

Colorado Parks and Wildlife

WILDLIFE RESEARCH PROJECT SUMMARY

Mammal and breeding bird response to bark beetle outbreaks in Colorado

Period Covered: July 1, 2013 – June 30, 2014

Principal Investigators: Jacob S. Ivan, Jake.Ivan@state.co.us; Amy Seglund, Amy.Seglund@state.co.us ;

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Mountain pine beetle (*Dendroctonus ponderosae*) and spruce beetle (*Dendroctonus rufipennis*) infestations have reached epidemic levels in Colorado, impacting approximately 3.7 million acres since the initial outbreak in 1996 (Figure 1). Though bark beetles are native to Colorado and periodic infestations are considered a natural ecological process, the geographic scale of their impact and simultaneous infestation within multiple forest systems has never been observed. This historic outbreak is having significant impacts on composition and structure of forest stands that will propagate for decades into the future. The widespread mortality of forested systems in Colorado is likely to have a dramatic, but poorly understood effect on wildlife species that depend on these habitats. The project described here uses occupancy estimation to determine which wildlife species (both species of conservation concern and game species) decrease their use of an area as bark beetles pass through, which increase their use, and which exhibit use similar to levels prior to infestation.

Statewide sampling was conducted during the summers of 2013 and 2014 (Figure 2). We sampled 150 Engelmann spruce (*Picea engelmanni*)/subalpine fir (*Abies lasiocarpa*) sites and 150 sites consisting mostly of lodgepole pine (*Pinus contorta*) or lodgepole pine mixed with other conifers. For both strata, sampling covered conditions ranging from sites that have yet to be impacted by bark beetles to those that were impacted by beetles more than a decade ago. At each 1-km² site, we sampled the breeding bird community using the Rocky Mountain Bird Observatory's protocol for "Integrated Monitoring in Bird Conservation Regions" (Hanni et al. 2014). We sampled the mammal community by deploying a remote camera near the center of each sample unit. Fieldwork for this phase of the project is now complete. However, data entry for 2014 is ongoing. For the purposes of this interim document, we report preliminary results for 3 mammalian species of conservation concern based on 2013 data only: snowshoe hares (*Lepus americanus*) and red squirrels (*Tamiasciurus hudsonicus*), which together comprise nearly 100% of the diet of the federally listed Canada lynx (*Lynx canadensis*), and American marten (*Martes americana*), which is a USFS Region 2 sensitive species.

We collected 197,092 photos of 25 species during summer 2013. Occupancy analyses of these data indicate that snowshoe hares are more likely to use spruce/fir stands than lodgepole stands, but in both cases, use of these stands declines as bark beetle infestations pass by. We expected use to increase dramatically at some point as the understory responds to increased light, but that response will apparently take longer than the decade or so that has passed since the earliest infestations. Unlike hares, red squirrel use is similar for spruce/fir and lodgepole stands, but similar to hares, use of these stands declined after bark beetle infestations. This may be related to significant mortality of cone-bearing trees that occurs with beetle infestations. Use of the 2 stand types by marten was similar, but in contrast to the previous 2 species, use is expected to increase following bark beetle infestations. We expect to complete a full analysis and report for this project by Fall 2015.

