated woodpecker, Canada lynx, wolverine, and grizzly bear.
3. Assess the potential severity of future disturbances (especially wildfire) across the landscape.
4. Identify projects that might move the forested landscape towards desired future conditions as defined by the Forest Plan.

Due to the Forest's urgent need for information about the MPB epidemic, interactions with non-governmental organizations were limited. Future assessments could greatly benefit from greater involvement with diverse stakeholders groups (*e.g.*, The Nature Conservancy, The Wilderness Society, The Defenders of Wildlife, The Wildlife Society, and commodity interest groups) to effectively incorporate their perspectives and encourage collaborative learning among all parties.

Lesson learned #2: Simulation models are useful tools for comparing impacts of treatment options and exploring future scenarios, especially when models are tailored to local conditions.

Simulation models help resource managers explore future conditions under different management and no-management scenarios. The assessment team for the Beaverhead-Deerlodge National Forest used SIMPPLLE (SIMulating Patterns and Processes at Landscape scaLEs) for this purpose. SIMPPLE is a landscape simulation model that produces spatially-explicit projections of how forest stands and forested landscapes might change over time (Chew and others 2012). The model accounts for variability in topography, wind direction, fuels, and conditions in adjacent stands, as well as projected future climate and disturbances. The project only took a couple of months to complete because the SIMPPLE model was already parameterized for the Northern Region as part of the Forest Plan Revision process.

The model employs "logic pathways" describing trajectories of vegetation change. The assessment team tailored these logic pathways to local conditions using the Northern Region's vegetation map (VMAP), regional LANDFIRE data, and aerial detection surveys of MPB activity. These datasets were compared to more accurate information from Forest Inventory and Analysis (FIA) plots where possible (Ecosystem Research Group 2010). In addition, fire and fuel staff with the National Forest worked with fire modeling specialists to improve the accuracy of LANDFIRE data for the area (Fig. 8.1).

The team used SIMPPLE to assess the quantity and spatial arrangement of wildlife habitat through the use of "queries." Queries function as habitat models, providing descriptions of important habitat characteristics for different species. The validity of model output depends on accurate identification of habitat

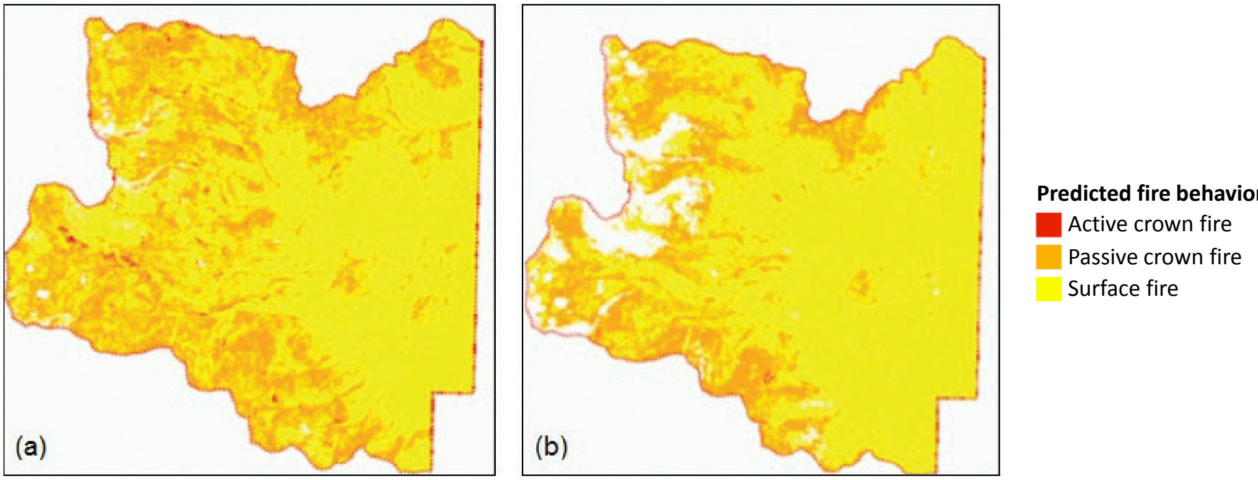

Figure 8.1. Managers and researchers used local data and expertise to refine LANDFIRE data for the Beaverhead-Deerlodge rapid assessment. FlamMap predictions of fire spread and behavior across a 60,000 acre treatment unit were substantially different when the team used the refined dataset (a) instead of the raw LANDFIRE data (b).

characteristics most constraining to specific wildlife species. Therefore, the assessment team created queries for each species based on an extensive literature review and communication with Forest Service wildlife biologists. For example, the assessment team focused on stands with large trees (dbh ≥ 10 inches) and dense understories when assessing suitable nesting habitat for northern goshawks.

