

Habitat Use and Distribution of Listed Neotropical Migrant Songbirds in Northeastern British Columbia

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ABSTRACT

The primary objective of this paper is to summarize the distribution and habitat use of Red- and Blue-listed neotropical migrant songbirds (hereafter referred to as “listed” species) in the Fort Nelson Forest District (FNFD) in northeastern British Columbia. Data were summarized from 2 main sources: anecdotal data and studies conducted prior to 1996; and 4 Forest Renewal British Columbia (FRBC) studies conducted since 1996. We also compared the relative density of listed species (pairs/ha) to densities reported in the central and eastern parts of their breeding range. The dominant biogeoclimatic zone in the FNFD is the Boreal White and Black Spruce (BWBS) zone (68% of the district), which represents a large part of the mixedwood boreal forest found in British Columbia. Northeastern British Columbia is home to 6 listed species that are rare or unrecorded in the rest of the province: bay-breasted warbler (BBWA), black-throated green warbler (BTNW), Canada warbler (CAWA), Cape May warbler (CMWA), Connecticut warbler (COWA), and Philadelphia vireo (PHVI). The listed species are of particular management concern because they have a relatively limited distribution in British Columbia, they use habitats often targeted for forest development, and little is known about their distribution and breeding ecology in the province. All the studies in the FNFD found listed species using similar habitats to those described in the literature. BTNW and COWA were rare and are likely restricted to the southern portion of the FNFD. PHVI also appeared to be rare, but were sporadically distributed throughout the eastern portion of the FNFD and as far north as southeastern Yukon. BBWA, CAWA, and CMWA were all common in their preferred habitats. The densities of common listed species (BBWA, CAWA, CMWA) and several other neotropical migrants (magnolia warblers, ovenbirds, Tennessee warblers) were similar to densities reported from the central and eastern parts of their ranges. This suggests that the FNFD has optimal habitat for these listed species and others, and that western portions of the boreal forest may have unique ecological characteristics that respond to human development differently than eastern portions of the boreal forest.

Key words: boreal forest, distribution, habitat use, neotropical migrants, northeastern British Columbia, songbirds.

The boreal region is the only forested circumpolar terrestrial biome, and includes very large forested wilderness areas interspersed with very large peatland wilderness areas, covering approximately 1.6 billion ha (Pastor et al. 1998). Today, the boreal forest is developed over significant portions of previous ranges, largely as a result of forest harvesting (Niemi et al. 1998). In British Columbia, the Boreal White and Black Spruce biogeoclimatic zone (BWBS) exemplifies the lower elevation component of the boreal region. The BWBS zone

occurs throughout northern British Columbia, but is most common in the Fort Nelson Forest District (FNFD) in the northeastern portion of the province. Much of the BWBS falls in the “enhanced resource development zone” (LRMP 1997) and as such, has a lower biodiversity emphasis option (B.C. Ministry of Forests and B.C. Ministry of Environment Lands, Lands and Parks 1995).

A number of songbirds that are rare or unrecorded in the rest of the province breed in the northeastern portion of British Columbia (Enns and Siddle 1996), including 6 that are listed as either Red or Blue species by the Conservation Data Centre (CDC) of the British Columbia Ministry of

Environment, Lands and Parks (MELP), and are hereafter referred to as "listed" species; Red-listed species are considered to be endangered or threatened in British Columbia, and Blue-listed species are considered to be vulnerable or sensitive (B.C. Ministry of Environment Lands, Lands and Parks 1998). Red-listed species believed to breed in the FNFD include the Cape May warbler (*Dendroica tigrina*; CMWA), the bay-breasted warbler (*Dendroica castanea*; BBWA), the Connecticut warbler (*Oporornis agilis*; COWA), and the black-throated green warbler (*Dendroica virens*; BTNW); Blue-listed species include the Canada warbler (*Wilsonia canadensis*; CAWA) and the Philadelphia vireo (*Vireo philadelphicus*; PHVI; Ministry of Environment Lands, Lands and Parks 1998). Very few nesting sites have been confirmed in British Columbia and information is limited regarding the distribution and abundance of these species (Campbell et al. 1997, 1999). Although their habitat requirements have been described in eastern North America, it is still unclear how applicable the descriptions are to northeastern British Columbia.

These species are of particular management concern because they are all neotropical migrants, meaning they breed in temperate regions but migrate long distances from their wintering grounds in the tropical Americas. Recent studies have indicated a widespread decline in populations of neotropical migrants, and provincial status reports on these species suggest that there could be significant negative impacts from forest development (Cooper et al. 1997a-f).

