

***Stand-level Management Guidelines for Selected Forest
Dwelling Species in the Fort St. John Timber Supply Area.***

Draft Report submitted to:

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Executive Summary

This document is a revised version of the November 2004 Stand-level Management Guidelines for the Fort St. John TSA written by Todd Manning RPBio, RFP and John M Cooper RPBio. Species accounts for Western Toad, Wood Bison, Common Nighthawk, Canada Warbler, Rusty Blackbird, Olive-sided Flycatcher and Yellow Rail were added and the accounts for both boreal and northern ecotypes of Woodland Caribou have been updated. A current Summary of Rankings and Status for forest-dwelling species in the Fort St. John TSA can be found at Appendix 1 which includes information specific to the SARA Schedule 1 species.

The December 2010 Stand-level Management Guidelines include accounts for 11 bird, 5 mammal, 1 amphibian and 1 fish species known to occur within forested areas of the Fort St. John TSA. Each species account includes a list of status designations, a distribution map, ecological characteristics and a description of key habitat features. Potential positive and negative impacts of forest practices on each species are described along with recommended stand-level management guidelines aimed at minimizing any negative impacts. Lists of SFMP indicators that augment or complement the landscape level management strategies recommended for each species are also included.

Distribution maps were generated using a fixed kernel density estimator (Hawth's Tools). Point data were loaded into a GIS and the resulting range represents a 95% probability that the species occurs within that polygon. Existing polygon data (Caribou, Wood Bison, and Yellow Rail) were supplemented by point data in an attempt to more accurately depict range. On occasions where there was no or little spatial data, range was estimated from species accounts in Birds of British Columbia (volumes 2, 3 and 4).

The literature cited section included at the back of the document is broken down by species for ease of reference.

Acknowledgements

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The authors would also like to extend their thanks to the following individuals for their contributions to the original Stand-level Management Guidelines (SLMG) for the Fort St. John TSA – Todd Manning (co-author), Warren Jukes (Canadian Forest Products Ltd., Chetwynd Division), John Deal (Canadian Forest Products Ltd., Corporate Forestry and Environment), Don Rosen (Canadian Forest Products Ltd.), David Menzies (Canadian Forest Products Ltd.), Darren Thiel (Canadian Forest Products Ltd.), Greg Taylor (Canadian Forest Products Ltd.), Mark Phinney (Louisiana-Pacific Canada Ltd., Dawson Creek), and Andrew deVries (Forest Products Assoc. of Canada, Ottawa) for their support.

Cover photo: Woodland Caribou (Northern ecotype). *Photo credit:* Vicki Prigmore

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1 Introduction

The following report is a revised summary of stand-level management guidelines associated with 18 selected forest-dwelling species found in the Fort St. John Timber Supply Area (TSA). The list was selected based one or more of the following:

- 1) Federal Species at Risk Act Schedule 1, 2 or 3
- 2) Provincially red and blue listed forest dwelling species that are directly negatively impacted by forestry operations, and
- 3) Regionally rare species that are sensitive to forestry operations (e.g., Sandhill Crane)

Management of habitat for species with this type of provincial or federal status listing is one of the guiding principles for forest management as expressed in the Sustainable Forest Management Plan (SFMP) for the TSA (March 2004). The overall philosophy is to use an adaptive management approach of short-term steering (i.e., combination of stand- and landscape-level planning and practices) towards achieving the long-term goals of sustainable forest management. This approach incorporates the experience gained from the results of previous management methods and actions into updated objectives and strategies.

This report supplements landscape level strategies by providing **stand-level management recommendations** for 18 species (11 birds, 5 mammals, 1 Amphibian, 1 fish) and **is applicable to areas with high habitat suitability for that species**. For each species, information is provided on its status (national and provincial listings), general habitat ecology, key habitat features, potential impacts by forestry operations, recommended stand-level management guidelines, literature cited, additional sources of information, and personal communications (if applicable).

For some of the species in this report, a combined coarse filter landscape-level management approach is required in addition to the recommended stand-level practices, in order to most effectively manage the habitat needs of that species. This is especially true for the mammal species described in this report (caribou, grizzly bear, wood bison, wolverine and fisher). For these species, landscape-level objectives and targets for ecosystem representation, seral stage and patch size distribution, connectivity, access management, and recreation management are just as important as applying the associated stand-level practices. Landscape-level indicators, objectives and targets have been identified in the SFMP (March 2004) for the Fort St. John TSA. Implementation of these objectives in conjunction with the stand-level practices recommended in this report, will together help achieve the multiple objectives and targets described in the SFMP.

In order to provide context for the stand level measures noted in this report, reference is also made to those SFMP indicators that have associated landscape level strategies that support the stand level management guidelines.

Relevant regional higher level plans (LRMPs, LUPs) or species recovery plans (e.g., for caribou) should also be consulted when considering implementation of management objectives and targets for some species.

In addition, some environmental practices such as respecting water quality and maintaining wetland water levels, are already covered under best practices currently established through ISO 14001 certification. Other objectives, such as the management of riparian areas, are also met Stand-level Management Guidelines for Selected Forest-dwelling Species in the Fort St. John Timber Supply Area through existing provincial legislation. Thus, the stand-level management guidelines described in this document were developed to provide additional ecological information and achievable operational recommendations for forest resource managers. They were developed by referring to relevant scientific literature and regional reports, reviewing associated provincial management guidelines (e.g., see *Identified Wildlife Management Strategy* (IWMS) <http://www.env.gov.bc.ca/wld/frpa/iwms/iwms.html>), conducting discussions with other forest managers and species experts, and the authors' cumulative knowledge, experience and professional judgment.

Additional useful information about species at risk in British Columbia can be obtained by consulting the BC Conservation Data Centre (CDC) *Endangered Species and Ecosystems* website <http://www.env.gov.bc.ca/atrisk/toolintro.html> . Information about the federal *Species at Risk Act* (SARA) and links to the *Committee on the Status of Endangered Wildlife in Canada* (COSEWIC) and the public registry of listed species (schedules 1-3), can be found at <http://www.speciesatrisk.gc.ca/>, and <http://www.sararegistry.gc.ca/>, respectively.

A tabular summary of global and regional rankings, national (COSEWIC) and provincial (Red or Blue) listings, and IWMS status, is provided in Appendix 1 for each of the 18 species. Further information on the CDC species ranking system (i.e., ranking code descriptors) can be found at <http://www.for.gov.bc.ca/hfd/library/documents/bib89068.pdf> . A list of acronyms used in this report is found following the Bull Trout account.

This document is not intended to be static. As changes are made to the Schedule 1 list of the Federal Species at Risk Act and the Provincial Red and Blue lists, this document will be updated as required.

Also, landscape level strategies for Species at Risk will be developed once the forest inventory project (VRI and PEM) is complete. Stand-level guidelines may need to be updated as a result of the landscape strategies.

2 Species Accounts - Birds

2.1 Bay-breasted Warbler (*Dendroica castanea*)

Status

Table 1. Status Information for the Bay-breasted Warbler (*Dendroica castanea*).