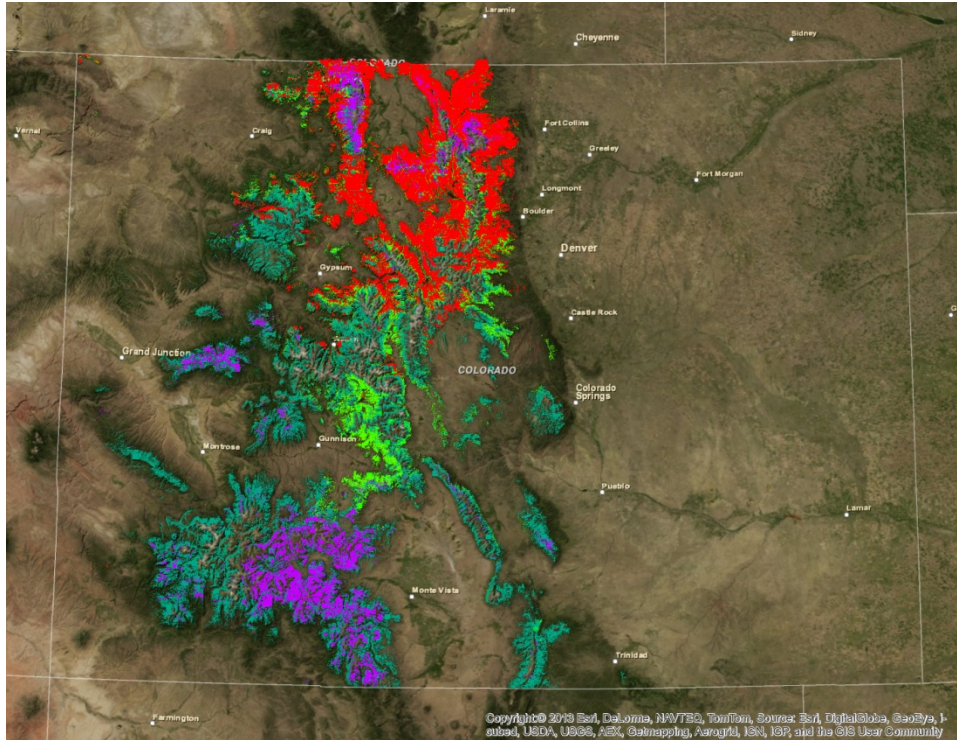


Figure 1. Current (2013) extent of mountain pine beetle (red) and spruce beetle (purple) infestations in spruce/fir (blue-green) and lodgepole pine (bright green) forests in Colorado. Bark beetle data were collected via USFS aerial surveys.

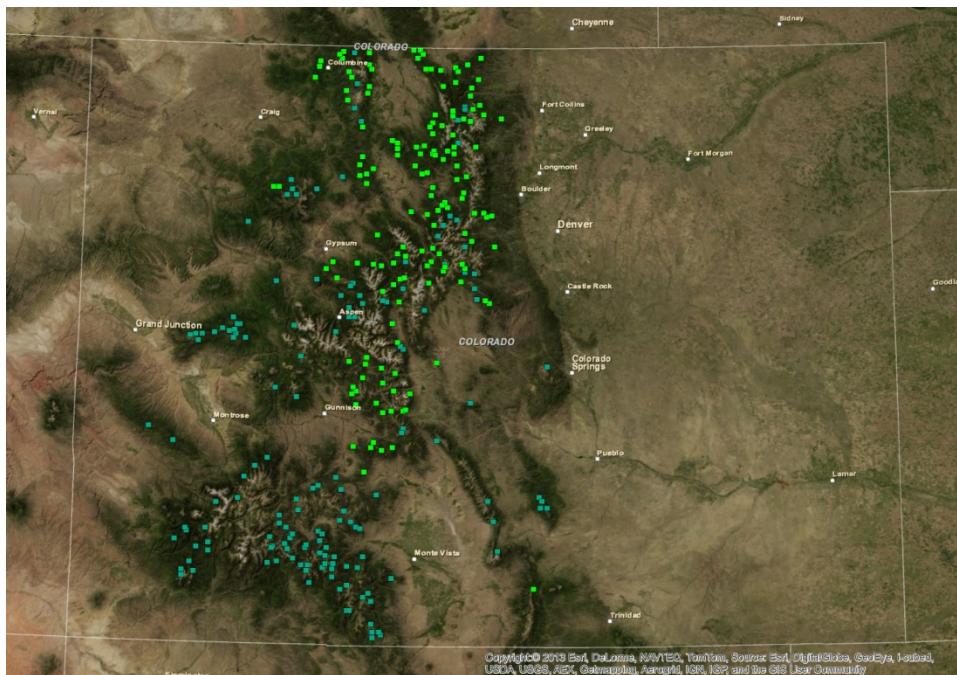


Figure 2. Sites sampled via point counts and remote cameras to assess impacts of bark beetle infestations on breeding bird and mammal species in spruce/fir (blue-green, N = 150) and lodgepole pine (bright green, N = 150) stands in Colorado, 2013–2014.

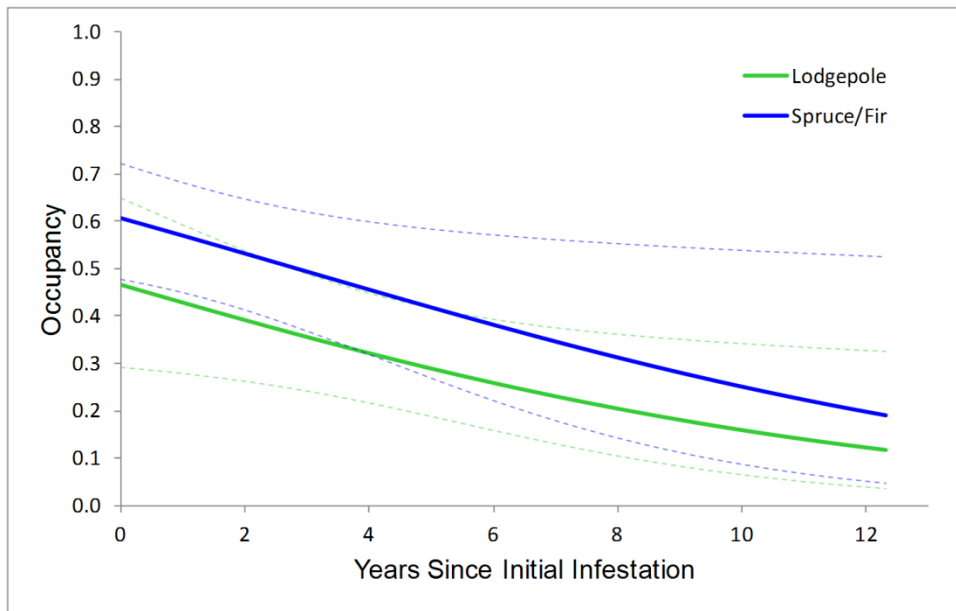


Figure 3. Snowshoe hare occupancy (i.e., use) of stands in relation to the number of years since initial infestation by bark beetles. Note that “0” years since infestation represents stands that have not yet been impacted. Use of spruce/fir stands is generally higher than use of lodgepole stands, but in both strata, use is expected to decline through time as bark beetles pass over an area.