There are 2 principal natural resource development industries in the FNFD: forest harvesting, and oil and gas development. The forest industry has had a significant and growing impact since the early 1970s. Original development targeted the valley-bottom white spruce (*Picea glauca*) stands and, as a result, these stands are relatively rare. The rate of harvest is likely to increase, particularly in the upland deciduous and mixedwood stands (M. Thorp, British Columbia Ministry of Forests, Fort Nelson, 1999, pers. comm.).

The natural gas industry has been active in the FNFD since the 1950s (LRMP 1997). Operations begin with seismic exploration, typically straight lines cut with a bulldozer, which may be hundreds of kilometres long. Seismic activity is increasingly laid out in a grid pattern over hundreds of square kilometres. The result is a bewildering pattern of intersecting straight lines, over the entire district. Once a likely gas source has been pinpointed, a well site is cleared, typically 1.5–5 ha, and a drilling rig is installed. Together, exploration and development may have cleared an average of 1,500 ha per year since the 1970s, or approximately 57,000 ha to date (M. Thorp, pers. comm.).

The objectives of this paper are to summarize FNFD bird inventory results, summarize the distribution and habitat use of listed forest-dwelling neotropical migrants (BBWA, BTNW, CAWA, CMWA, COWA, PHVI), comment on the relative

abundance of species in this area compared to the centre of their range, comment on possible impacts from forestry and mining, and suggest future research required.

STUDY AREA

The FNFD is bounded to the east by Alberta, to the north by the Yukon and the Northwest Territories, to the west by the northern Rocky Mountains, and to the south by the Fort St. John and Mackenzie forest districts (Fig. 1). It is the second largest forest district in British Columbia, covering approximately 8.2 million ha. The BWBS is the dominant biogeoclimatic zone, found over 68% of the district. This landscape features long, very cold winters, where monthly average temperatures are $<0^{\circ}\text{C}$ for half the year (Meidinger and Pojar 1991). The major tree species are white and black spruce (*Picea mariana*), lodgepole pine (*Pinus contorta*), tamarack (*Larix laricina*), balsam fir (*Abies balsamea*), paper birch (*Betula papyrifera*), balsam poplar (*Populus balsamifera*), and trembling aspen (*Populus tremuloides*). Forest fires are the dominant natural disturbance, though frequent outbreaks of defoliating insects also occur (B.C. Ministry of Forests and B.C. Ministry of Environment Lands, Lands and Parks 1995). The district has relatively high forest productivity compared to other neighbouring boreal forest districts, due to the FNFD's high topographic complexity, extensive riparian forest habitat associated with large rivers, coarse-textured and well-drained soils, high precipitation, and high latitude (giving long summer daylight hours; D. Patterson, Forest Management Division, Alberta Department of Environmental Protection, 1999, pers. comm.). The Boreal Plains, Northern Boreal Mountains, and Taiga Plains ecoprovinces are represented in the study areas. For a complete description see Demarchi (1990).

METHODS

Since 1996, MELP has initiated 4 bird inventories in the FNFD to gain a better understanding of boreal forest bird communities. These studies have been funded by Forest Renewal British Columbia (FRBC). For more details on survey methods please refer to the specific reports (Bennett and Enns 1996, Bennett et al. 1998, Savignac 1998, Bennett 1999). The Smith River, the Dunedin airstrip (an area accessed by the Dunedin airstrip between Torpid Creek and the Dunedin River), Dunedin River (valley bottom of Dunedin River, accessed by helicopter west of the Dunedin airstrip), and Prophet River were surveyed in 1998. In 1997, 261 northern goshawk (*Accipiter gentilis*) call-playback sites scattered throughout the west-central portion of the FNFD were sampled (with a 5-min listening period for songbirds), and in 1996 the Liard River near the "Big Bend" was surveyed.

We generated distribution maps for each listed species as in Enns and Siddle (1996), with locations from recent surveys

(Bennett and Enns 1996, Bennett et al. 1998, Bennett 1999) plotted over the previous ranges as reported by Godfrey (1986) and Enns and Siddle (1996). We summarized the habitat use for each listed species from recent studies in the FNFD (Bennett and Enns 1996, Enns and Siddle 1996, Bennett et al. 1998, Savignac 1998, Bennett 1999), and common habitat

attributes are presented in tabular fashion. The habitats that listed species used in the FNFD were compared to the habitats they used in other regions of the boreal forest. Densities of listed species were estimated from point count and transect data from the FRBC studies and compared to density estimates in the literature.

