

Effects of riparian buffer width on high-elevation songbird communities

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INTRODUCTION

In temperate areas, riparian zones occupy a minor proportion of the overall land base, yet receive disproportionately high use by wildlife (Bunnell and Dupuis 1993). The presence of water contributes to greater levels of plant productivity and diversity, creating a structurally complex vegetation community that is attractive to many terrestrial species. In many areas of British Columbia, riparian zones support a greater avian diversity and richness than occurs in all other habitats (Bunnell et al. 1995).

Timber extraction on Crown lands in British Columbia is regulated by the Forest Practices Code. When harvesting occurs adjacent to riparian habitats, legislation requires the retention of forested buffers, or the creation of riparian management areas. Initially developed for the protection of aquatic habitat and water quality, the objectives of riparian management areas also include the protection of terrestrial wildlife values (British Columbia Ministry of Forests and B.C. Ministry of Environment, Lands and Parks 1995). Currently, minimum buffer widths are based on stream size, the presence of fish, and use as a community watershed. It is not yet known if these criteria are sufficient to meet the habitat needs of riparian- and forest-associated terrestrial wildlife species.

Headwater streams, often small and rarely containing fish, receive little or no protection and may be at particular risk of riparian habitat degradation. In high-elevation forests, these riparian areas are used not only by riparian-associated bird species, but also by those species requiring interior and mature forest habitats. As such, it is important to determine both the effects of this habitat loss on subalpine songbird communities and the ability of riparian buffers to afford alternative songbird habitat.

Our project examines the influence of riparian management strategies on songbird conservation. The primary goal of the research was to assess the effectiveness of different buffer widths in providing suitable breeding habitat for songbirds along small, high-elevation streams. The project objectives were twofold:

1. to determine the effects of riparian buffer width on the structure and composition of breeding songbird communities; and
2. to describe the habitat use and associations of particular songbird species.

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METHODS AND MATERIALS

Study Area

The research was conducted within Tree Farm License (TFL) 35, a 30 000 ha area located in the Kamloops Forest Region and operated by Weyerhaeuser Canada. Study sites were located in both the mid-elevation Montane Spruce (MS) and the high-elevation Engelmann Spruce–Subalpine Fir (ESSF) biogeoclimatic zones. In 1998, 10 study sites were located throughout the TFL and included two replicates each of four treatments and two replicate controls. The four treatment widths were defined as “very narrow” (~ 2 m), “narrow” (~ 12 m), “medium” (~ 30 m), and “wide” (~ 60 m). Controls were located along streams with approximately 250 m of undisturbed forest extending into the upland. Site selection was limited to those small streams (~ 5 m wide) with recent harvesting (< 4 years) on one side and forested habitat on the other side.

Sampling Methods

Spot-mapping was used to census songbirds breeding in the study area (Bibby et al. 1992). This method involves repeated visits to a well-marked grid, within which all songbird locations are recorded. One 300 × 150-m grid, constructed at each study site, was oriented lengthwise along one side of the stream. Songbird locations were recorded onto 1:1500 maps of each grid. In 1998, a single survey was performed at each site. As spot-mapping requires a minimum of six visits to a site, the 1998 data was sufficient to assess species presence or absence only. In 1999, seven surveys were conducted at each site.

In 1999, behaviour sampling examined the selection and utilization of habitat attributes by songbird species. Focal sampling with continuous recording (Martin and Bateson 1993) tracked individuals and noted movements and locations. From these data, the vegetation species and vegetation layers preferred by a species can be determined and movement patterns quantified. Sampling concentrated on the foraging and territorial display behaviour of the winter wren (*Troglodytes troglodytes*) and the yellow-rumped warbler (*Dendroica coronata*). Behaviour observations were carried out within, and immediately outside, each study grid. Individual birds were followed for as long as possible and all activities were described into a small tape recorder. For each movement or location, data was recorded under six categories: activity, substrate, relative position on the substrate, height above ground, movement direction, and distance moved.

In 1998, vegetation sampling quantified habitat structure and vegetation composition. Twelve vegetation plots, systematically placed in each grid, were used to describe the vegetation community at successive distances from the stream. Circular plots of 10-m radius (0.03 ha) were employed to estimate tree density by species and diameter class, average canopy height, and canopy cover. Shrub and ground cover was estimated along two 20-m line transects placed in each plot, oriented at right angles to each other, and intersecting at the plot centre. The line-intercept method (Cook and Stubbendieck 1986) was used to measure shrub cover by species, height class, and vigour. Ground cover was measured by cover type and height class with the point-intercept method (Bonham 1989).

Analysis

All bird observations from the 1999 field season were digitized into a GIS (ARCVIEW 3.1) to delineate songbird territories. The process of determining territory size, shape, and location is currently under way. Community parameters, such as richness, diversity, and similarity, will be estimated from these data, and species-specific territory density and distribution calculated and compared across treatments. Concurrent analysis of breeding bird behaviour and vegetation data will indicate vegetation features that influence the presence of particular species. To date, only preliminary descriptive analyses have been performed on the data; statistical analyses will be conducted in the winter and spring of 1999/2000.

RESULTS AND DISCUSSION

We recorded 22 songbird species within the study grids during the single survey in 1998. By comparison, multiple surveys in 1999 recorded 46 songbird species within the study grids. In the forested buffers and control sites, the most frequently encountered species included the golden-crowned kinglet (*Regulus satrapa*), winter wren, Townsend's warbler (*Dendroica townsendi*), and yellow-rumped warbler. Two species, the brown creeper (*Certhia americana*) and the boreal chickadee (*Parus hudsonicus*), were recorded exclusively in the control sites. Conversely, species that commonly occurred in the harvested areas included the dark-eyed junco (*Junco hyemalis*), chipping sparrow (*Spizella passerina*), and American robin (*Turdus migratorius*).

In our behaviour sampling, we recorded 18 511 seconds of bird activity in total. This consisted of 9862 seconds of foraging activity, 10 616 seconds of display and territorial behaviour, and 523 seconds of other activity types, which included calling, perching, and preening. We observed winter wrens on eight sites for a total of 8720 seconds and yellow-rumped warblers on seven sites for 5492 seconds. Additional data were also collected on golden-crowned kinglets and Townsend's warblers whenever possible.

Preliminary vegetation analysis has concentrated on riparian habitat characteristics across treatments. Small diameter trees dominated the very narrow and medium treatments, while the highest mean number of large trees was recorded in the wide treatment and the controls. The lowest mean shrub cover and number of vertical shrub layers occurred in the very narrow treatment. By contrast, the greatest mean shrub cover and number of shrub layers were present in the wide and control sites.

Our preliminary results support the existing literature; particular species are forest specialists, while other species are either disturbance-tolerant forest birds or habitat generalists. Brown creepers and boreal chickadees appear the most sensitive to harvesting effects. Other species, such as winter wrens and Townsend's warblers, are strongly associated with forest habitats, but seem tolerant of edges and adjacent clearcuts. Generalist species, including dark-eyed juncos and chipping sparrows, use both clearcuts and forest edges and are likely to dominate songbird communities in heavily harvested forests. A combination of forested and harvested habitats can actually increase species richness across a landscape by attracting both forest- and open-habitat species. However, decreasing forest area results in a reduced number of forest species; a landscape that is moderately or heavily disturbed may contain few of the forest species that commonly occur in unharvested habitats. Thus, it is important for forest managers to know the potential effects of different harvest strategies so that they may decide what species to manage for and how best to achieve their management objectives.

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