COSEWIC	Not Assessed
BC Provincial	Red-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	Yes
Peripheral Category	<5% of global range occurring over <5% of BC

Distribution

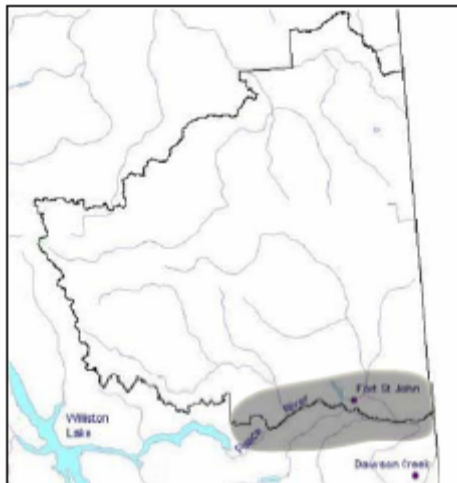


Figure 1. Known distribution of the Bay-breasted Warbler within the Fort St. John TSA. This species most likely occurs elsewhere in the TSA. Map Credit: Houde et al. 2004.

Ecology

The Bay-breasted Warbler reaches the northwestern limit of its range in northeastern British Columbia. Records are relatively few compared to other “northeastern” warblers, but this species breeds locally in various parts of the Taiga Plains and Boreal Plains ecoprovinces (Campbell et al. 2001). Like the Cape May Warbler, breeding abundances are linked to spruce budworm outbreaks.

In northeastern, British Columbia this species may be found in mature stands of pure white spruce or white spruce mixed with aspen or birch (Enns and Siddle 1996; Cooper et al. 1997; Bennett et al. 2000). Bay-breasted warblers have been confirmed within the Kobes landscape unit of the Fort St. John TSA during “Listed” warbler surveys conducted between 2005 and 2008 (Preston 2009). This warbler seems to occur more frequently in large river valley bottoms in the

northern Taiga Plains whereas it is more widely distributed in upland areas than in southern parts of the Taiga Plains and in the Boreal Plains (Bennett et al. 2000), even though it breeds in the Peace Lowland. Territory sizes in eastern North America range from 1.5 ha in forests with low population densities (Sabo 1980) to 4 territorial males/ha in areas with spruce budworm outbreaks (Erskine 1992).

One brood is raised each year. Clutch size ranges from 3 to 7 eggs. The number of eggs laid is strongly influenced by food supply with larger clutches typical during periods of high food abundance (Williams 1996). Nests are built in coniferous trees, although deciduous may be used, and they are typically on a horizontal branch, near the trunk, between 2 and 18m off the ground (Baicich and Harrison 1997). Spring migrants usually arrive in northeastern British Columbia in late May. Fall migration occurs from late July through August (Campbell et al. 2001).

Key Habitat Features

Some common characteristics of breeding habitat include a high proportion of old spruce with dead lower branches, a relatively closed upper canopy, open patches in mid-canopy and an understory dominated by high-bush cranberry, paper birch, dogwood, or Sitka alder (Cooper et al. 1997; Campbell 2001).

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.1 (forest type distribution by LU)
- 6.2 (seral stage targets by LU)
- 6.3 (Patch size and rotating reserve provisions)
- 6.9 (Cumulative wildlife tree patches by LU)
- 6.22 (patch cutting in major river corridors)

Management Guidelines

The following stand-level management guidelines for Bay-breasted Warbler are recommended for those areas of high habitat suitability:

- i. Retain some wildlife tree patches 2 ha or larger in mature spruce-leading cutblocks greater than 50 ha.'s in size.
- ii. Consider retaining some larger WTP's (e.g. Wit's > 5 ha) in blocks greater than 100 ha's in size, if feasible, in areas with known concentrations of breeding Bay-breasted Warblers
- iii. Minimize harvest (e.g. less than 10% of total annual harvest) between 15 May and 1 August in spruce-leading stands.

Based on current distribution knowledge, these management guidelines should be applied specifically within Operating Areas #25 (Alces Creek), #26 (Beatton-Doig), #27 (Montney Creek), #43 (Cache Creek), # 44(East Farrell), and #45 (West Farrell). The guidelines may also be applied in other areas where there are known concentrations of Bay-breasted Warblers.

2.2 Cape May Warbler (*Dendroica tigrina*)

Status

Table 2. Status Information for the Cape May Warbler (*Dendroica tigrina*)

COSEWIC	Not Assessed
BC Provincial	Red-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	Yes
Peripheral Category	<1% of global range occurring over <5% of BC

Distribution

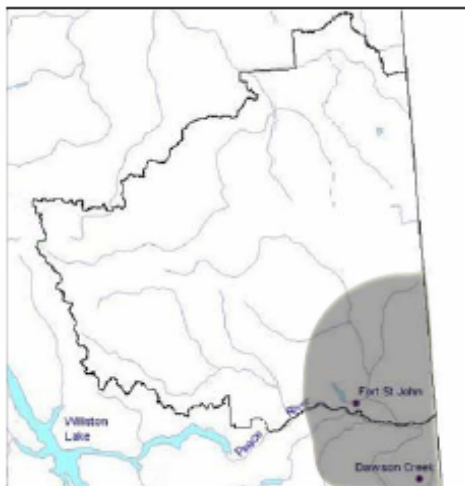


Figure 2. Known distribution of the Cape May Warbler within the Fort St. John TSA. This species most likely occurs elsewhere in the TSA. Map Credit: Houde et al. 2004.

Based on known distribution, the Cape May Warbler occurs largely in the Milligan and Lower Beatton LU's. Lower Beatton is heavily impacted by agriculture; Milligan by natural disturbances. The old seral target for conifer in both of these units is a minimum of 25% but both of these units are in a recruitment phase. Rotating reserves have been spatially identified for conifer stands in the Lower Beatton LU and deciduous leading stands in the Milligan LU. During "listed" warbler surveys (2005-2008), Cape-May Warblers were confirmed within the Kobe, Blueberry, Tommy Lakes, Kahntah and Halfway landscape units within the Fort St. John TSA (Preston 2009).

Ecology

In British Columbia, the Cape May Warbler occurs almost exclusively in the Taiga Plains and Boreal Plains ecoprovinces (Campbell et al. 2001). Northeastern British Columbia is at the most northwestern edge of this warbler's range (Baltz and Latta 1998) and populations there are sparse and scattered in distribution.

The Cape May Warbler's preferred habitat is mature to old growth, spruce dominated forests (Cooper et al. 1997), although smaller numbers occur in young (40-80 year old) stands (Bennett et al. 2000). An abundant prey base is an essential breeding habitat feature; breeding distribution and abundance is often strongly linked to presence of spruce budworm (Cooper et al. 1997). Although a nest has yet to be found in British Columbia, the species likely breeds wherever suitable habitat and conditions occur within its restricted range. Breeding territories may be small; in one study in Ontario, breeding territories were 0.4 ha (Kendeigh 1947 cited in Baltz and Latta 1998).