The rapid assessment and simulation modeling provided important insight to resource managers and specialists with the Beaverhead-Deerlodge National Forest and the Northern Region. The results have already informed decision making and changed plans for project implementation. Forest managers were especially grateful to the assessment team for detailed information on cumulative effects to wildlife habitat. Species viability is evaluated at the forest-level per Forest Planning Regulations, so the finer-resolution information from this assessment is essential for planning at the project level. Managers with the National Forest have already incorporated the assessment findings into NEPA analyses and used them for forest-wide consultation with the U.S. Fish & Wildlife Service on delineation management of grizzly bear habitat.

Lesson learned #3: Assessments should consider the effects of natural disturbances and management actions at different spatial scales and over different timeframes.

Model output from SIMMPLE was used to compare the potential impacts of management strategies at different spatial scales, information that is important for conservation biological diversity (Haufler 1999). The rapid assessment was conducted for three spatial scales: the landscape in and around the Beaverhead-Deerlodge National Forest (8.3 million acres), the forested portion of the Beaverhead-Deerlodge National Forest (2.6 million acres), and twelve smaller landscapes within the National Forests (20 to 573 thousand acres) (Fig. 8.2).

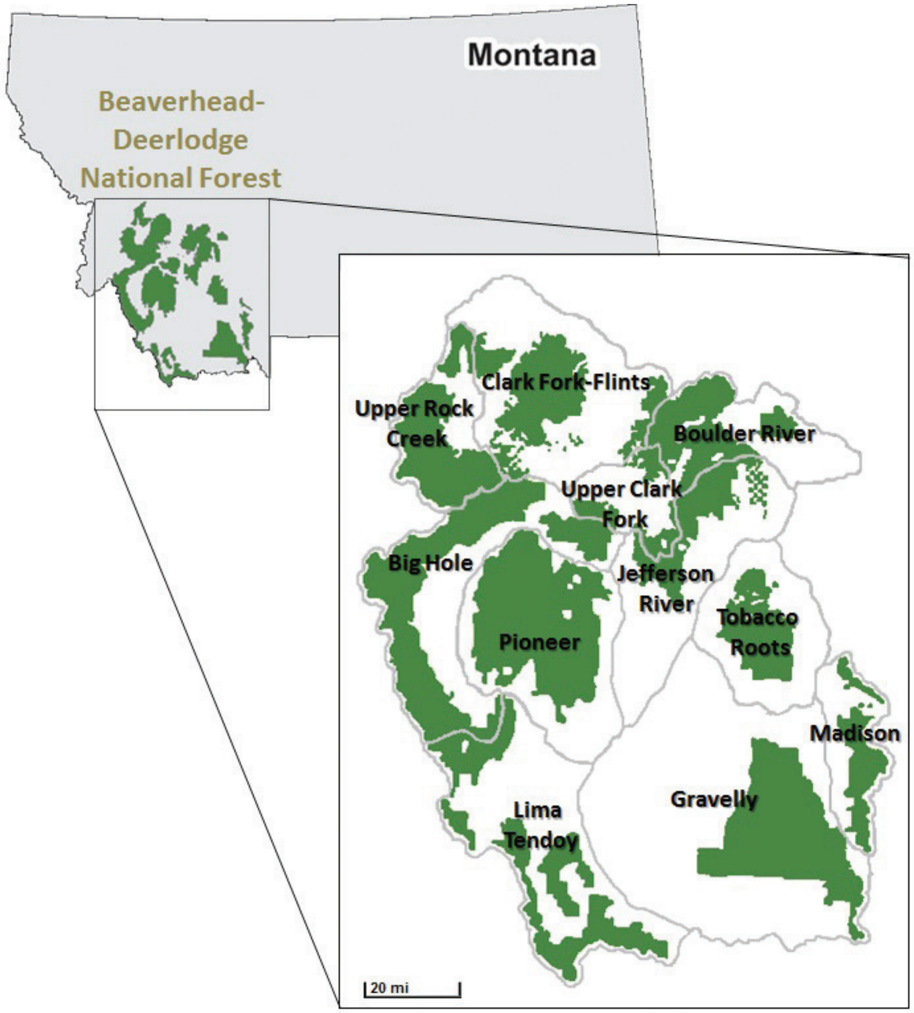

