Overview of Western Water Assessment Work on Bark Beetles

Bark Beetles and Forest Change

Accomplishments 2009-2011

Brought together scientists and stakeholders in a variety of contexts

- MPB Scientist-Stakeholder Meeting (Dec. 2009)
- MPB-Water Science Symposium (April 2010)
- 2nd MPB-Water Science Symposium (April 2011)

Produced synthesis document

- 2010 Symposium Report (May 2010 IWCS)

Produced new research

- Manuscript on hydrologic impacts of infestations
- Manuscript on explaining a weak nitrate response

Bark Beetles and Forest Change

Goals for 2011 & 2012

- Expand geographic scope of outreach to Utah (this workshop) and potentially SW Colorado
- Expand and update *Beetles, Water, and Climate* website

  http:/wwa.colorado.edu/ecology/beetle/
- Complete publication of conceptual beetle-water impact model
- Input into WWA project on drivers of anomalous snowmelt patterns in the UCRB

Synthesis Report on MPB-Water Symposium

FEATURE ARTICLE FROM INTERMOUNTAIN WEST CLIMATE SUMMARY, MAY 2010

INTERMOUNTAIN WEST CLIMATE SUMMARY

A product of The Western Water Assessment

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Impacts of the mountain pine beetle infestation on the hydrologic cycle and water quality: A symposium report and summary of the latest science

By Jeff Lukas and Eric Gordon, Western Water Assessment

The ongoing mountain pine beetle (MPB) infestation in Colorado and southern Wyoming has left a very obvious and visually dramatic imprint on forest ecosystems (Figure 1). Less obvious, but no less important, are the impacts this widespread tree mortality may have on the water resources that come from these affected forests.

While studies of previous insect infestations and other forest disturbances (e.g., clearcutting) provide some guidance as to how hydrologic regimes and water quality may be affected, there has been very little published research specific to the ongoing infestation in the Rocky Mountain region. There are, however, a number of recently completed and ongoing research projects that investigate how the MPB infestation may be affecting water resources.

Figure 1: As watersheds experience significant tree mortality from mountain pine beetle, how will the hydrologic cycle and water quality be affected? (Williams Fork Mountains, Colorado; Photo: US Geological Survey)

On April 8, 2010, the Western Water Assessment convened a meeting in Boulder, CO, entitled "MPB Science Symposium: Impacts on the Hydrologic Cycle and Water Quality." This symposium brought together the investigators on these projects to present their research results and future plans, and discuss the implications for both forest managers and water resource managers. The 50 participants represented research units at the University of Colorado, Colorado State University, Colorado School of Mines, the University of Arizona, the University of Wyoming, the University of Idaho, University of California–Los Angeles, US Forest Service, US Geological Survey, and the National Center for Atmospheric Research, and also included resource managers from the US Forest Service, Bureau of Reclamation, National Park Service, Northern Colorado Water Conservancy District, and Aurora Water.

The day began with a presentation by US Forest Service hydrologists Liz Schnackenberg and Carl Chambers on the outstanding questions regarding MPB impacts of greatest relevance to their agency. They split these questions into "natural processes" (what are the impacts of MPB-killed forests on water yield, peak flows, sediment yield, stream channel stability, woody debris inputs to streams, riparian areas, and groundwater) and "management effects" (how will salvage logging and associated road-building modify these impacts).

The subsequent presentations, however, covered only a subset of these natural processes, and only one presenter explicitly treated management effects. This appears to indicate a gap between the information needs of the principal forest management agency dealing with the MPB infestation and the MPB-water research that is being done in the region.

The 12 talks that followed presented the findings from research projects led by university and agency scientists (see Sidebar on p. 2, *Symposium Presentations*). Collectively, these projects use a diverse set of tools—field sampling, designed treatment and controls, remotely sensed imagery, computer modeling, and statistical methods—to investigate the impacts of MPB on hydrology and water quality over multiple time scales and spatial scales. Overall, there was significant commonality in the research questions and results, so here we have attempted to synthesize the findings of all of the projects. The paragraphs in italics provide high-level summaries of the findings in each section. Specific results or statements are attributed to the individual presenters where appropriate.

Feature Article, May 2010 IWCS (Lukas and Gordon)

"No compelling evidence yet for runoff changes caused by the current MPB infestation"

"Initial results…do not indicate nutrient loading or other water chemistry changes of the magnitude that would present problems for either human water use or aquatic ecosystems"

"Lurking in the background…is the prospect of dramatic changes in water quality…that would occur if a large and intense wildfire were to occur in an MPB-affected forest"

"Management practices…such as harvesting for fuels reduction, have the potential for greater effects on water yield and water quality than those caused by MPB alone, at least at the stand level"