One brood is raised each year. Clutch size ranges from 4 to 9 eggs. The size of brood is strongly influenced by food supply, with larger clutches typical during periods of high food abundance (Baltz and Latta 1998). Nests are usually built in coniferous trees, typically on a short horizontal branch, near the top of the tree. Nest heights are usually between 10 to 20m off the ground (Baicich and Harrison 1997). Spring migrants arrive in northeastern British Columbia in early May. Fall migration probably begins in late July with juveniles following in August (Campbell et al. 2001).

Key Habitat Features

In northeastern British Columbia, this species is reported from a variety of habitats ranging from all major forest types to non-commercial areas with less than 10% tree cover, but the sample size was insufficient to develop a habitat model (Vernier and Bunnell 2010). Some common characteristics of Cape May Warbler habitat include tall stands of white spruce that are fairly dense but have frequent openings. Very tall conifers, extending above the main canopy, are used by males as singing perches and are, apparently, key breeding habitat components. Sites are usually on flat ground with an open, mossy (*Dicranum* sp., *Pleurozium* sp., *Rhytidiopsis* sp.) ground cover and understory plants include highbush cranberry, horsetail, bunchberry, palmate coltsfoot, willow, and twinflower (Enns and Siddle 1996; Cooper et al. 1997). Abundant spruce budworm is an important element of breeding habitat.

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.1 (forest type distribution by LU)
- 6.2 (seral stage targets by LU), 6.3 (Patch size and rotating reserve provisions)
- 6.9 (Cumulative wildlife tree patches by LU)
- 6.22 (patch cutting in major river corridors)
- 6.26 (salvage strategy, which allows some budworm stands to persist on the landscape)

Management Guidelines

The following stand-level management guidelines for Cape May Warbler are recommended for those areas of high habitat suitability:

- i. Retain some wildlife tree patches greater than 2 ha in size in mature spruce leading cutblocks greater than 50 ha's in size.
- ii. Consider retaining some larger WTP's (e.g. WTP's > 5 ha) in blocks greater than 100 ha in size, if feasible, in areas with known concentrations of breeding Cape May Warblers.
- iii. Minimize harvest (e.g. less than 10% of total annual harvest) between 15 May and 1 August in spruce leading stands between 15 May and 1 August.

Based on current distribution knowledge, the management guidelines should be applied specifically within Operating Areas #2 (South Blueberry), #25 (Alces Creek), #26 (Beaton-Doig), #27 (Montney Creek), #29 (Prespatou), #30 (South Milligan), and #31 (Osbourne River). The guidelines may also be applied in other areas where there are known concentrations of Cape May Warblers.

2.3 Black-throated Green Warbler (*Dendroica virens*)

Status

Table 3. Status Information for the Black-throated Green Warbler (*Dendroica virens*)

COSEWIC	Not Assessed
BC Provincial	Blue-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	Yes
Peripheral Category	<1% of global range occurring over <7% of BC

Distribution

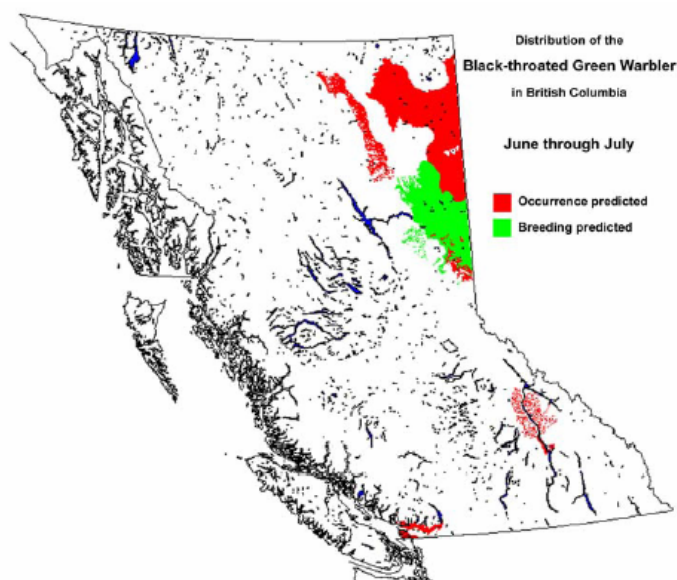


Figure 3. Predicted occurrence of the Black-throated Green Warbler in British Columbia. Known occurrences occupy a smaller subset of the area shown above. Map Credit: M.I. Preston and Centre for Wildlife Studies, Victoria.

Ecology

The Black-throated Green Warbler reaches the northwestern limits of its range in northeastern British Columbia, where it occurs almost exclusively in the Boreal Plains ecoprovince (Campbell et al. 2001). Black-throated Green Warblers were often found to co-occur with Canada and Connecticut warblers and were confirmed within the Lower Beatton, Kobes, Blueberry and Tommy Lakes landscape units during “Listed” warbler surveys in the Fort St. John TSA between 2005 and 2008 (Preston 2009).

The Black-throated Green Warbler typically frequents old forest although it has also been recorded breeding in mature stands (Cooper et al. 1997; Savignac 1998; Bennett et al. 2000). Breeding habitat varies from pure coniferous to pure deciduous forests, although almost all

sites have at least some conifer component. In northeastern British Columbia, mature spruce and mixed forests, especially riparian-influenced stands, below 1,200 m elevation are probably the most important breeding habitats. Breeding territories are smaller in favoured coniferous forests than in mixed forests. Breeding territories in Ontario ranged from 0.5-0.9 ha (Kendeigh 1947 cited in Morse 1993). This species is also known to breed in “islands” of spruce as small as 0.35 ha (Morse 1993).

One brood is raised each year. Clutches usually contain 4 eggs, although 3 to 5 is possible, nest site microhabitat is not highly specialized, however mature rather than juvenile trees are preferred and nests are usually found in coniferous trees (Baicich and Harrison 1997). Spring migrants usually arrive in northeastern British Columbia in late May. Fall migration begins in early July with juveniles following in August (Campbell et al. 2001).

Key Habitat Features

In northeastern British Columbia, Black-throated Green Warbler breeding habitat is primarily mature mixedwood (spruce, pine, trembling aspen, balsam poplar) forests (Enns and Siddle 1996). Stands tended to be mesic, with rose, baneberry, highbush cranberry, bunchberry, fireweed, kinnikinnick, mosses, peavine and American vetch in the understory (Cooper et al. 1997). Pure deciduous forests are rarely used in this province, however even a small clump of mature spruce within an otherwise pure aspen stand attracts Black-throated Green Warblers (Cooper et al. 1997). Pure spruce forests are used less often (M. Phinney pers. comm.).

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.1 (forest type distribution by LU)
- 6.2 (seral stage targets by LU)
- 6.3 (Patch size indicator, with rotating reserve provisions)
- 6.7 (riparian reserves)
- 6.9 (WTP's)
- 6.22 (patch cutting in major river corridors)

Management Guidelines

The following stand-level management guidelines for Black-throated Green Warbler are recommended for those areas of high habitat suitability:

- i. Retain some wildlife tree patches 1.0 ha or greater in size in mature spruce leading mixedwood blocks greater than 100 ha in size.
- ii. Consider retaining some larger WTP's (e.g. WTP's > 5 ha) in blocks greater than 100 ha in size, if feasible, in areas with known concentrations of breeding Black-throated Green Warblers.

