The Effects of Silvicultural Manipulations On Spruce Beetle Populations

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Engelmann spruce (Picea engelmannii) is one of the most important tree species of the southern Rocky Mountain region. Along with subalpine fir (Abies lasiocarpa), Engelmann spruce comprises the dominant overstory type of high elevation (6700 ft) forest stands over large areas. These spruce-fir stands are highly valued for the production they afford to winter wildlife and as wildlife habitat. They form a valuable component of the recreational landscape, as well as a source of timber.

The most significant cause of mortality for matura spruce is the spruce beetle (Dendrococcus ponderosae), whose populations can increase to very high levels and kill large numbers of trees over significant areas. Spruce beetle populations are currently increasing throughout much of Colorado and northern New Mexico. In many cases these outbreaks have been precipitated by severe weather events (hailstorm, avalanche, etc.), prolonged drought conditions, and susceptible stand conditions. While the relationship between stand conditions and bark beetle activity has been demonstrated for many bark beetle/host systems, the extended periods of time associated with spruce stand development (ranging from 250 to 400 years) has meant that little is known about the influence of stands and landscape-level conditions upon bark beetle activity.

Currently there is a high level of spruce beetle activity throughout much of the southern Rocky Mountains. A significant amount of mature spruce trees have been killed by the spruce beetle in many affected areas. However, in areas where providing management activities have reduced spruce density, average size, and encouraged regeneration of mixed species stands, the levels of mortality have been moderated.

In general, silvicultural treatments can affect a stand's tree species distribution, age, and size class distribution and density. We would expect all of these characteristics to affect a stand's resistance to spruce beetle attack. Although there is significant anecdotal and circumstantial evidence that stand manipulations can reduce the impact of spruce beetle, there is little definitive data to support this hypothesis.

The goal of the project is to determine the impact of previous management with regards to subsequent spruce beetle activity. This project will measure and monitor stand characteristics in areas that have had recent spruce beetle activity. A critical part of the study will be the selection of stands to be measured for beetle activity and stand characteristics. USDA Forest Service stand data has been used to select stands to be used in the study. A list of candidate stands has been created on the Rocky Mountain Region Forest Health Management area. Sampling location 50:50 at least 50% of the total basal area is spruce and an existing record of silvicultural manipulation at some point in the past. In order to determine what the impact of management on subsequent spruce beetle activity, isolated stands will be matched to non-released stands. The project's stand evaluation is a data-intensive activity that will compare stand condition information, stand activity (management) information, and measures of spruce beetle activity.

Field work (stand measurement) is scheduled to continue during the summer of 2008. Beetle impact data as well as stand mensural information will be gathered. Field work will continue during the fall season of 2008, which will complete the survey of 5 National Forests in southern Colorado.

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