Nitrate response from beetle-killed forests

WWA Project: *Effects of Mountain Pine Beetle on Water Quality in Colorado*

Jimmy McCutchan, Suzanne van Drunick, and Tommy Detmer, CIRES

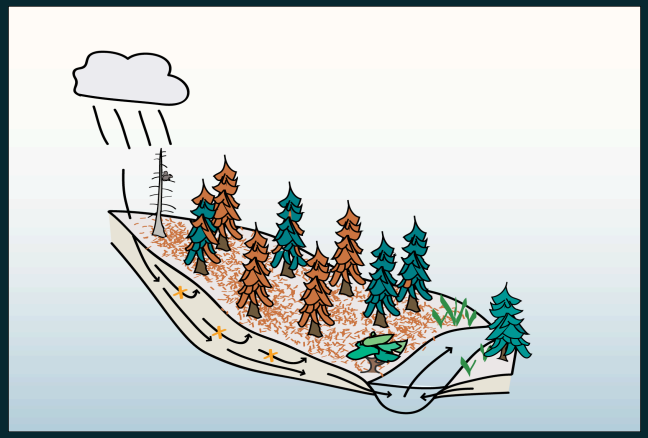
Chuck Rhoades, USFS-RMRS

Dave Clow, USGS

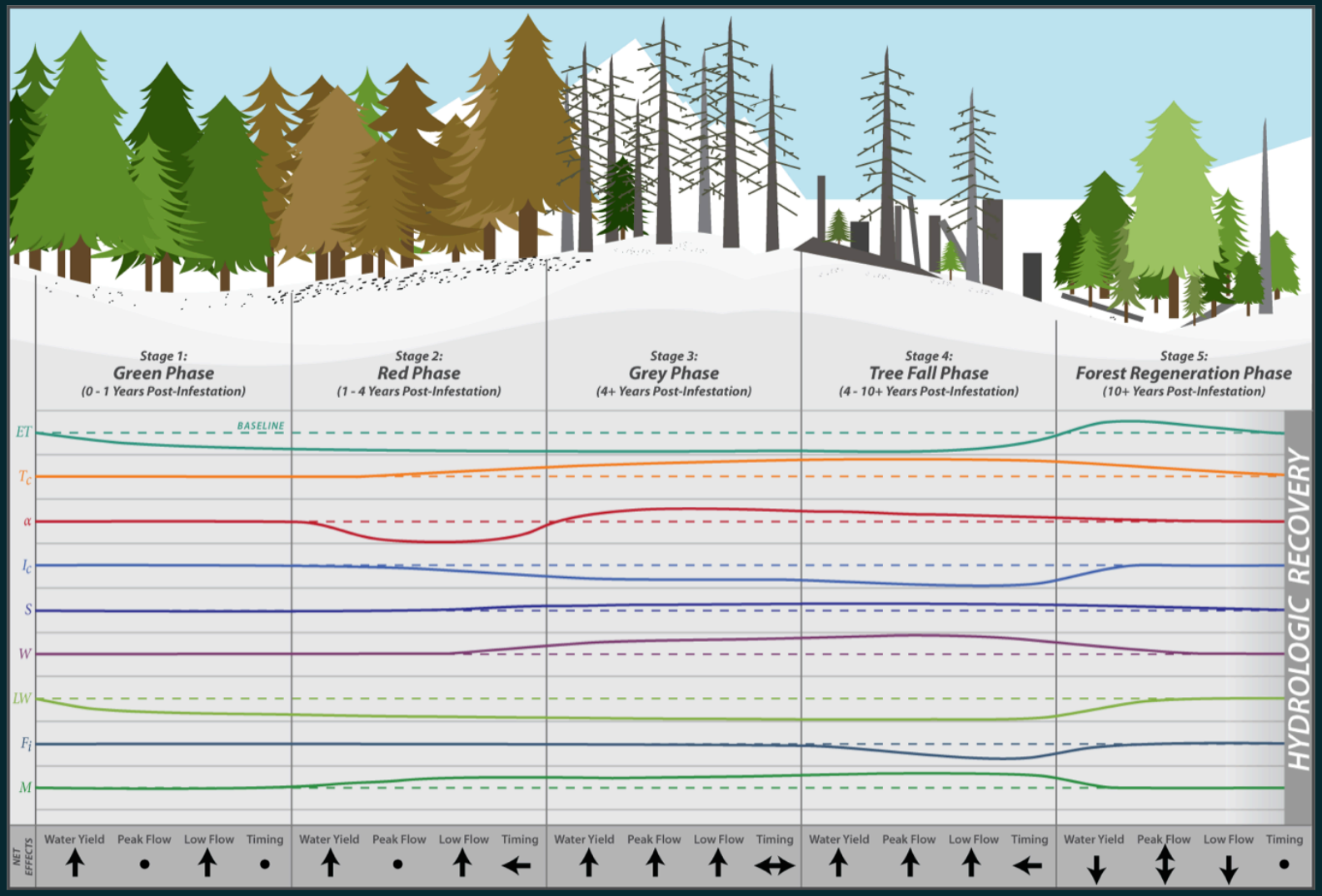
Leigh Cooper, CU

John Stednick, CSU

Biogeochemistry of Beetle Kill: Explaining a Weak Nitrate Response



Conceptual Model of Hydrologic Impacts



Pugh and Gordon (2011, in review)