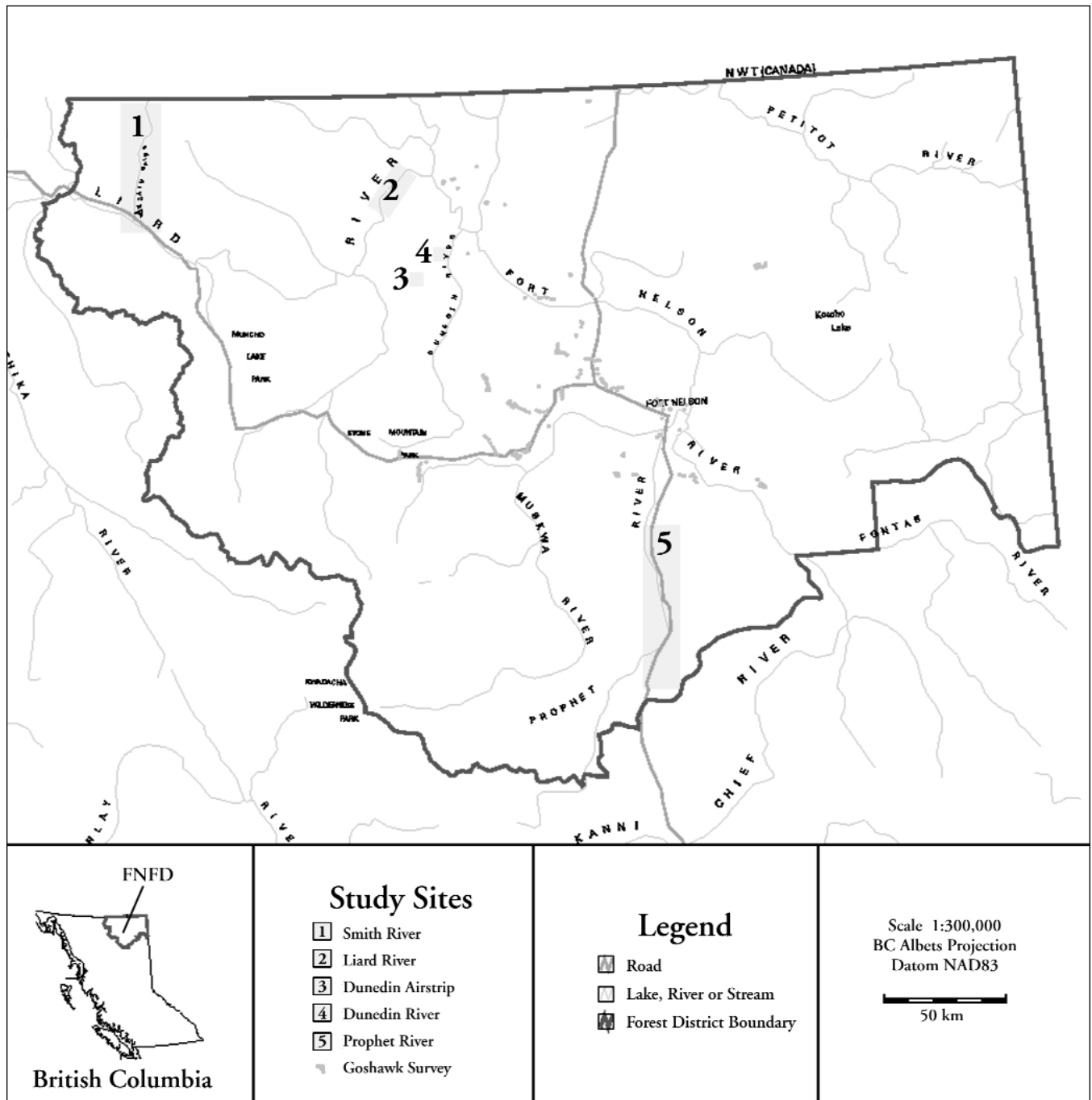


Figure 1. Location of Fort Nelson Forest District and study areas in northeastern British Columbia.

RESULTS

GENERAL

The number of neotropical migrant songbirds¹ recorded throughout the FNFD appeared to decrease the farther north and west studies were conducted in the FNFD. The Prophet River study site in the southern portion of the FNFD had the most neotropical migrants (27 species; Savignac 1998), and the Smith River in the northwest portion of the FNFD had the least (20 species; Bennett et al. 1999).

Since 1996, 357 individual records of listed species have been made in the FNFD. These records account for approximately 80% of all records of listed species collected in the FNFD to date (S. Cannings, British Columbia Conservation Data Centre, 1999, pers. comm.). The new records also represent predominantly new sites where the species have been recorded. Previous records were generally along the Alaska Highway, at provincial parks, and near the Fort Nelson airport. The Prophet River was the only site where all 6 listed species were recorded in the FNFD, and it is the only site where BTNW, COWA, and PHVI were recorded. BBWA, CAWA, and CMWA were all recorded at the Liard, northern goshawk, and Dunedin sites, whereas the CMWA was the only listed species recorded at the Smith River site.