- iii. WTP's should contain at least 1-2 mature spruce trees.
- iv. Minimize harvest (e.g. less than 10% of total annual harvest) between 15 May and 1 August in spruce dominated mixedwoods.

Based on current knowledge of predicted breeding distribution, the management guidelines should be applied specifically to mixedwood cutblocks with significant riparian habitat types at low to moderate elevations within Operating Areas in the southern portion of the TSA , including Operating Areas #1 , #2, #3, #4, #5 , #6, #9, #10, #18, #23, #32, and #33.

2.4 Connecticut Warbler (*Oporornis agilis*)

Status

Table 4. Status Information for the Connecticut Warbler (*Oporornis agilis*)

COSEWIC	Not Assessed
BC Provincial	Red-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	Yes
Peripheral Category	<2% of global range occurring over <5% of BC

Distribution

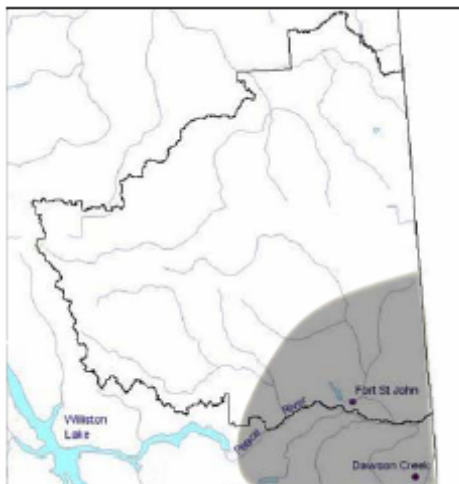


Figure 4. Known distribution of the Connecticut Warbler within the Fort St. John TSA. Map Credit: Houde et al. 2004.

Ecology

The Connecticut Warbler reaches the northwestern edge of its range in northeastern British Columbia (Pitocchelli et al. 1997). These warblers likely breed locally at low elevation in the Taiga Plains and Boreal Plains ecoprovinces (Campbell et al. 2001). In British Columbia, the Connecticut Warbler frequents deciduous or mixedwood forest, usually in pure trembling aspen stands, although aspen and spruce, and balsam poplar and white spruce forests are also used. Immature to old stands are used (Cooper et al. 1997; Campbell et al. 2001). In eastern North America, this warbler also breeds in coniferous forests (Pitocchelli et al. 1997). During “listed” warbler surveys (2005-2008), the Connecticut Warbler occurred within the Lower Beaton, Blueberry, Kobes and Halfway landscape units of the Fort St. John TSA (Preston 2009).

One brood is raised each year. Clutches usually contain 3 to 5 eggs. Nests are placed on the ground among herbs and grass or at the base of a sapling, in mossy hummocks, or a few inches off the ground in the base of a shrub (often wild rose), and are usually well concealed by

overhanging vegetation (Baicich and Harrison 1997). Connecticut Warblers are long distance migrants, therefore they arrive late and leave early: spring migrants usually arrive in northeastern British Columbia in late May; fall migration of adults begins in late July and juveniles probably follow in mid-to-late August (Campbell et al. 2001).

Key Habitat Features

In northeastern British Columbia, pure stands of aspen on flat or gently rolling topography are the preferred breeding habitat of the Connecticut Warbler (Cooper et al. 1997). Pole age forests are probably the minimum growth stage suitable for this warbler as it has not been found in recent clearcut slash, sapling, or early pole seral stands (Lance and Phinney 1994). Along the Prophet River, this warbler was found in immature aspen stands only (Savignac 1998). Age class may not be as important as development of appropriate herb and shrub layers as this warbler forages almost exclusively on, or very near, the ground. Connecticut Warbler breeding sites typically have a well developed herb layer and a sparse shrub layer under a fairly closed canopy of aspens (Lance and Phinney 1994). There is usually a noticeable gap between the low herbs and shrubs and the higher aspen canopy (Enns and Siddle 1996). Vegetation in the herb and shrub layers often includes prickly rose, red osier dogwood, willow, bunchberry, soopalallie, fireweed, paintbrush, purple peavine, and white geranium (Campbell et al. 2001).

Breeding territories in Minnesota ranged from 0.24-0.48 ha (Niemi and Hanowski cited in Pitocchelli et al. 1997), but these were in coniferous forest. Habitat patch size seems critical as Connecticut Warblers are not found in aspen groves of less than four hectares (Johns 1993). In northeastern British Columbia, suitable habitat <5 ha may be used if it is within a larger forested area.

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.1 (forest type distribution by LU)
- 6.2 (seral stage targets by LU)
- 6.3 (Patch size indicator, with rotating reserve provisions including the spatial identification of some large aspen stands greater than 100 ha)
- 6.7 (riparian reserves)
- 6.9 (WTP's)
- 6.22 (patch cutting in major river corridors)

Management Guidelines

The following stand-level management guidelines for Connecticut Warbler are recommended:

- i. In deciduous cutblocks >100 ha in these LU's, target some WTP's >4 ha in size where aspen and well-developed herb understory's are present.

- ii. Minimize (e.g. less than 10% of annual harvest) harvest between 15 May and 1 August in aspen stands

Based on current distribution knowledge, the management guidelines should be applied specifically to pure aspen cutblocks (e.g. less than 20% coniferous content) in Operating Areas #1, #2, #25, # 26, #27, #29, #30, #31, #43, # 44 and #45. The guidelines may also be applied in other areas where there are known concentrations of Connecticut Warblers.

2.5 Canada Warbler (*Wilsonia canadensis*)

Status

Table 5. Status Information for Canada Warbler (*Wilsonia canadensis*)

COSEWIC	Threatened
BC Provincial	Blue-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	No
Peripheral Category	80% of breeding habitat occurs in Canada

Distribution

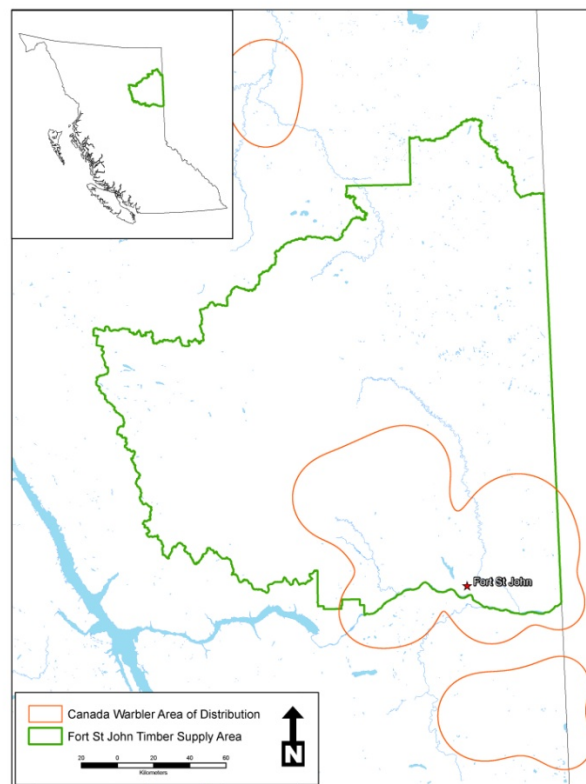


Figure 5. Known distribution (delineated in red) of the Canada Warbler within the Fort St. John TSA (delineated in green). This species most likely occurs elsewhere in the TSA. Map Credit: Gill 2010.

