Prescribed Burn Avian Monitoring Program for Montane Meadows in Kootenay National Park : Dolly Varden Burn

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1.0 Background and Objectives

Fire plays a key role in shaping the forests of the Rocky Mountains (Johnson and Miyanishi 1991, Arno 1980, Habeck and Mutch 1973). In Kootenay National Park in the southern Rockies of British Columbia, fire suppression has been actively carried out since the park was established in 1919 (Masters 1990). One consequence of this has been significant juvenile forest ingrowth in the meadows and open forest components in the montane region of Kootenay National Park (Van Egmond 1990). The increased canopy cover is thought to have affected ungulate range quality in these meadows, forcing deer, elk and moose to seek out browse on roadsides where they are subject to greater mortality. Increased canopy cover in these meadows has likely affected other species as well. Long term ecosystem management objectives for the mountain parks include the use of fire to maintain ecological processes (Parks Canada 1997) and prescribed burns are now being conducted in montane meadows and other areas. However, little is known of the effects of these burns on park wildlife, including birds. The montane region supports a high density and diversity of songbirds (e.g., Hebblewhite 1997, Vernier 1995, Holroyd and Van Tighem 1983, Stuart-Smith, unpubl. data) and information on their response to prescribed burning is required for effective ecosystem management.

The main objectives of this project were to:

1. Establish a methodology for an annual avian monitoring program to assess the effects of prescribed burning in montane meadows
2. Obtain estimates of avian abundance, richness, and diversity in the Dolly Varden prescribed burn in spring/summer 1998.

2.0 Study Area

The Dolly Varden meadow is located south of Kootenay Crossing and west of the Dolly Varden picnic area in Kootenay National Park. (Figure 1). It is approximately 50 ha in size, lies at 1190 m in elevation and is classified as a montane wet shrubby meadow (ecosite VL2), with slope 0-5 % (Poll et al. 1984). Approximately 15 ha of this polygon was burned with a low intensity prescribed fire in April 1998. The burned portion has several small streams running through it, open grassy areas, large areas dominated by tall shrubs (mainly willow, *Salix sp.*), and scattered White Spruce (*Picea glauca*), Lodgepole Pine (*Pinus contorta* var. *latifolia*), Douglas Fir (*Pseudotsuga mensiesii* var. *glauca*), Trembling Aspen (*Populus tremuliodes*), Paper birch (*Betula papyrifera*) and willow trees along the edges and scattered throughout.

3.0 Methods

3.1 Survey Method Determination

There are three main methods used to census songbirds; spot mapping, transect surveys, and point counts. There is a vast and often contradictory literature on the relative merits of the various methods (Ralph et al. 1993, Dale and Holroyd 1994), but some general statements can be made. Spot or territory mapping is an intensive method that can provide detailed information about bird-habitat relationships, but is time consuming and inefficient because each site must be visited at least eight times. It relies on the assumption that birds live in pairs and have discrete, non-overlapping territories, which does not hold for all species (Bibby et al 1993). It also does not work well for birds that do not show strong territorial behaviour, such as semi-colonial species (i.e., Wilson's Warbler in good habitat, Rufous Hummingbirds - see Table 1 for scientific names), those that do not sing, and those that may sing in more that one territory and keep quite while moving between them, such as some wood warblers (Bibby et al. 1993).

Point counts are considerably more efficient and can be a strong tool for identifying habitat relationships, because the count area is known and the vegetation inside within can be accurately measured (Dale and Holroyd 1994). They are particularly useful where steep or uneven terrain make walking and surveying simultaneously difficult and noisy (Dale and Holroyd 1994). Many songbird researchers use some form of point counts, enabling comparisons among different studies. However, this method relies mainly on song to detect birds, and thus is not particularly good for counting shorebirds, ducks, grouse, or woodpeckers. In addition, for small areas where the count area borders a non-count area, such as a small meadow surrounded by a feathered forest edge (like the montane meadows under consideration here), determining whether a bird is singing in the meadow or just inside the forest can be difficult from a distance. This is a large disadvantage for a study such as this one, where major effects of the burn are expected to occur along the edge of the meadow, where the encroaching trees had been burned. An accurate survey of this area is important for detecting differences over time.

