Bird Responses to Burns and Clear Cuts in the Boreal Forest of Canada[1]

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Introduction

Unlike many other ecosystems in North America, the boreal forest in Canada still retains a natural fire regime. However, increasing industrial forestry, primarily clear cutting, could alter natural fire dynamics and adversely affect some species. A possible solution to this, promoted by many forest managers, is to cut the forest in a way that emulates natural fire patterns on the landscape (e.g. Hunter 1993). This can be done by retaining some live trees on clear cuts to emulate wood left after a burn and by laying out cutblocks on the landscape in a similar size and shape distribution as that produced by fire. A major assumption of this approach is that the responses of biota to clear cutting are similar to their responses to burns. Here we evaluate this assumption by summarizing information on bird assemblages in burns and recent clear cuts in boreal mixed-wood stands (aspen (*Populus tremuloides*) and white spruce (*Picea glauca*)) in Alberta and boreal black spruce (*Picea mariana*) forest in Quebec.

Bird Assemblages Associated with Burned and Logged Stands

Clear cutting and stand-replacing fires both reinitiate forest succession, but are not likely to provide the same habitat conditions for birds (e.g. Hobson and Schieck 1999). In Alberta mixed-wood stands, immediately after a fire the stand is dominated by large burned snags and the ground cover is dominated by herbs. By contrast, immediately after clear cutting only a few live residual canopy trees remain singly or in clumps and the ground is covered by grass. In recent burns, cavity nesters and species that forage on beetles in the dead trees predominate, whereas clear cuts are dominated by open country or parkland-type species (*Table 1*). By about 25 years post-disturbance, many of the snags have fallen in burns and the shrubby understory is well developed. Conversely, on clear cuts some of the residual live trees have died, increasing snag density to levels similar to burns at this age. The shrub layer is more developed in clear cuts but amount of dead wood on the ground is lower than in burns. Generally, snag dependent bird species decreased and shrub-breeding species increased 25 years after burns, whereas in clear cuts there were more species that foraged and nested in canopy trees, because of the retention of live residuals (*Table 1*; Hobson and Schieck 1999). Eventually, as the canopy closed, both the vegetation structure and bird communities converged in mature stands at about 50-60 years post-fire (Song 2002).

Vegetation changes and bird communities in Quebec black spruce forests show similar patterns to those in Alberta mixed-wood stands. The largest differences between bird communities in burns and clear cuts occurred shortly after disturbance (*Table 1;* Imbeau et al. 1999). Species that forage and nest in snags were present in recent burns and absent in clear cuts. Vegetation structure and bird communities in black spruce burns and logged areas converged after 80-100 yrs (Drapeau, unpubl. data).

Fire Associates

Black-backed and Three-toed Woodpeckers (*P. tridactylus*) exploit recently burned coniferous forest to forage on wood-boring insect larvae (Cerambycidae and Buprestidae) and bark beetle larvae (Scolytidae) up to 8-10 years post-fire and then decline (Nappi 2000, Hoyt and Hannon 2002). Black-backs are absent from mature forests (80 yr), are found more frequently in old growth forest (95-150) and then appear to decline in the very old forests in Quebec (*Table 3*), as snags are lost and the forest reverts to a treed state. Hutto (1995) and Saab and Dudley (1998) found similar trends in Northern Rocky Mountain coniferous forests. These results suggest that over the long term, burns may be temporal sources for fire-specialists (Hutto 1995).