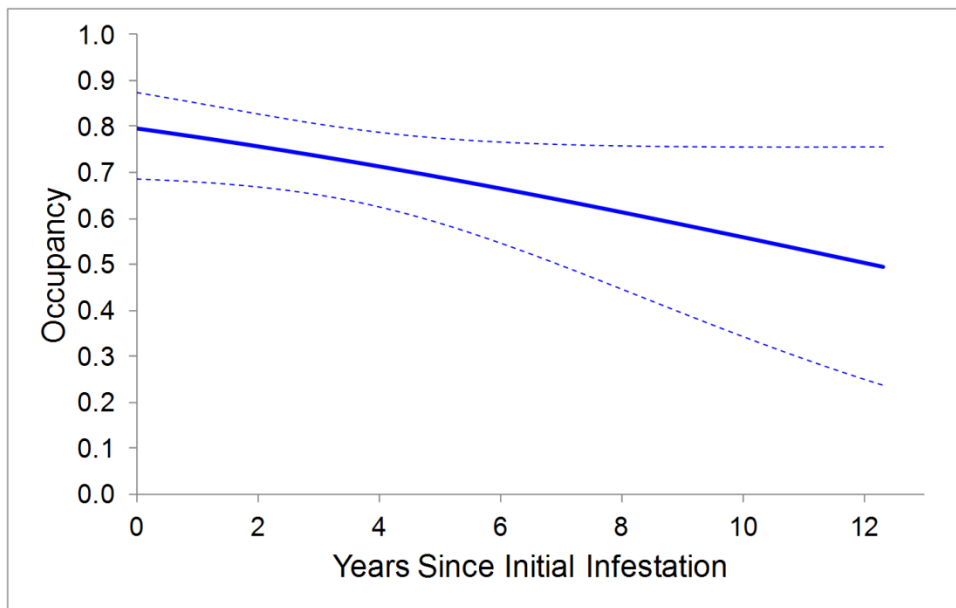


Figure 4. Red squirrel occupancy (i.e., use) of stands in relation to the number of years since initial infestation by bark beetles. Note that “0” years since infestation represents stands that have not yet been impacted. Use of spruce/fir and lodgepole stands is generally similar (only a single line here compared to 2 lines for snowshoe hares above) and is predicted to decline through time as bark beetles pass over an area.

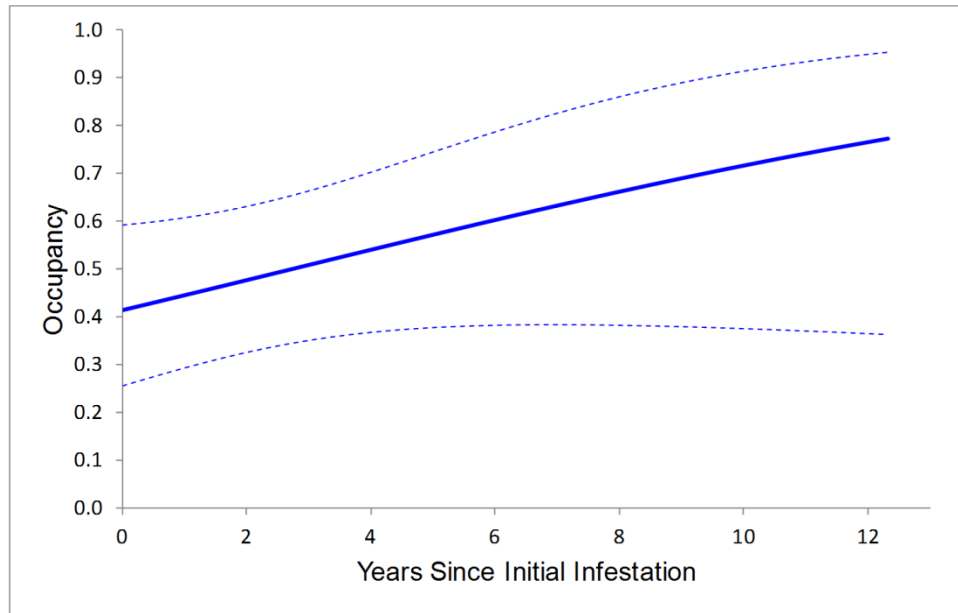


Figure 3. American marten occupancy (i.e., use) of stands in relation to the number of years since initial infestation by bark beetles. Note that “0” years since infestation represents stands that have not yet been impacted. Use of spruce/fir and lodgepole stands is generally similar (only a single line here compared to 2 lines for snowshoe hares above) and is predicted to increase through time as bark beetles pass over an area.