Transects with small belt widths (< 30 m) avoid this problem, as it is easier to estimate distance to the birds for shorter distances, and more birds are visually detected as well as heard. In open, level

except in one location where they came within 60 m from one another. Transects were marked with pink flagging tape at 20-40 m intervals.

Three surveys were conducted, on May 31, June 15, and July 1 1998. Other studies have found that the number of songbird species detected at a site begins to level off after three surveys, and that additional surveys do not detect significantly more species (F.K.A. Schmiegelow, University of Alberta, pers. comm). Weather during all surveys was calm to light winds and light to no rain. Surveys were conducted between 5:30 am and 8:30 am by two observers. Both observers had at least five years experience in surveying birds by sound and sight, and spent 2 weeks at the beginning of the 1998 season training in local bird identification and distance estimation. Each observer surveyed each transect at least once to minimize observer bias. Transects were walked at a slow, consistent pace of about 10 m per minute. All birds detected within a 25 m band on either side of the transect line recorded, and the perpendicular distance to each bird from the transect line estimated. Care was taken not to record the same bird twice. The species, method by which it was detected (song, visual, call), and the time it was detected, were recorded for all birds, and the location and behaviour of visually detected birds. Birds detected outside the 25 m strip width were also recorded, and the perpendicular distance of the bird to the transect line noted. These distance data enable density calculations at a later date if desired. Red squirrels were also recorded, as these mammals can be surveyed using the same methods as for birds.

3.3 Point Counts

Three point count stations were established in the burned area (Figure 1). Point centers were placed such that the majority of the burned area was covered, and that the count area covered only burned area. Point counts were conducted on June 15 and July 1 (time limitations prevented point count data from being collected during the first transect survey on May 31). All birds detected within a 75 m radius of the point count station during a 12 minute period were recorded, along with the time of detection, type of detection (song, call, visual), distance of the bird to the point center, and the behaviour and location of visually detected birds. Each observer surveyed each station at least once and survey times were varied such that each station was surveyed at a different time of day for each survey.

abundance of all species was 80.67 ± 18.06 (std.). Abundance appeared to increase as the season progressed; from 63.5 on May 31, to 79.0 on June 15, and to 99.5 on July 1 (Table 2).

The point count data produced 97 detections representing 32 species. Mean abundance was 39.75 species. Because totals were much lower than those generated from the transect counts, and many species known to be present were not detected (i.e., grouse, snipes, sapsuckers), transect data were used for further community analysis.

The mean abundance of each species is given in Table 2. Fifty percent of the total abundance was comprised of 9 species; Dark-eyed Junco, Lincoln's Sparrow, American Robin, Warbling Vireo, Alder Flycatcher, Ruby-crowned Kinglet, Common Yellowthroat, Pine Siskin, and Yellow Warbler (Table 2). With the exception of the junco, these are mainly insectivorous species (Table 1, Ehrlich et al 1988). This was also true of most species in the burn; considering all 50 species, 76 % rely primarily on insects for their diet (Table 3). Seven different nesting locations were represented by the 50 species (Table 3), likely reflecting the wide array of nesting habitats available within the burn.

Log series α.diversity was 55.66, with a variance of 61.97. Interpreting diversity indices is difficult (Krebs 1989) and the measure here is provided for future comparisons within the burn over time.