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Table 1— *Vegetation structure and common bird species up to 25 yr after fire and logging in the boreal forest of Alberta and Quebec. Adapted from Hobson and Schieck (1999), Imbeau et al. (1999) and Drapeau et al. (2002). See* Table 2 *for common and scientific names of birds.*

Years post-disturbance	Vegetation		Common birds			
			Alberta		Quebec	
	Burn	Clear cut	Burn	Clear cut	Burn	Clear cut
0	many burned snags high herb cover	few live residual trees high grass cover	BBWO TTWO BRCR AMKE TRSW WIWR HAWO	LISP COYE LCSP RUBL PISI MOWA ALFL TEWA YWAR	BBWO TRSW AMKE WIWR	LISP ALFL COYE WIWA
25	few snags standing shrubby understory	dead and live residual trees shrubby understory	COWA GRJA HETH AMRO PHVI OCWA	AMRE BAWW CAWA MOWA RUGR WETA RBGR	LISP WIWR EABL OSFL TRSW COYE	LISP ALFL CEWX COYE PHVI

Conservation Issues

The major conservation issue for burn-dependent species is salvage logging, which will increase as forestry expands north. Trees that are salvaged are in the same diameter classes that woodpeckers use for foraging and nesting (Hoyt 2000, Nappi 2000). In addition climate change will alter fire cycles: they will be shorter in Alberta leading to a shortage of old growth forest and will be longer in Quebec leading to a shortage of early seral stages. Maintenance of suitable amounts of post-fire forests spared from salvage logging should be a prerequisite condition for sustainable forest management.

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Table 2— *Common names, scientific names and four-letter species codes for birds referenced in this article.*

Species code	Common name	Scientific name
ALFL	Alder flycatcher	*Empidonax alnorum*
AMRE	American Redstart	*Setophaga ruticilla*
AMRO	American Robin	*Turdus migratorius*
BAWW	Black-and-white Warbler	*Mniotilta varia*
BBWO	Black-backed Woodpecker	*Picoides arcticus*
BRCR	Brown Creeper	*Certhia americana*
CAWA	Canada Warbler	*Wilsonia candensis*
CEWX	Cedar Waxwing	*Bombycilla cedrorum*
COWA	Connecticut Warbler	*Oporornis agilis*
COYE	Common Yellowthroat	*Geothlypis trichas*
EABL	Eastern Bluebird	*Sialia sialis*
GRAJ	Gray Jay	*Perisoeius canadensis*
HAWO	Hairy Woodpecker	*Picoides villosus*
HETH	Hermit Thrush	*Catharus guttatus*
LCSP	LeConte's Sparrow	*Ammodramus leconteii*
LISP	Lincoln's Sparrow	*Melospiza lincolnii*
MAKE	American Kestrel	*Falco sparverius*
MOWA	Mourning Warbler	*Oporornis philadelphia*
OCWA	Orange-crowned Warbler	*Vermivora celata*
OSFL	Olive-sided Flycatcher	*Contopus borealis*
PHVI	Philadelphia Vireo	*Vireo philadelphicus*
PISI	Pine Siskin	*Carduelis pinus*
RBGR	Rose-breasted Grosbeak	*Pheucticus ludoviciana*
RUBL	Rusty Blackbird	*Euphagus carolinus*
RUGR	Ruffed Grouse	*Bonasa umbellus*
TEWA	Tennessee Warbler	*Vermivora peregrina*
TRSW	Tree Swallow	*Tachycineta bicolor*
TTWO	Three-toed Woodpecker	*Picoides tiydactylus*
WETA	Western Tanager	*Piranga ludoviciana*
WIWA	Wilson's Warbler	*Wilsonia canadensis*
WIWR	Winter Wren	*Troglodytes troglodytes*
YWAR	Yellow Warbler	*Dendroica petechia*

Table 3— *Occurrence of Black-backed Woodpeckers over time post-fire in black spruce forests in Alberta and Quebec.*

Time after fire (yr)	Percent occurrence[1]		No. sites sampled
0-2	Alberta	38	20
	Quebec	87	56
16-20	Alberta	0	45
	Quebec	5	49
80	Alberta	0	21
95	Quebec	9	53
150	Alberta	37	21
>200	Quebec	3	61

[1]Data compiled from Nappi (2000) and Hoyt and Hannon (2002); Nappi used point counts and play-backs of territorial calls and Hoyt used only playbacks of territorial calls, so data are not strictly comparable between regions.