All the studies found species using habitats similar to those described in the literature, with the exception of the CAWA. Almost all of the records of CAWA since 1996 were in mature aspen-dominated forests, whereas in studies outside the FNFD, CAWA were frequently recorded in younger, cut-over areas (McLaren 1987). Mature and old forests appeared to be preferred by all listed species except the COWA and to a lesser extent PHVI, which used pole-stage aspen (Savignac 1998). All listed species were generally restricted to valley-bottom sites and mid-slopes along major rivers, except CMWA, which were found in mid to upper elevations throughout the FNFD (Bennett and Enns 1996, Bennett 1999).

There is a unique assemblage of western montane and eastern boreal forest bird species in the FNFD because it is bordered on the west by the Rocky Mountains and the east by the northern Alberta Plain. "Western" species such as western tanager (*Piranga ludoviciana*), Townsend's warbler (*Dendroica townsendi*), varied thrush (*Ixoreus naevius*), and Hammond's flycatcher (*Epidonax oberholseri*) were common and recorded in the same locations as "eastern" species such as BBWA, magnolia warbler (*Dendroica magnolia*; MAWA), ovenbird (*Seiurus aurocapillus*; OVEN), and red-breasted grosbeak (*Pheucticus ludovicianus*; Bennett and Enns 1996, Bennett et al. 1998, Greenberg and Sterling

1994, Savignac 1998, Bennett 1999). The FNFD is also uniquely situated at the southern extent of many arctic breeding species and the northern extent of many southern breeding species. For example, we found evidence of breeding Pacific loons (*Gavia pacifica*) and arctic terns (*Sterna paradisaea*) in the same area as breeding pairs of black terns (*Chlidonias niger*) and soras (*Porzana carolina*).

BAY-BREASTED WARBLER

Abundance/Population Status

BBWA were relatively common in their preferred habitat. The density of BBWA was the third highest out of 20 species in mature mixed riparian forest and fifth highest out of 31 species in mature coniferous riparian forest at the Liard River (Bennett and Enns 1996). Eastern North American populations have been demonstrated to fluctuate widely depending on spruce budworm (*Choristoneura fumiferana*) levels (Williams 1996). No long-term studies have confirmed that this phenomenon occurs in the western part of their range. A North American-wide decline in BBWA populations has not been demonstrated, although spraying of vast areas of forest to control for spruce budworms, and forest harvesting are anticipated to cause population declines. Their status is listed as follows: Provincial listing - Red; CDC provincial rank - S2B, SNZ; CDC global rank - G5; COSEWIC (Committee on the Status of Endangered Wildlife in Canada) - not listed; British Columbia Identified Wildlife - no.

Distribution

BBWA breed across the boreal forests of Canada and northern New England with the bulk of the population thought to be in Ontario, Quebec, and the Maritime provinces (Dunn and Garrett 1997). The breeding range extends from east-central and northeastern British Columbia to extreme southeastern Yukon, and across northeastern Alberta as far as western Newfoundland (Dunn and Garrett 1997). BBWA winter from Costa Rica and Panama to northwest South America east of the Andes (Williams 1996, Dunn and Garrett 1997).

The breeding distribution has been confirmed in the Yukon, as a BBWA nest site was found in the lower La Biche River drainage in 1996 (Eckert 1998). Enns and Siddle (1996) also recorded secondary evidence of breeding northwest of Fort Nelson in 1992. Records since 1996 have expanded the range west by approximately 75 km. No nest sites have been located in British Columbia, but males have been recorded defending territories, and males and females have been seen carrying food to suspected nest sites (Bennett and Enns 1996).

Habitat Use

Enns and Siddle (1996) proposed a BBWA habitat model of mixedwood stands dominated by tall, closed-canopy, large spruce, with aspen and birch also common in the canopy and

¹ We used the list of neotropical migrants used by Savignac (1998) to compare total numbers between studies. Only forest songbirds were considered (i.e., swallows, shorebirds, and other open-habitat species are not included in the totals presented).

a tall (1–2 m) shrubby understory of highbush cranberry (*Viburnum edule*), red-osier dogwood (*Cornus stolonifera*), and green alder (*Alnus crispa*). All studies since then have found BBWA using similar habitat, with the exception of balsam poplar also being associated with BBWA sites (Bennett and Enns 1996, Bennett 1999). It appears that the farther north and west BBWA are found in the FNFD, the more restricted they are to valley-bottom and mid-slope mature mixed forests. In the south-central portions of the FNFD, the BBWA has been found at numerous upland-slope sites and does not appear to be restricted to large river valleys (Bennett et al. 1998, Savignac 1998). However, at the “Big Bend” on the Liard River and in the Dunedin River, BBWA were restricted to valley-bottom and mid-slope sites (Bennett and Enns 1996, Bennett 1999).