Ecology

Northeastern British Columbia marks the northwestern limit of the Canada Warbler's breeding range (Campbell et al. 2001, Savignac 2008). These long distance neo-tropical migrants arrive in the Fort St. John TSA from late May, breeding likely occurs between early June and late July and the fall migration starts shortly after nesting is complete in late July or early August (Cooper et

al. 1997, Campbell et al. 2001). They overwinter in Columbia, Venezuela, Peru and Brazil in the foothills of the Andes where habitat loss is thought to be contributing significantly to population declines (Campbell et al 2001, Savignac 2008).

In British Columbia, Canada Warblers breed at elevations from 300-570 m, mainly in the Boreal Plains and Taiga Plains eco-provinces (Campbell et al. 2001). They are typically associated with a variety of forest habitats, but a structurally complex understory with coarse wood debris are considered to be a critical habitat features (Savignac 2008). Canada Warblers have been confirmed in the Lower Beatton, Blueberry and Kobes landscape units within the Fort St. John TSA during “listed” warbler and breeding bird Surveys between 2005 and 2008 (Preston 2009). They commonly co-occurred with Black-throated Green and/or Connecticut warblers (Preston 2009).

Canada Warblers typically build bulky cup nests on or near the ground, in moss covered woody debris or rocks, under the overhang of stream banks or alongside clumps of herbs (Campbell et al. 2001). They are thought to be monogamous, clutch size ranges from 3-5 eggs (usually 4), incubation takes approximately 12 days and chicks fledge in about 10 days (Campbell et al. 2001, Savignac 2008).

These insectivores exploit a unique niche amongst warbler species in British Columbia, primarily gleaning foliage on shrubs (particularly red osier dogwood) or paper birch saplings (Enns & Siddle 1996) and on the ground. They also use a variety of other foraging strategies including hawking and hover gleaning to prey on flying insects, spiders and other arthropods. Though not dependent upon spruce budworm, they will heavily utilize this prey source during outbreaks (Patten & Burger 1998).

Key Habitat Features

For the Fort St. John TSA, selection ratios for Vegetation Resource Inventory based habitat models indicated that Canada Warblers exhibited a significant preference for old hardwood stands (>90 years)(Vernier & Bunnell 2010). In 99% of sites in northeastern British Columbia occupied by Canada Warblers, aspen was the dominant tree species and dense layers of green alder (*Alnus viridis*) or red-osier dogwood (*Cornus sericea*) were often prominent in the understory (Campbell et al. 2001, Campbell et al. 2007). Canada Warblers were only present in stands with a well developed shrubby understory, suggesting that this species is more of an indicator of the shrub layer than of hardwoods (Campbell et al. 2007, Vernier & Bunnell 2010). The species is more prevalent in moist mixed forests and is often found in shrubby riparian forests on unstable slopes and in ravines (Campbell et al. 2001, Savignac 2008). Recently disturbed sites and old-growth stands with small canopy openings also provide good habitat (Savignac 2008). In British Columbia, Canada warblers use edge habitat and shrubby areas along roads, transmission lines and recreational areas (Campbell et al. 2001).

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.1 (forest type distribution by LU)
- 6.2 (seral stage targets by LU)
- 6.3 (Patch size indicator, with rotating reserve provisions including the spatial identification of some large hardwood and mixedwood stands greater than 100 ha)
- 6.6 (coarse wood debris volume)
- 6.7 (riparian reserves)
- 6.8 (shrubs)
- 6.9 (WTPs)
- 6.22 (patch cutting in major river corridors)
- 6.28 (species composition)
- 6.36 (protection of streambanks and riparian values on small streams)

Impacted by Forestry Operations?

In the boreal forests of western Canada, habitat loss due to permanent conversion of forests for industrial infrastructure and agricultural uses along with road development may be associated with population declines (Savignac 2008). Existing harvesting practices typically avoid logging some of the preferred habitats, particularly riparian areas and unstable slopes. Since this species uses a broad range of seral stages, local logging and some loss of old-growth stands may not have negative long term impacts as long as stand regeneration occurs and post-treatment silvicultural practices that limit shrub layer regeneration are avoided (Gauthier & Aubry 1996, Campbell et al. 2001).

Management Guidelines

The following stand-level management guidelines for Canada Warbler are recommended:

- i. Ensure some large patches (> 100 ha.) of mature- and mid-seral hardwood and mixedwood forest with well-developed understories and coarse-woody debris remain on the landscape.
- ii. In cutblocks in mature- and mid-seral hardwood and mixedwood stands, establish WTPs > 1 ha. Linear WTPs should be avoided (unless contiguous with mature forest) to reduce amount of edge habitat and avoid parasitism by brown-headed cowbirds.
- iii. WTPs should contain well developed under-stories and significant concentrations of coarse-woody debris, and if feasible, be located around concentrations of breeding Canada Warbler.

- iv. Minimize harvest in mature- and mid-seral hardwood and mixedwood stands between 15 May and 1 August.

2.6 Olive-sided Flycatcher (*Contopus cooperi*)

Status

Table 6. Status Information for Olive-sided Flycatcher (*Contopus cooperi*)

COSEWIC	Threatened
BC Provincial	Blue-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	No
Peripheral Category	~54% of breeding habitat occurs in Canada

Distribution

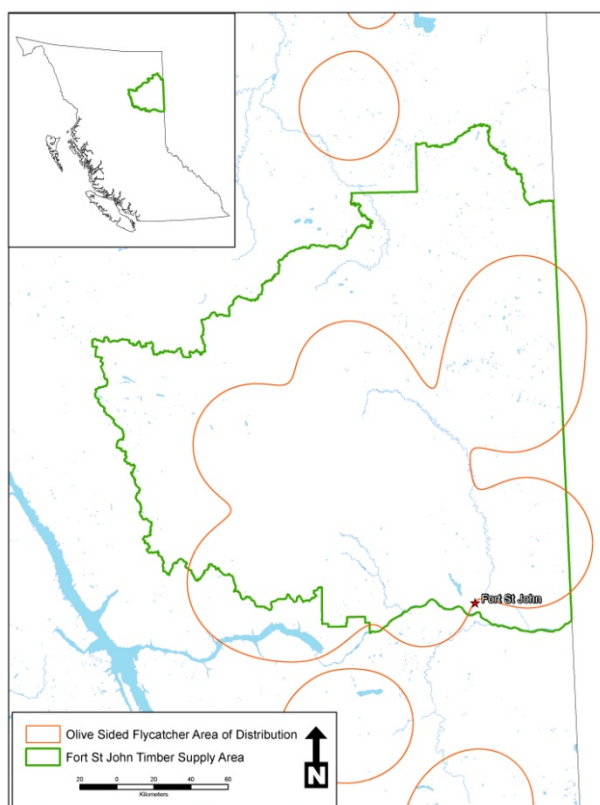


Figure 6. Known distribution (delineated in red) of the Olive-sided Flycatcher within the Fort St. John TSA (delineated in green). This species most likely occurs elsewhere in the TSA. Map Credit: Gill 2010.