moch	Mountain Chickadee*	*Parus gambeli*	Conifer	Foliage gleaner	Insects	Common
nofl	Northern Flicker	*Colaptes auratus*	Snag	Hawks	Insects	Common
nowa	Northern Waterthrush	*Seiurus noveboracensis*	Ground	Ground gleaner	aq. inverts	Uncommon
ocwa	Orange-crowned Warbler	*Vermivora celata*	Ground	Foliage gleaner	Insects	Common
osfl	Olive-sided Flycatcher	*Contopus borealis*	Conifer	Hawks	Insects	Common
piwo	Pileated Woodpecker*	*Dryocopus pileatus*	Snag	Bark gleaner	Insects	uncommon
pisi	Pine Siskin*	*Carduelis pinus*	Conifer	Foliage gleaner	Seeds	Common
rcki	Ruby-crowned Kinglet	*Regulus calendula*	Conifer	Foliage gleaner	Insects	Common
rnsa	Red-naped Sapsucker	*Sphyrapicus nuchalis*	Deciduous	Hawks	Insects, tree sap	Common
rugr	Ruffed Grouse*	*Bonasa umbellus*	Ground	Foliage browser	Omnivore	Common
ruhu	Rufous Hummingbird	*Selasphorus rufus*	Conifer	Hawks	Insects	Common
rwbl	Red-winged Blackbird	*Agelaius phoeniceus*	Reeds	Ground gleaner	Insects	Common
sosp	Song Sparrow	*Melospiza melodia*	Ground	Ground gleaner	Insects	Rare
spgr	Spruce Grouse*	*Dendragapus canadensis*	Ground	Foliage browser	Greens	Common
swth	Swainson's Thrush	*Catharus ustulatus*	Shrub	Foliage gleaner	Insects	Common
towa	Townsend's Warbler	*Ddendroica townsendi*	Conifer	Foliage gleaner	Insects	Common
trsw	Tree Swallow	*Tachycineta bicolor*	Snag	Aerial forager	Insects	Uncommon
vath	Varied Thrush	*Ixoreus naevius*	Conifer	Ground gleaner	Insects	Common
wavi	Warbling Vireo	*Vireo gilvus*	Deciduous	Foliage gleaner	Insects	Common
weta	Western Tananger	*Piranga ludoviciana*	Conifer	Folliage gleaner	Insects	Common
wifl	Willow Flycatcher	*Empidonax traillii*	Shrub	Hawks	Insects	Uncommon
wiwr	Winter Wren	*Troglodytes troglodytes*	Snag	Ground gleaner	Insects	Common
wwcr	White-winged Crossbill*	*Loxia leucoptera*	Conifer	Foliage gleaner	Seeds	Uncommon
yewa	Yellow Warbler	*Dendroica petechia*	Shrub	Foliage gleaner	Insects	Uncommon
yrwa	Yellow-rumped Warbler	*Dendroica coronata*	Conifer	Foliage gleaner	Insects	Common

Table 3. Distribution of nest locations and primary diet items of the 50 species observed in the Dolly Varden burn.
After Ehrlich et al. 1988.

Nest Locations	# of species	Primary Diet	# of species
Building/cliff	2	insects	38
conifer tree	14	omnivore	3
deciduous tree	7	seeds	4
ground	12	greens	2
reeds	2	aquatic inverts	3
shrub	8		
snag	5		

4.1 Nesting Evidence

During the surveys, four American Robin, two Common Snipe, and one Tree Swallow nests were found. The robin nests were too high to see into them, but two were active, evidenced by a female at one nest and a female completing nest building at the other. The other two nests looked recent but no birds were present. Females were flushed off the snipe nests while walking transects; both nests contained 4 eggs. The swallow was nesting in a cavity in a burned tree near the edge of the meadow, and was seen entering and exiting the cavity.

In addition, a Rufous Hummingbird was observed performing courtship displays (large u-shaped dives), a pair of Lincoln's Sparrows were observed carrying nesting material to the shrubs in the center of the burn, and a robin was observed carrying food. Five fledgling juncos, one fledgling Yellow-rumped Warbler, and one fledgling Chipping Sparrow were also detected.

5.0 Discussion

A high number of species and individuals were detected in the Dolly Varden burn. Of the 158 winter and summer resident birds in the park (listed in Harris 1976), fifty, or 32 %, were found in 15 ha of the Dolly Varden meadow. The richness of this site is evident in comparison to that detected in other studies in the Rocky Mountains. Hebblewhite (1997) surveyed montane forest in the Carrot Creek and Johnson Creek areas of Banff National Park and detected only 30 species along his transects, despite the fact that he surveyed a much larger area (4x1500 m transects, 200 m wide). McIvor and McIvor (1994), in their survey of six aspen stands in Banff National Park, detected between 13 and 20 species at a given site (6, 600 transects, 50 m wide).

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