BLACK-THROATED GREEN WARBLER

Abundance/Population Status

The BTNW is likely a rare breeding bird in the FNFD. Both studies that recorded the BTNW in the FNFD were in the southern portion of the district and only 9 records were made (MacNaughton 1995, Savignac 1998). BTNW are found in higher numbers in the Fort St. John and Dawson Creek forest districts (Merkens and Booth 1998; C. Siddle, Vernon, 1999, pers. comm.). Long-term declines and range contractions have occurred in Wisconsin, Michigan, and southern Ontario, but North American trends are confused by year to year population fluctuations (Dunn and Garrett 1997). The greatest abundance of BTNW are thought to occur in Maine, Nova Scotia, and New Brunswick. Their status is listed as follows: Provincial listing - Red; CDC provincial rank - S2B, SNZ; CDC global rank - G5; COSEWIC - not listed; British Columbia Identified Wildlife - no.

Distribution

BTNW breed across the boreal forests of Canada from east-central British Columbia and northern and central Alberta to Newfoundland (Dunn and Garrett 1997). The BTNW also breeds in central Minnesota and the Appalachian Mountains (Dunn and Garrett 1997). BTNW winter mainly in northeast Mexico south to Central America.

The breeding distribution has been confirmed by MacNaughton (1995), Siddle (1992) and Enns and Siddle (1996) who, combined, have >122 records of the BTNW in the Boreal Plains and Taiga Plains ecoprovinces around Fort St. John. Records since 1996 have expanded the range north by approximately 100 km. No nest sites have been located in British Columbia (Campbell et al. 1999).

Habitat Use

Enns and Siddle (1996) proposed a BTNW habitat model of tall mixedwood stands of spruce and poplar with mid-aged, mid-canopy aspen (BWBS balsam poplar riparian habitat

type). They also found BTNW in the same habitat used by OVEN. The stands tended to be mesic with relatively shrubby understories of highbush cranberry, prickly rose (*Rosa acicularis*), bunchberry (*Corus canadensis*), and fireweed (*Epilobium angustifolium*). The only study to find BTNW since 1996 was the Prophet River study. At the Prophet River, BTNW were found in a relatively closed, mature mixed stand and a relatively open, aspen-dominated stand with a thick shrub layer (Savignac 1998). It appears that the BTNW is more restricted to old, valley-bottom forests than the other listed warblers, as it is rarely found in upper-slope sites (Savignac 1998; C. Siddle, pers. comm.).

CANADA WARBLER

Abundance/Population Status

CAWA were relatively common in most of the surveys and often were 1 of the most common species in their preferred habitat. For example, at the Liard River study site, CAWA were the most abundant species in mature deciduous upper-slope forest. At the Prophet River, CAWA were only recorded twice, but all habitat types were not systematically surveyed (Savignac 1998). Sharp population declines have been noted in Pennsylvania due to fragmentation; however, it appears to be stable over much of its range (Dunn and Garrett 1997). Their status is listed as follows: Provincial listing - Blue; CDC provincial rank - S3, S4B; CDC global ranking - G5; COSEWIC - not listed; British Columbia Identified Wildlife - no.

Distribution

CAWA breed across the boreal forests of Canada, from north-eastern British Columbia to Nova Scotia and south to central Alberta across to northeastern Ohio (Dunn and Garret 1997). They winter almost exclusively in South America east of the Andes in Columbia, Peru, Ecuador, and Venezuela (Dunn and Garret 1997).

The breeding distribution has been confirmed in British Columbia by Siddle (1992), Enns and Siddle (1996), Bennett and Enns (1996), Bennett et al. (1997), Savignac (1998) and Bennett (1999), who have recorded 141 CAWA in the Boreal Plains and Taiga Plains ecoprovinces between Fort St. John and the Yukon–British Columbia border. Records since 1996 have expanded the range west by approximately 50 km. No nest sites have been located, but evidence of breeding has been observed (i.e., males and females carrying food; males defending territories). CAWA have also been recorded frequently in the southeastern portion of the Yukon along the Liard River (C. Machtans, Western Arctic Habitat Program, Canadian Wildlife Service, 1998, pers. comm.).

Habitat Use

Enns and Siddle (1996) proposed a CAWA habitat model of steep unstable slopes with thick undergrowth, often dominated by soopolallie (*Shepherdia canadensis*) and rose. Birch was the

dominant tree cover, and spruce, aspen, and balsam poplar were also present. Windthrown trees and debris were common. Almost all records of CAWA since 1996 have been in mature aspen stands with closed canopies, open midstories (tree stems spaced widely), and dense understories often dominated by alder and highbush cranberry (Bennett and Enns 1996, Bennett et al. 1998, Savignac 1998, Bennett 1999). Two records along the Liard River were from young deciduous forest types (Bennett and Enns 1996). Other literature suggests that CAWA prefer riparian habitats and shrubs along streams (Dunn and Garrett 1997), but most of our records have been in upper-slope forests. These records suggest that CAWA require dense shrub habitat but can exploit both mature and young forest types depending on location and availability.

