Early Seral Forest Stands and Their Relationship to Wildlife Populations and Ecosystem Stability

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Biodiversity across landscapes is more than simply a species count; it also includes the range of habitats and ecological processes (‘diversity’) present. If these processes are interrupted, an integral component of the ecosystem is lost, leading to more visible consequences such as species declines or extirpations. We are entering (or already in) a bottleneck, with regards to the ecological processes across much of our ‘working forest’. Once beetle-salvage operations taper off, sources of wood will become even more constrained, leading to increasing pressure on the stands of mature forest remaining on a landscape dominated by younger stands. Effective planning for biodiversity on these landscapes requires understanding how stands of different age-classes contribute to the ‘functioning’ of the forest ecosystem, and when mature stands can be harvested as younger stands start to support ‘mature forest’ species.

However, far more work has been done on the opposite end of the spectrum, namely understanding the importance of ‘old growth’ forest stands. Important questions that now need addressing are: What are the implications of dwindling stands of mature forest, in terms of ecological processes and wildlife resilience? When do younger stands begin to play a ‘mature role’, and can we understand the features that contribute to this change? Recently, researchers in Quebec have found that nearly all species of passerine bird and forest-floor small mammals exhibited similar densities in residual forests (old mosaics, young mosaics, and megablocks) as in control stands (St-Laurent et al. 2007), and noted that most passerine bird and forest-floor small mammal species had similar densities in control stands and logged stands allowed to regenerate to 3-m height (St-Laurent et al. 2008). The only species for which St-Laurent et al. (2008) observed lower densities in 3-m tall stands were the red-backed vole (*Myodes gapperii*), brown creeper (*Certhia americana*), and golden-crowned kinglet (*Regulus satrapa*). However, science-based planning (or ‘ecosystem-based management’) for the future harvest of mature timber in BC’s central interior must now consider the impact of an increasing dominance of younger stands on the landscape.

The overarching goal of this study is to facilitate this planning process, by providing greater insight into how the young-to-mature stand representation influences the wildlife component of ecosystems. The study will occur in the Interior Douglas-fir (IDF) ecosystem of BC. Extensive harvesting has occurred in the IDF in the past. But, with a declining timber supply from lower-elevation sites, wood flow from the IDF will become increasingly critical in sustaining the forest industry.

The requirement to allow stands to regenerate to 3-m height before adjacent stands can be logged is common across much of Canada (Ontario: OMNR, 2001; in Quebec: art. 75, Quebec Government, 2003; in British Columbia: art. 65, BCMFR, 2004; in Alberta: art. 7.2.2.3, ASRD, 2006) however, there are few data either supporting or refuting this criteria on an ecological basis. We are using two squirrel species (the red squirrel, *Tamiasciurus hudsonicus*, and the northwestern chipmunk, *Tamias amoenus*) as indicators of forest condition, and ecological maturity. The northwestern chipmunk is a specialist in early seral habitats (Sullivan and Klenner 2000) while red squirrels are typically tied to mature forests (Obbard 1987). The varying responses to stand ages by these two species will indicate the stage in the development of young lodgepole pine stands when they begin to function as mature forest, thus allowing the harvest of adjacent stands.

Sixteen stands in four age/height classes (Table 1) have been established north of Kamloops, BC, (near O’Connor lake, approx 50°53N, 120°21W) in the transition zone between the IDF and the BEC subzones. In each of these stands we have established paired transects at the boundary between the regenerating area and adjacent mature forest. One of each pair of transects parallels the boundary, 30 m within the harvested area, while the second transect runs parallel 30 m within the mature stand. We are assessing populations of the focal species at three scales. At the landscape scale, we use track tunnels (Larsen, in Press, Fisher and Merriam 2000) to assess the activity levels in each of our 16 stands. These activity levels are then correlated with abundance and demographic data obtained from a subset of these stands, where the focal species are assessed using livetrapping (stand scale). Finally, we will interpret the results generated at the landscape and stand scales in light of data on habitat selection, reproduction, and survival of individuals collected using radio-telemetry.

During the summer of 2008, we selected the 16 study stands, established transects, and collected preliminary track tunnel and live-trapping data (two sessions each of track tunnel and livetrapping, corresponding to pre/early dispersal, and late dispersal periods). Preliminary analysis of the data indicated
that juvenile red squirrels begin to explore juvenile lodgepole pine stands when the stands reach 3 – 4 m height (Figs. 1 – 4). These results concur with Larsen (in press) who conducted a similar track tunnel study. Chipmunk populations seemed to persist across all of the age classes that we focused on (i.e. up to 20 yrs, or 8 m tall).

We will continue the track tunnel and live-trapping efforts during the summer of 2009, and will begin collection of radio-telemetry data for a cohort of dispersing juvenile squirrels. In 2009 we will also collect stand structure and understory vegetation data to describe our study stands and aid in identifying critical habitat features utilized by these two focal species. Identification of critical habitat features will facilitate stand management to accelerate the transition from young to ecologically mature forest and aid in identification of the precise stage at which a stand becomes capable of supporting stable wildlife populations, and hence, when adjacent stands can be harvested with less risk of disrupting critical ecological processes.

Table 1. Approximate heights and ages of selected study stands.

<table>
<thead>
<tr>
<th>Class</th>
<th>Height</th>
<th>Approximate Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&gt; 1 m</td>
<td>0 – 3 yrs</td>
</tr>
<tr>
<td>2</td>
<td>1 – 2 m</td>
<td>6 – 10 yrs</td>
</tr>
<tr>
<td>3</td>
<td>3 – 4 m</td>
<td>10 – 15 yrs</td>
</tr>
<tr>
<td>4</td>
<td>6 – 8 m</td>
<td>17 – 20 yrs</td>
</tr>
</tbody>
</table>

Figure 1. Activity of red squirrels in juvenile lodgepole pine forest near Kamloops, BC. Activity is expressed as the mean proportion of track tunnels showing tracks after a 3-day track tunnel session.
Figure 2. Weekly activity of red squirrels in juvenile lodgepole pine forest near Kamloops, BC. Weeks 1 and 4, 2 and 5, 3 and 6, 4 and 8, are repeated measurements of stands in replicate A, B, C, and D, respectively.

Figure 3. Abundance (number of unique individuals captured per trapping session) of red squirrels in juvenile lodgepole pine forest near Kamloops, BC.
Figure 4. Abundance (number of unique individuals captured per trapping session) of red squirrels in juvenile lodgepole pine forest near Kamloops, BC. Repeated measurements of stands are similar to those in Fig 2.

Literature Cited