Figure 8.2. Map of 11 landscape areas for the Beaverhead-Deerlodge National Forest's rapid assessment (National Forest System land in green).

Results from simulation modeling for the Beaverhead-Deerlodge National Forest demonstrate that the effects of natural disturbances and silvicultural treatments varied with scale (Ecosystem Research Group 2010):

- Treatments substantially altered vegetation characteristics, such as forest structural stage and canopy cover, within treated stands. However, the percentage of the landscape occupied by different cover types was similar among treatments and no-treatment scenarios at the end of the simulation period (Fig. 8.3).
- Simulated treatments affected fire occurrence at both the treatment and landscape scale. Some simulated treatments resulted in 50 percent fewer acres burned compared to the no-treatment scenario, and all treatments combined resulted in 8 percent fewer acres burned across the landscape.
- The availability of wildlife habitat across the entire landscape remained relatively unchanged during the 50-year simulation period, regardless of the treatment or no-treatment scenario. Exact locations of potential habitat for the nine focal species varied among treatment scenarios, resulting in observable differences within individual treatment units (Fig. 8.4).

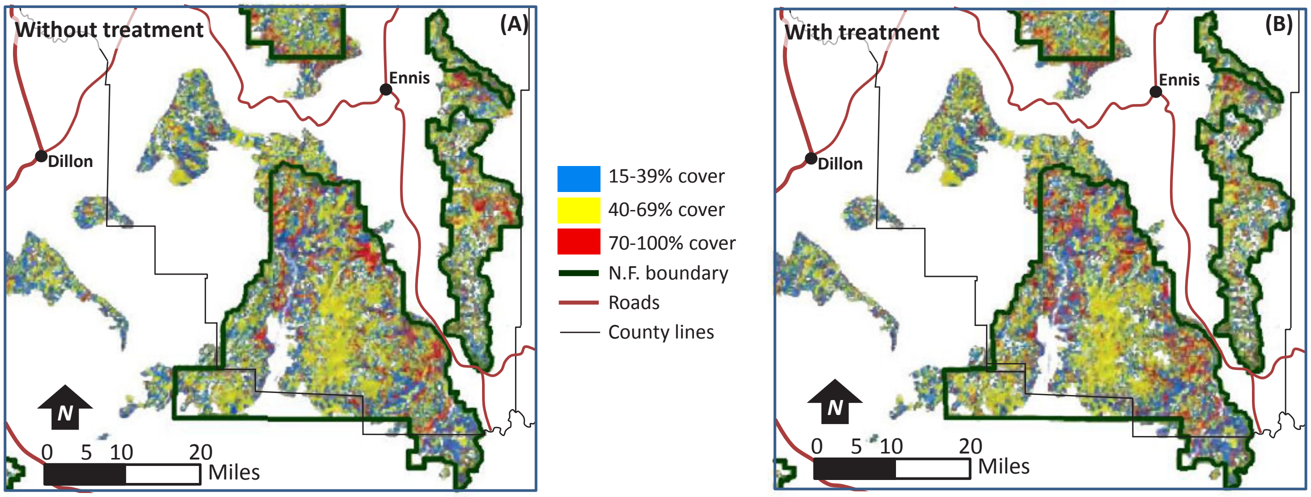

Figure 8.3. Modeled canopy cover for the year 2060 on the Gravelly and Madison landscape areas of the Beaverhead-Deerlodge National Forest. No treatment (A) and treatment (B) scenarios resulted in fairly similar predictions of canopy cover at the spatial scale of landscape areas (adapted from Ecosystem Research Group 2010).