CAPE MAY WARBLER

Abundance/Population Status

CMWA were relatively common in most of the surveys and often were 1 of the most common species in their preferred habitat. For example, CMWA were the fourth most common bird recorded in the mature conifer habitat at the Dunedin airstrip, and the seventh most common in old coniferous habitat at the Smith River. Population status estimates are problematic for CMWA populations because they fluctuate more than most warblers, due to their reliance on spruce budworm populations (which are known to be very cyclic). Some local decreases and increases have been noted with no clear North American-wide trend (Dunn and Garrett 1997, Baltz and Latta 1998). The cyclic nature of CMWA populations has only been confirmed in the eastern part of its range. Their status is listed as follows: Provincial listing - Red; CDC provincial rank - S2B, SNZ; CDC global rank - G5; COSEWIC - not listed; British Columbia Identified Wildlife - no.

Distribution

CMWA breed across the boreal forests from southeastern Yukon and northeastern British Columbia across Canada to southwestern Newfoundland (Dunn and Garrett 1997) and are generally thought to be more common in the eastern part of their range (Dunn and Garrett 1997). CMWA winter primarily in the Bahamas and islands in the western and southern Caribbean (Baltz and Latta 1998).

The breeding distribution has been confirmed in the southeastern Yukon, where CMWA were recorded along the La Biche and Beaver rivers (C. Machtans, pers. comm.). Their distribution was also confirmed in northeastern British Columbia, where they were recorded around Fort Nelson (Enns and Siddle 1996). Records since 1996 have expanded the range northwest by approximately 150 km. No nest sites have been located, but males have been recorded defending territories, and males and females have been seen carrying food to suspected nest sites (Bennett and Enns 1996, Bennett et al. 1998, Bennett 1999).

Habitat Use

CMWA occupy mature to medium-aged coniferous forests, or bogs dominated by black and/or white spruce (Dunn and Garrett 1997, Baltz and Latta 1998). Enns and Siddle (1996) proposed a CMWA habitat model of white spruce in relatively dense, tall stands on flat ground with an open mossy understory. Almost all records of CMWA since 1996 have been in mature black and/or white spruce stands with open moss-dominated understories (Bennett and Enns 1996, Bennett et al. 1998, Savignac 1998, Bennett 1999). CMWA were found in young (40–80 yr old) to old (>140 yr old) forests, but most of the sightings were in mature forest. Tall spruce trees protruding from the canopy were often used by males for singing perches.

CONNECTICUT WARBLER

Abundance/Population Status

The COWA is not a common species anywhere in its range (Dunn and Garrett 1997). There is some evidence that it has declined since the nineteenth century, but it is unclear why, since breeding and wintering habitat appears to be relatively secure (Cooper et al. 1997f, Dunn and Garrett 1997). Their status is listed as follows: Provincial listing - Red; CDC provincial rank - S2B, SNZ; CDC global ranking - G4; COSEWIC - not listed, British Columbia Identified Wildlife - no.

Distribution

COWA breed across the boreal forests in Canada in a relatively narrow band from northeastern and east-central British Columbia and central Alberta, to central Quebec (Dunn and Garrett 1997). It is generally uncommon and local over much of its range (Dunn and Garrett 1997). COWA wintering range is poorly understood, but they are thought to winter entirely in South America in the Amazon region.

The breeding distribution has been confirmed by Siddle (1992) and Enns and Siddle (1996), who recorded 26 COWA around Fort St. John. COWA are more abundant in the Dawson Creek and Fort St. John forest districts (Merkens and Booth 1998; C. Siddle, pers. comm.). Since 1996, COWA have only been recorded along the Prophet River in the FNFD, which is a range expansion north by approximately 100 km (Savignac 1998). No nest sites have been located, but males have been recorded defending territories, and males and females have been seen carrying food to suspected nest sites (Campbell et al. 1999).

Habitat Use

Habitat varies widely throughout its range from wet conifer bogs to well-drained deciduous woodlands (Dunn and Garrett 1997). Enns and Siddle (1996) proposed a COWA habitat model of mature, well-spaced, aspen-dominated forests on flat to gently sloping terrain with intermittent white spruce. The understory was well developed with a noticeable gap between the shrub layer and the canopy layer. Since 1996,

COWA have only been recorded at the Prophet River (Savignac 1998). All records of COWA at the Prophet River were in immature aspen stands (Savignac 1998).

