Project Summary
Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: Investigation into relationships between disturbance history and mountain pine beetle outbreak severity and consequences in the lodgepole pine forest type of Rocky Mountain National Park, Colorado

Discipline: Natural Resources
Type of Project: Research
Funding Agency: National Park Service
Other Partners/Cooperators: Colorado State University
Effective Dates: June 15, 2009 – December 31, 2010
Funding Amount: $13,990

Investigators and Agency Representative:
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Project Abstract: Rocky Mountain National Park (ROMO) is currently experiencing a mountain pine beetle (MPB; *Dendroctonus ponderosae*) outbreak of unprecedented scale and severity that will undoubtedly reshape the forest landscape of the Park. On the surface, the MPB outbreak, which is affecting the lodgepole pine (*Pinus contorta*) forest type, has some characteristics in common to the large, high-severity fires that have shaped the lodgepole pine forests of ROMO for the past several centuries (Buechling and Baker 2004, Sibold *et al.* 2006). However, these two disturbance types have distinct characteristics that influence post-disturbance stand development. For example, Rocca and Romme (2009) suggest that the severity of the current MPB outbreak in ROMO is considerably more heterogeneous than the stand-replacing fires of past centuries. Overall, differences in the patchiness, severity, and mechanisms of tree mortality (girdling in contrast to burning) of these two disturbance types can create dissimilar stand development pathways and resulting forest stand and landscape characteristics (Sibold *et al.* 2007). As a result, it is likely that the current MPB outbreak will create unique forest landscapes that will be outside of the historic range of variability for ROMO. In order to minimize surprises and to inform possible management actions (e.g., wildland fire use) following the outbreak, Resource Managers in ROMO are in need of information on the ecological consequences of the outbreak for the lodgepole pine forest cover type.

Key to understanding the ecological consequences are the identification of relationships between the current outbreak and prior disturbance history. Disturbance history is a primary determinant of forest conditions, which in turn significantly influence the susceptibility and severity of forest ecosystems to insect outbreaks (Bebi *et al.* 2003, Kulakowski *et al.* 2003), as well as post-outbreak stand development (Sibold *et al.* 2007). As such, understanding relationships between disturbance history and the current MPB outbreak is a critical first step in evaluating the ecological consequences of this unprecedented event.

In the context of the lodgepole pine forest type on the west side of ROMO, disturbance history and forest conditions primarily reflect stand-replacing fire events and to a lesser degree, fine-scale events have created a somewhat more complex forest landscape. The majority of the lodgepole pine stands have homogeneous age and size structures that reflect regeneration following large, stand-replacing fires in the 18th and 19th centuries (Sibold *et al.* 2006). Subsequent events including wind blow downs, insect outbreaks, surface fires, and mechanical thinning contribute to more heterogeneous forest conditions that could have significant influences on outbreak severity and stand response (Sibold *et al.* 2007).

The objective of this project is to investigate the role of past disturbance history and ecosystem management activities on the susceptibility, severity and post-outbreak stand development in the lodgepole pine forest type of the west side of ROMO. This

research will provide Resource Managers with important information that will help elucidate the patterns and consequences of the current mountain pine beetle outbreak, potential impacts of the outbreak for the east side of the Park, and will contribute vital information for a landscape-scale modeling analysis of projected future forest conditions.

Outcomes with Completion Dates: Due Date for Final Report and/or Other Products: May 31, 2010

Products:

- One-page quarterly updates are to be provided via electronic mail to the ROMO key official.
- One hard copy and one electronic copy of the interim report due, December 31, 2009 to be delivered to the ROMO key official.
- Final report of the project due May 31, 2010.
- Principal investigator will give two talks on the results of the research at ROMO, dates to be identified

Keywords: lodgepole pine forest, mountain pine beetle, disturbance history, Rocky Mountain National Park, Colorado State University