Ecology

Olive-sided Flycatchers breed in forested areas with suitable habitat throughout British Columbia with the exception of the Haida Gwaii and they display strong site fidelity in both breeding and wintering habitats (Campbell et al. 1997, Altman & Sallabanks 2000). Their breeding range extends north and west across much of Alaska and they overwinter in

mountainous regions of South America, primarily in the Andes and Panama, thus undertaking the longest migration of all flycatchers that nest in North America (Altman & Sallabanks 2000, Pearce & Kirk 2007, and B.C. CDC 2010).

During breeding bird and “listed” warbler surveys (2005-2008), 34 Olive-sided Flycatchers were recorded in the Fort St. John TSA (Preston 2009). This species likely arrives in northeastern British Columbia in early to mid May and most individuals will have departed before the end of August (Campbell et al. 1997). They breed most abundantly at higher elevations in the Sub-boreal Interior ecoprovince (Campbell et al. 1997). Olive-sided Flycatchers are considered indicators for the coniferous forest biome across their breeding range and prefer natural and manmade edge habitats and semi-open areas, particularly in mature coniferous and conifer dominant mixed stands in close proximity to wetlands and water features (Campbell et al. 1997, Altman & Sallabanks 2000). They occur commonly in burnt over openings and clearcuts with residual tall trees and snags for perching and foraging (Altman & Sallabanks 2000, Pearce & Kirk 2007).

Olive-sided Flycatchers likely have the lowest reproductive rate of all passerines in North America, they are monogamous and produce a single brood usually of 3 chicks (range 2-5), pairs may re-nest if early nesting attempts fail (Altman & Sallabanks 2000, Pearce & Kirk 2007). Nests are build from intertwined twigs, sticks and roots and are typically located away from the trunk on horizontal branches of conifers (particularly Douglas-fir), where overhanging foliage provides protection from the elements, usually 2-15 m above the ground (Campbell et al. 1997, Altman & Sallabanks 2000). The date of clutch initiation is dependent upon elevation, latitude and potentially the weather (Pearce & Kirk 2007). Males feed the female whilst she incubates for 15-19 days; chicks fledge at 17-23 days, but are reliant on their parents for food for approximately 7 days post-fledging (Pearce & Kirk 2007).

Olive-sided Flycatchers perch on snags and tall trees, and specialize in sallying flying insects, near or above the canopy level within forest clearings and semi-open stands (Altman & Sallabanks 2000). They consume small prey in flight, but return to their perch to consume larger insects (Altman & Sallabanks 2000). Olive-sided flycatchers depend almost exclusively on this method of foraging, but may resort to foraging from lower perches or foliage gleaning during inclement weather particularly when fledglings are being fed (Altman & Sallabanks 2000).

Key Habitat Features

Olive-sided Flycatchers prefer edge habitat and open or semi-open areas of coniferous stands and are often found within close proximity to lakes, rivers, beaver ponds, wetlands and meadows (Altman & Sallabanks 2000). Critical habitat features for this species are considered to be residual snags and tall trees in open areas that stand above canopy height for perching and foraging (Altman & Sallabanks 2000).

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.1 (forest type distribution by LU)
- 6.2 (seral stage targets by LU)
- 6.26 (salvage)

Impacted by Forestry Operations?

Timber harvest may increase local habitat availability, by creating edge and open habitat and forest practices that leave residual wildlife trees and patches will attract Olive-sided Flycatchers (Altman & Sallabanks 2000, Pearce & Kirk 2007). Though frequently associated with early post-disturbance landscapes including those caused by anthropogenic disturbances such as timber harvest, there is some evidence to indicate that they may represent population sinks due to higher instances of nest mortality in these areas when compared to early or mid-successional stands derived from wildfire and natural disturbances (Pearce & Kirk 2007). Olive-sided Flycatchers are positively associated with early post-fire sites, so wildfire suppression has a negative impact on this species (Altman & Sallabanks 2000).

Management Guidelines

The following stand-level management guidelines for Olive-sided Flycatcher are recommended:

- i. Retain natural openings (especially burns but also wetlands) where they exist
- ii. Retain several stems per ha within cutblock area (live trees or snags where they exist) to act as perching trees

2.7 Rusty Blackbird (*Euphagus carolinus*)

Status

Table 7. Status Information for Rusty Blackbird (*Euphagus carolinus*)

COSEWIC	Special Concern
BC Provincial	Blue-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	No
Peripheral Category	>70% of breeding range occurs in Canada

Distribution

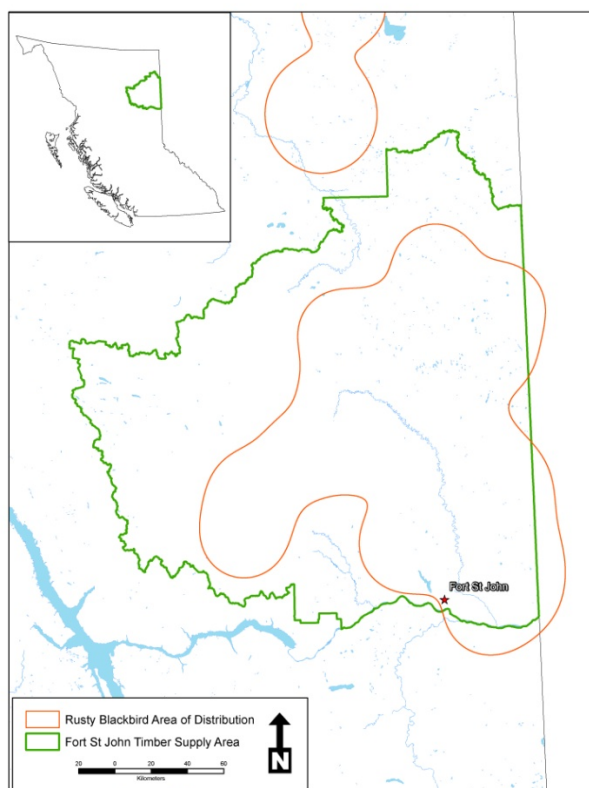


Figure 7. Known distribution (delineated in red) of the Rusty Blackbird within the Fort St. John TSA (delineated in green). This species most likely occurs elsewhere in the TSA. Map Credit: Gill 2010.

Ecology

Rusty Blackbirds breed in forested wetlands across the boreal forests of Canada, Alaska, and the northeastern United States, including south-central and northern British Columbia (Campbell et al. 2001). They typically overwinter in the Mississippi Valley, but are recorded regularly in low numbers in southern parts of the province year round (Campbell et al. 2001). Rusty Blackbirds

occur in all ecoprovinces of northeastern British Columbia, typically at elevations of 540 – 1465 m and most commonly within Sub-boreal Spruce, Boreal White and Black Spruce and Sub-Boreal Pine-Spruce bio-geoclimatic zones (Campbell et al. 2001). The first spring migrants likely arrive in the Fort St. John TSA from Alberta in mid April and they gather in multi-family, mixed-species flocks post nesting season (late July or early August) in preparation for the fall migration east (Campbell et al. 2001).