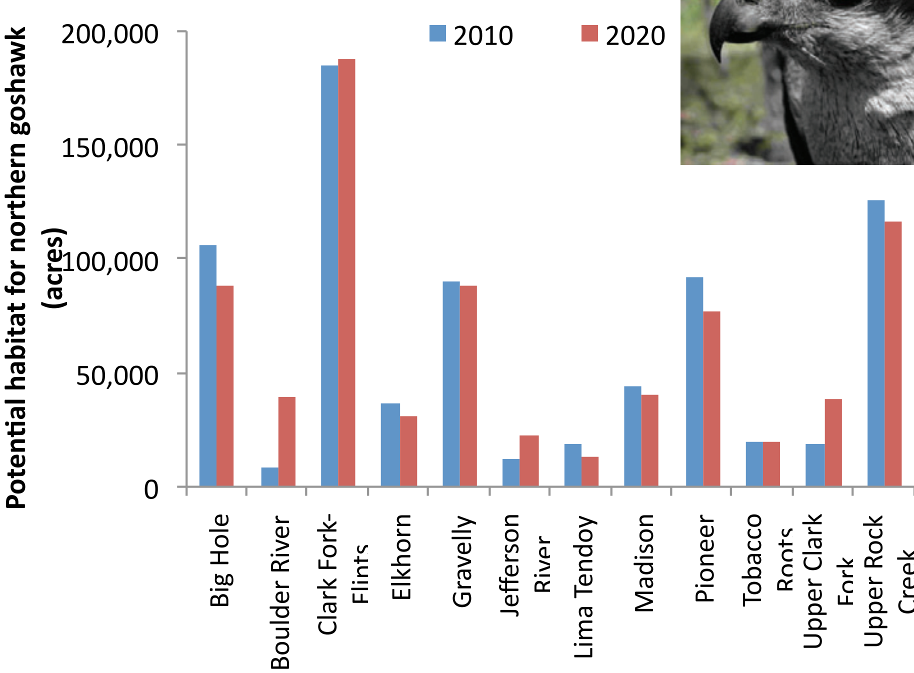

Figure 8.4. Potential habitat for northern goshawk in and around the Beaverhead-Deerlodge National Forest covered similar acreage in 2010 and 2020 under the treatment scenario (about 760,000 acres). However, the location of potential habitat shifted over time, with some landscape units gaining potential habitat and others losing potential habitat (adapted from Ecosystem Research Group 2010).

The assessment team was initially surprised by the minor impact that treatment scenarios had on vegetation, disturbances, and wildlife habitat. Upon further consideration, they realized that the limited extent of proposed treatments likely resulted in these predicted outcomes. Simulated treatments only covered 350,000 acres (13 percent) of the forested portion of the Beaverhead-Deerlodge National Forest. Budgetary constraints, feasibility considerations, and other management objectives limit the acres that can reasonably be treated.

Lesson learned #4: Managers and researchers need to consider model assumptions and limitations when interpreting results.[8]

The rapid assessment for the Beaverhead-Deerlodge National Forest highlights the utility of simulation modeling for assessing potential futures of disturbance-prone forests. This case study also points to the value of multi-scaled assessments for informing resource management planning and management actions. Another key aspect of the Beaverhead-Deerlodge National Forest assessment is the team's explicit consideration of model assumptions and limitations.

Complexity in ecosystem processes and disturbance interactions, as well as uncertain future conditions, render it impossible to predict treatment effects and future vegetation patterns with certainty. This reality was discussed and acknowledged by the assessment team for the Beaverhead-Deerlodge National Forest. Assumptions for the rapid assessment and SIMPPLLE model are clearly listed in the final report from the Ecosystem Research Group. The report also describes the level of certainty for projections of potential habitat by wildlife species. High certainty is attributed to projections for northern goshawk habitat due to an abundance of local data on nest locations. In contrast, projections for flammulated owl habitat are less certain. The National Forest had less data on nest locations for the owl, and the remotely-sensed vegetation data had low reliability for detecting key habitat features, such as low density Douglas-fir stands.

The assessment team regarded SIMPPLLE output as a "best guess" based upon current research on disturbance impacts, stand development, and characteristics of wildlife habitat. They decided that the rapid assessment would provide the most supportable results and applications for planning and project implementation if interpreted comparatively (*e.g.*, Scenario X results in more acres of aspen cover type than Scenario Y) rather than predictively (*e.g.*, Scenario X results in Z acres of aspen cover type).