PHILADELPHIA VIREO

Abundance/Population Status

PHVI appear to be relatively rare and locally distributed, and their distribution is likely associated with the presence of adequate deciduous forests (Campbell et al. 1997). They may be vulnerable to logging of northeastern deciduous forests, but their ability to use second-growth forests likely makes them less vulnerable than other northeastern songbirds (Cooper et al. 1997b). Nonsignificant increases and decreases in populations have been noted in Canada and the United States, and their habitat appears to be relatively secure (Moskoff and Robinson 1996). Their status is listed as follows: Provincial listing - Blue; CDC provincial rank - S3S4B; CDC global ranking - G5; COSEWIC - not listed; British Columbia Identified Wildlife - no.

Distribution

PHVI breed across the boreal forests of Canada from southeastern Yukon and northeastern British Columbia to southwestern Newfoundland (Godfrey 1986, Campbell et al. 1997). PHVI winter from Guatemala south to central Panama (Ehrlich et al. 1988).

Breeding of PHVI has been confirmed by Enns and Siddle (1996), who recorded 6 PHVI around Fort St. John and Fort Nelson, and the Canadian Wildlife Service, which recorded PHVI in southeastern Yukon (C. Machtans, pers. comm.). Since 1996, PHVI have only been recorded at the Prophet River (Savignac 1998), which is within their previously defined range (Enns and Siddle 1996). Four nest sites have been located in stands of trembling aspen and 1 in a balsam poplar stand (Campbell et al. 1997).

Habitat Use

PHVI typically use tall, young aspen or balsam poplar stands with 80–100% canopy closure (Campbell et al. 1997). Some mixed aspen and spruce forests are also used and both old-growth and second-growth stands are used, but second-growth stands are probably preferred (Campbell et al. 1997). Enns and Siddle (1996) propose a PHVI habitat model of dense, rapidly growing young aspen (approximately 20 years old), with lots of branches in the mid to lower canopy, and a 80–100% canopy closure. Associated understory species included Indian paintbrush (*Castilleja miniata*), fireweed, highbush cranberry, alder, willow (*Salix* spp.), and clover (*Trifolium hybridum*). Since 1996, PHVI have only been recorded at the Prophet River (Savignac 1998). All records of PHVI at the Prophet River were at the edge of old forests and old clearcuts dominated by deciduous trees (Savignac 1998).

DISCUSSION

STATUS AND DISTRIBUTION

CMWA, CAWA, and BBWA appear to be widely distributed in the FNFD and common in their preferred habitat. The CMWA probably has the widest distribution throughout the district and within individual valleys, as it utilizes valley bottom to upper elevations more readily than BBWA and CAWA. BTNW and COWA are rare in the district and appear to have a much more restricted and patchy distribution. They are mainly restricted to the southern and eastern portions of the district. PHVI appear to have a similar distribution to BTNW and COWA, as they are rare in the FNFD and sporadically distributed. However, PHVI have been recorded in southeastern Yukon along the La Biche River, which enters the Liard River approximately 25 km northwest of the “Big Bend” study site (C. Machtans, pers. comm.). This suggests that PHVI occur throughout the FNFD at least as far east as Fort Nelson and north to the Yukon border. As Campbell et al. (1997) noted, PHVI are restricted to areas with adequate young to mature deciduous forests. The songs of the PHVI and red-eyed vireos (*Vireo olivaceus*; REVI) are very similar, and the PHVI may even mimic the REVI, which also makes it difficult to determine the true distribution of PHVI.

It is unknown whether populations of any of the listed species are declining throughout North America or specifically in British Columbia because there are limited data and a high degree of variability in population levels from year to year, and ranges contract and expand periodically (Cooper et al. 1997a-f). However, all the listed species utilize young to mature forest habitats to some degree and these habitats are being harvested at an increasing rate in the FNFD. Based on the past 3 years of inventory work, a review of the status of listed neotropical migrants in northeastern British Columbia is necessary to update the current designations. We believe BBWA and CAWA are likely still at risk because they appear to utilize lower elevation habitats along major river systems that have already been harvested extensively. BTNW, COWA, and PHVI are also likely still at risk because of their rarity and restricted, patchy distribution in the district. CMWA appear to be the least at risk because they are more widely distributed throughout the FNFD.