Rusty Blackbirds prefer riparian coniferous habitats and forest wetlands; they are often associated with beaver ponds, slow moving streams, swampy lakeshores, bogs marshes and sedge meadows (Campbell et al. 2001, Savignac 2006). During spring and fall they are likely to be found in mixed flocks on cultivated agricultural grounds with artificial food supplies (Campbell et al. 2001, Savignac 2006). Their diet consists of primarily of aquatic insects and invertebrates, including crustaceans and snails (Savignac 2006). They may also forage for small fish and amphibians and in severe weather may resort to preying on small birds (Campbell 1947, Skutch 1996, Savignac 2006).

Rusty Blackbirds build bulky cup nests, typically overhanging standing water in small to medium sized coniferous trees (often Black Spruce) or deciduous shrubs (Campbell et al. 2001, Savignac 2006). They are monogamous and typically nest as solitary pairs, though some studies have found loose nesting colonies (Campbell et al. 2001, Savignac 2006). Females usually lay 4 or 5 eggs (range 3-6), incubation lasts for approximately 14 days and nestlings fledge after about 13 days (Campbell et al. 2001, Savignac 2006).

This species was not detected during breeding bird and “listed” warbler surveys within the Fort St. John TSA between 2005 and 2008 (Preston 2009). However, there are a number of noteworthy records for the Fort St. John area from earlier years (Campbell et al. 2001). The low number of records for this species in northeastern British Columbia may also be attributed to the highly secretive nature of these birds during the breeding season and the inaccessibility of their breeding habitat (Campbell et al. 2001).

Key Habitat Features

Within the boreal forest biome, Rusty Blackbird breeding habitat is characterized by coniferous forest wetlands and riparian areas. Breeding sites are almost exclusively associated with slow moving and still water, with a majority of nests found in coniferous forest habitats (Campbell et al. 2001). Dead and dying trees and shrubs are commonly used for nesting (Campbell et al. 2001).

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.1 (forest type distribution by LU)
- 6.2 (seral stage targets by LU)

- 6.7 (riparian reserves)
- 6.8 (shrubs)
- 6.9 (WTPs)

Impacted by Forestry Operations?

Existing forest practices that maintain riparian management zones provide and protect a great deal of Rusty Blackbird breeding habitat, because this species is strictly riparian and avoids forest interior areas (Savignac 2006). Conservation of forest wetlands is considered crucial to the success of this species; conversion for agricultural, urban and industrial uses is a significant threat across much of the breeding range (Hobson et al. 2002).

Management Guidelines

The following stand-level management guidelines for Rusty Blackbird are recommended:

- i. Retain natural openings (e.g., wetlands, swampy shores along lakes and streams) where they occur, especially in areas with dense conifer regeneration

2.8 Common Nighthawk (*Chordeiles minor*)

Status

Table 8. Status Information for Common Nighthawk (*Chordeiles minor*)

COSEWIC	Threatened
BC Provincial	Yellow-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	No
Peripheral Category	No

Distribution

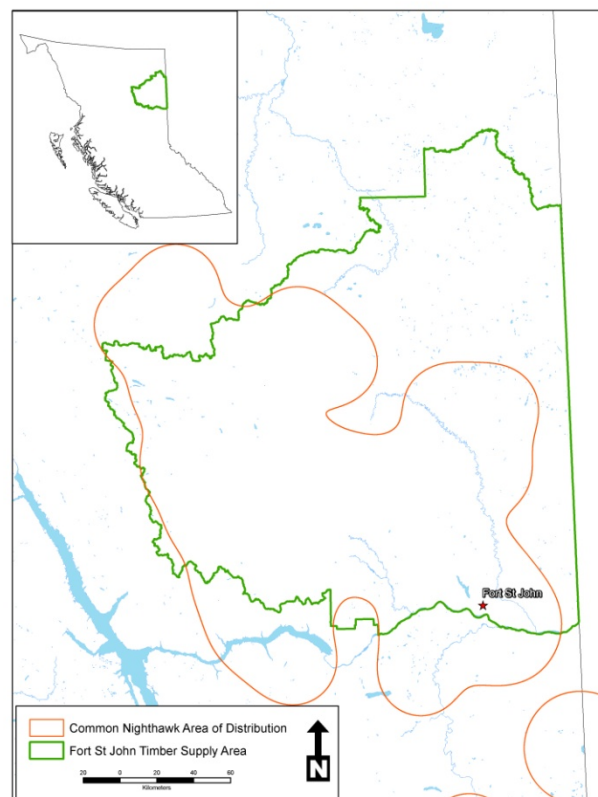


Figure 8. Known distribution (delineated in red) of the Common Nighthawk within the Fort St. John TSA (delineated in green). This species most likely occurs elsewhere in the TSA. Map Credit: Gill 2010.

Ecology

This neo-tropical migrant winters in South America and breeds throughout most of North America, in British Columbia they occur mainly to the east of the Coast Mountains, in the Lower Mainland and on Vancouver Island (Pearson & Healey 2010). They are crepuscular, with a diet consisting of a wide variety of insects, particularly ants, beetles and flies which they hawk in

flight, often over water or near street and building lights which attract large groups of insects (Savignac 2007, Pearson & Healey 2010). They rely on cryptic plumage to camouflage themselves whilst roosting in trees during the day and whilst nesting and brooding on the ground (Poulin et al. 1996). Common Nighthawks usually arrive in British Columbia from early May and they aggregate in large numbers in late August or early September in preparation for the fall migration (Cannings et al. 1987).

Common Nighthawks have a lifespan of 4-5 years and reach maturity at 1 year of age (Poulin et al. 1996). Breeding in British Columbia likely occurs in mid to late May and pairs produce a single clutch invariably of 2 eggs laid directly on ground devoid of vegetation (Poulin et al. 1996). The females are solely responsible for incubation, which lasts for 16-20 days; nestlings remain in the nest until the end of August and are fully developed between 45 and 52 days (Poulin et al. 1996). Predators for the Common Nighthawk include American crows, Common Raven, Peregrine falcon and domestic cats.

Key Habitat Features

Open areas, devoid of vegetation are critical breeding habitat for the Common Nighthawk (Poulin et al. 1996, Savignac 2007). The Common Nighthawk is associated with open and edge habitat within mixed and coniferous stands, they nest on the ground in logged/burned areas, open forest, semi-arid grasslands, sand and gravel bars, pasturelands, gravel pits, and other open areas devoid of vegetation at elevations up to 1250 m (Campbell et al. 1990, Savignac 2007). This species roosts lengthwise on tree branches and fence posts during the day (Poulin et al. 1996). They often forage over water where prey is most abundant (Savignac 2007).

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.2 (seral stages)
- 6.6 (coarse woody debris)
- 6.30 (establishment delay)

Impacted by Forestry Operations?

