

Project: Predicting Biodiversity Maintenance after Bark Beetles and MPB Management

The health of mixed coniferous forests is a critical management issue in BC with implications and impacts on the forest industry, biodiversity conservation and regional land use planning. Interior BC forests have high biodiversity (>200 vertebrate species), and many wildlife species have strong preferences for large and decayed trees for nesting and feeding (Martin et al. 2004, Drever & Martin 2007). As salvage operations focus on mature pine stands, retention of remaining old mixed forests will become increasingly important to support the rich assemblage of resident and migrant wildlife (Martin et al. 2006). Insect outbreaks and fire are the two major natural disturbance factors structuring the succession of mature conifer stands. The current outbreak of mountain pine beetle in interior BC is at a larger scale and intensity than previously experienced, raising the concern that wildlife species may be strongly impacted by these dramatic changes in forest health.

Since 1995, we have conducted population and community level studies on >180 wildlife species in the Cariboo-Chilcotin region of Interior BC to determine the critical habitat attributes and wildlife responses to several silvicultural treatments (selection cutting with variable retention, beetle hazard reduction, salvage cutting; Martin et al. 2002). We monitored tree health conditions annually using standard forest inventory, wildlife tree and forest health techniques for >10,000 tagged trees on 29 mixed stands. We have determined critical habitat attributes and population trends for many species in healthy old forest stands (Martin et al. 2004). From 1995-2005, the percent of dead and dying conifers increased from 6% to 55%, with numbers of dead trees rising sharply in 2004 (Martin et al. 2006). Over this period, 40% of 101 bird and mammal species showed significant population changes, with some increasing and others in sharp decline (Drever & Martin 2007). For many insectivorous cavity nesters, bark beetle-attacked stands initially represented an enhancement of habitat quality for foraging. Since 2001, cavity nester populations increased, and moved to nesting patches with high density MPB-attacked trees, with year round residents showing greater increases than migratory species (Norris and Martin 2008). However, as the epidemic proceeds, conditions deteriorate as the supply of forest insects and old trees decline. On our study sites, MPB benefits declined as tree mortality exceeded 40%; by 2006 several species were in steep decline. We urgently need to determine which forest conditions will support wildlife populations through peak and post-epidemic conditions.

In 2007 and 2008, bark beetle infection levels have reached post-epidemic status on our study sites on the Stack Valley Road. With field work and analyses of existing data, we continue to evaluate the role of insect outbreaks and beetle management activities on wildlife biodiversity at the peak and in post-epidemic conditions in mature mixed conifer forests, including the two sites on DND property on the Stack Valley Road. We are determining from our field study which post-epidemic habitats serve best as wildlife refuges. On our study sites, richness of woodpeckers and all other birds was positively correlated with tree species richness and negatively correlated with density of pines (Drever et al. 2008). Harvest type had a similar effect on richness for most species (uncut < partial harvest < clear cut with reserves). Management options on crown lands need to balance the priorities of biodiversity conservation and timber extraction, and consider the needs of forest species during and after the epidemic. We need to ensure the maintenance of habitats for wildlife populations after their 'boom and bust' response to dead trees when forest landscapes are extensively cut.

Summary: Despite the regularity of bark beetle outbreaks in conifer forests, impacts of beetles on wildlife biodiversity remain unstudied. Initially insect outbreaks can result in improved conditions for wildlife but populations may decline steeply due to cumulative effects of forest change. In Interior BC, >40% of birds had significant population changes in the past decade. We are evaluating influences on biodiversity and population trends due to peak and post-epidemic MPB and beetle management.

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