[8] *This lesson learned reinforces material presented in Research Finding 3 of Chapter 5.*

Literature cited

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Meet the chapter presenters and authors

Barry Bollenbacher recently celebrated his 40th year with the Forest Service! He has served in his current position as Regional Silviculturist for the Northern Region since 1992. Barry works closely with researchers from the Rocky Mountain Research Station and other organizations to help incorporate science into silviculture prescriptions, forest plans, and regional training programs. Barry graduated from Michigan State University in 1975 with a bachelor's degree in Forestry. Barry can be reached at bbollenbacher@fs.fed.us; 406-329-3297.

Rob Gump is the Forest Silviculturist and Ecologist for the Beaverhead-Deerlodge National Forest. Rob has held this position since 2008, as well as previously from 1990 to 1996. He also spent 27 years with the Forest Service in the Northern and Pacific Northwest Regions. Rob is certified silviculturist, and he has been active with the fire and fuels management community for almost 30 years. Reach Rob at rgump@fs.fed.us; 406-683-3965.

Mike Hillis worked as a wildlife biologist for the Forest Service for 34 years, primarily in the Northern and Pacific Northwest Regions. He retired in 2003 and has since worked as the Senior Wildlife Biologist for the Ecosystem Research Group out of Missoula, MT. Mike specializes in long-term, broad-scale modeling for species potentially at risk in the northern and central Rockies. He graduated from Oregon State University in 1970 with a Bachelor's degree in Wildlife Biology. Mike can be reached at mhillis@ecosystemrg.com; 406-721-9240.

Claudia Regan is the Regional Ecologist with the Rocky Mountain Region of the Forest Service. She has worked with the agency as a full-time employee for 18 years and in temporary or seasonal capacities for 6 years. Regional Ecologists serve as applied scientists who bridge scientific research with resource management issues and work toward information synthesis, delivery, and application. Claudia has Bachelor's and Master's degrees in Forest Science from Southern Illinois University and a Ph.D. in Ecology from Colorado State University. Reach Claudia at cregan@fs.fed.us; 303-275-5004.

Appendix A. Scientific names of insect, plant, animal, and fungi species.

Common name	Scientific name
Insect species	
Western spruce budworm	*Choristoneura occidentalis*
Lodgepole needle miner	*Coleotechnites milleri Busck*
Mountain pine beetle	*Dendroctonus ponderosae*
Tree species	
Subalpine fir	*Abies lasiocarpa*
Engelmann spruce	*Picea engelmannii*
Whitebark pine	*Pinus albicaulis*
Bristlecone pines	*P. aristata and P. longaeva*
Foxtail pine	*P. balfouriana*
Pinyon pines	*P. edulis and P. monophylla*
Limber pine	*P. flexilis*
Ponderosa pine	*P. ponderosa*
Scotch pine	*P. sylvestris*
Lodgepole pine	*P. contorta*
Quaking aspen	*Populus tremuloides*
Animal species	
Northern goshawk	*Accipiter gentilis*
Elk	*Cervus canadensis*
Pileated woodpecker	*Dryocopus pileatus*
Wolverine	*Gulo gulo*
Canada lynx	*Lynx canadensis*
Fisher	*Martes pennant*
Flammulated owl	*Otus flammeolus*
Lazuli bunting	*Passerina amoena*
Black-headed grosbeak	*Pheucticus melanocephalus*
White-headed woodpecker	*Picoides albolarvatus*
Black-backed woodpecker	*Picoides arcticus*
American three-toed woodpecker	*Picoides dorsalis*
Downy woodpecker	*Picoides pubescens*
Hairy woodpecker	*Picoides villosus*
Chickadees	*Poecile spp.*
Golden-crowned kinglet	*Regulus satrapa*
Bull trout	*Salvelinus confluentus*
Mountain bluebird	*Sialia currucoides*
Pine squirrel	*Tamiasciurus hudsonicus*
Grizzly bear	*Ursus arctos horribilis*
Fungi species	
Blue-stain fungus	*Grosimannia clavigera*

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