ABUNDANCE AND HABITAT USE

Many of the species found in the study areas, including all the Red- and Blue-listed species, have a breeding distribution that extends from the hardwood forests of eastern North America through the boreal forest, to terminate in northwestern British Columbia and the southern Yukon (Godfrey 1986, Campbell et al. 1997, Dunn and Garrett 1997). The designation of these species as “eastern” has given rise to the idea that the breeding heartland of such species is in the eastern provinces of Canada, with numbers

diminishing westwards until finally a scattering of isolated pairs are found at the western terminus of the range. The listed status of a number of these species in northeastern British Columbia, together with published range maps that show them barely reaching the province, appear to have supported this contention. To test this idea, 6 neotropical migrant warbler species were selected and their breeding densities in the present study areas were compared to published breeding densities elsewhere in Canada and the northeastern United States. Three of these species, (CMWA, BBWA and Tennessee warbler [*Vermivora peregrina*; TEWA]), are spruce budworm-specialists. The other three, (CAWA, MAWA, and OVEN), are more generalist insectivores, which exploit a wide range of invertebrate food and have populations that tend to be stable over long periods. The breeding ranges of these 6 species terminate in northern British Columbia or adjacent southern Yukon, with the exception of TEWA, which extends across most of British Columbia to the west coast (Dunn and Garrett 1997).

Each of these warbler species appears to have surprisingly high breeding densities in suitable habitat in northeastern British Columbia, even, in some cases, beyond the previously known western limit of the species distribution (Figs. 2 and 3). In general, the densities are comparable to, or higher than, those in the central and eastern parts of their ranges. As most individuals of these species migrate to the area from the east or southeast they must travel considerably greater distances than their eastern counterparts to reach their breeding grounds. Rather than being considered marginal to their breeding range, it appears that much of the habitat in northeastern British Columbia is optimal for their breeding requirements and birds may be being rewarded for the extra expenditure of energy on migration by higher breeding success. For a more complete discussion of these comparisons see our unpublished report (Bennett et al. 1999).

CONCLUSION

Studies in the FNFD have focused primarily on reconnaissance-level inventories with a secondary objective of developing habitat models for listed species. Accurate distribution maps will take many years to complete, as access is severely limited during the summer months. However, habitat suitability maps should be created for all listed species for the entire Fort Nelson Forest District based on recently proposed habitat associations. Areas mapped as highly suitable should be deferred from harvesting whenever possible until a review of the status of northeastern warblers is completed. Detailed nest searches should also be conducted later in the season (end of June, first half of July) to confirm successful breeding of listed species and to compare nest productivity in the FNFD with eastern populations.

The habitat used by listed species in the FNFD was similar to those reported in the literature, with BBWA, BTNW, CAWA, and CMWA using mature deciduous to coniferous-dominated forests, and COWA and PHVI using young to mature deciduous-dominated forests. Densities of common listed species (BBWA, CAWA, CMWA) and several other neotropical migrants are similar to densities reported from the eastern and central parts of their range. This suggests that the FNFD has optimal habitat for listed species and others. The FNFD also has a unique assemblage of “eastern” species and “western” species characteristic of the western cordillera, and marks the southern and/or northern limit of several species; such avifauna and their habitat should be protected. Further management recommendations and suggestions for future research are described in the full report.

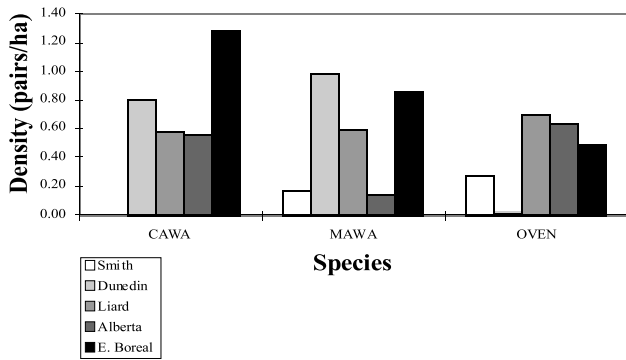


Figure 2. Comparison of densities of budworm specialists (BBWA = bay-breasted warbler, CMWA = Cape May warbler, TEWA = Tennessee warbler).

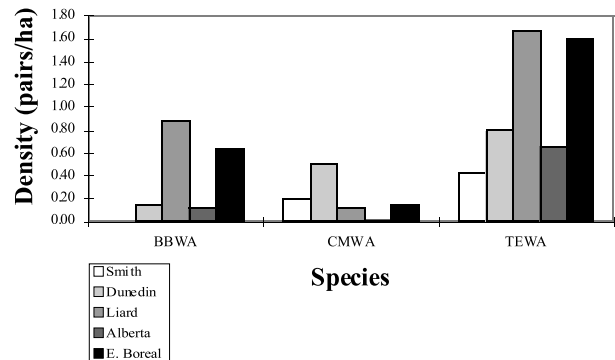


Figure 3. Comparison of densities of non-budworm specialists (CAWA = Canada warbler, MAWA = magnolia warbler, OVEN = ovenbird).

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