Logging increases the amount of open area available for Common Nighthawk breeding habitat, conversely fire suppression and forest practices that reduce the number of open areas within forest habitat including reforestation and regeneration have a negative impact on this species. Increased access to open areas may increase nest mortality due to vehicle collisions and disturbance for this cryptic ground-nesting species. Pesticide use results in reduced prey availability and likely breeding success.

Management Guidelines

The following stand-level management guidelines for Common Nighthawk are recommended:

- i. In areas with breeding common nighthawk, allow for a regeneration delay to provide nesting habitat within cutblock area
- ii. Retain some pieces of coarse woody debris within cutblock areas to provide nesting cover

2.9 Yellow Rail (*Coturnicops noveboracensis*)

Status

Table 9. Status Information for Yellow Rail (*Coturnicops noveboracensis*)

COSEWIC	Special Concern
BC Provincial	Red-Listed
Forest Dwelling	No
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	No
Peripheral Category	~90% of breeding habitat occurs in Canada

Distribution

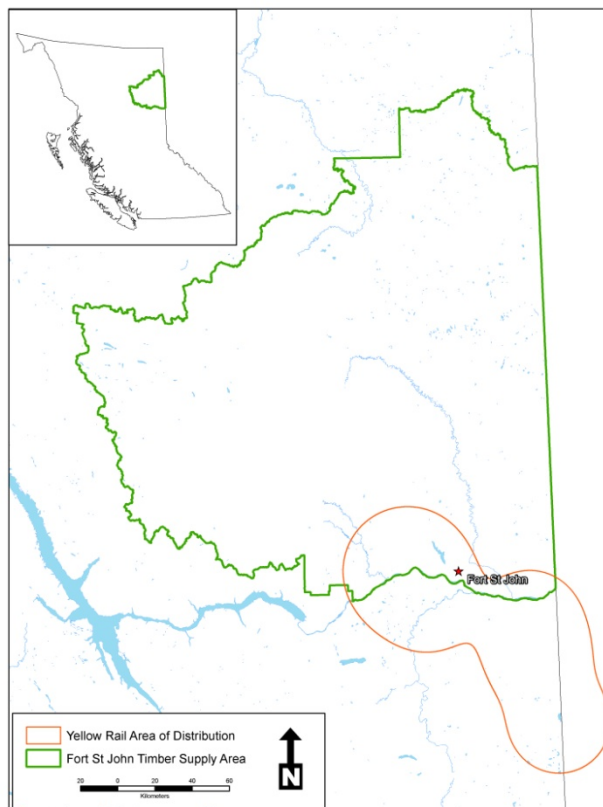


Figure 9. Known distribution (delineated in red) of the Yellow Rail within the Fort St. John TSA (delineated in green). This species most likely occurs elsewhere in the TSA. Map Credit: Gill 2010.

Ecology

The Fort St. John TSA lies on the extreme eastern limit of the known breeding range for the Yellow Rail in Canada (Horn 2009). A great deal of uncertainty surrounds the behavior of these secretive birds. They breed locally, in isolated populations across Canada and the northern

contiguous United States, mainly east of the Rocky Mountains. They are believed to be extremely rare in BC, only known to breed in the Peace River and Kootenay areas, but may be more abundant across their range than records suggest (Bookhout 1995, Horn 2009). The species was not detected during breeding bird and “listed” warbler surveys within the Fort St. John TSA between 2005 and 2008 (Preston 2009). Yellow Rails overwinter amongst the coastal marshes of the eastern seaboard from North Carolina to southern Texas (Bookhout 1995). They probably migrate nocturnally in groups, likely arriving in BC from late May or early June and departing late August or early September.

Nesting sites occur in shallow sedge, grass and rush marshes with little standing fresh or brackish water or wet meadows (Bookhout 1995, Horn 2009). Nests are cups constructed from sedges and grasses typically placed on thick matted thatch on the ground or close to it and concealed by a canopy of dead vegetation (Bookhout 1995, Horn 2009). Pairs will build several nests; one will be used as a natal nest, the others as brood nests. Females produce a single brood per season, but may re-nest if their first clutch does not hatch. An average of 8 eggs (range 5-10) are incubated for approximately 18 days by the female, the male may remain close to the nest during this time (Horn 2009). Hatchlings are semi-precocial and are moved to a brood nest within a day or two of hatching and fledge at about 35 days old (Stalheim 1974). Yellow Rails forage diurnally for freshwater snails, beetles, grasshoppers, seeds and various other insects and crustaceans (Horn 2009).

Key Habitat Features

Wet marshy areas with *Carex* species growing on a moist substrate or in shallow water appear to be a key factor in Yellow Rail habitat selection (Bookhout 1995, Horn 2009). The nest site has to remain wet throughout the nesting season, but water depth must not exceed 15cm (Bookhout 1995, Wilson 2005, Horn 2009). Nests are typically built under a dry mat of senescent or dead vegetation to reduce the risk of predation (Horn 2009).

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.7 (riparian reserves)
- 6.9 (wildlife tree patches)

Impacted by Forestry Operations?

Habitat loss and degradation are considered to be the most significant threat to this species, so conservation of forest wetlands is crucial (Horn 2009). Livestock grazing near wetlands should be avoided as this removes the vegetation required for nesting in the subsequent seasons (Grace et al. 2005). Prescribed burns may be useful for stimulating the growth of desirable graminoid vegetation, but this should be done frequently to avoid destructively hot fires which prevent the development of senescent mats of vegetation (Robert et al. 2000).

Management Guidelines

The following stand-level management guidelines for Yellow Rail are recommended:

- i. Ensure wetlands, especially marshes and wet sedge meadows with minimal woody vegetation, are not impacted or are put into WTPs

2.10 Great Blue Heron (*Ardea herodias herodias*)

Status

Table 10. Status Information for the Great Blue Heron (*Ardea herodias herodias*)

COSEWIC	Not Assessed
BC Provincial	Blue-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	Yes
Peripheral Category	<5% of global range occurring over <25% of BC

Ecology

The Great Blue Heron is widespread across North America. The subspecies *Ardea herodias herodias* breeds in British Columbia's southern interior. There are a few records of Great Blue Herons from March to August for the northeast; however breeding in the region has not been confirmed (Campbell et al. 1990; Butler 1991, 1995; Phinney 1995; Gebauer and Moul 2001).

Great Blue Herons build a stick nest that ranges in size from 50 cm, to 1.0 m in diameter for older nests (Butler 1992). Clutches usually range from 3 to 5 eggs (Campbell et al. 1990). Herons in the interior are migratory, moving south in the fall or early winter as open water freezes (Gebauer and Moul 2001).

Key Habitat Features

Herons may nest individually or in colonies. Nests are usually located in mature forests (deciduous, coniferous or mixed). Colonies may extend for several tree lengths within a stand. Herons tend to avoid human disturbance with some notable exceptions (e.g., Stanley Park, Vancouver). Herons may return to the same nest site for many years, although they will change locations, particularly if subjected to predation pressure or human disturbance (Gebauer and Moul 2001). Nests are located near suitable foraging areas that may include riverbanks, lake edges, marshes and upland, grassy habitats (Butler 1991; Gebauer and Moul 2001).

Management Guidelines

Potential breeding distribution is likely limited to the Peace River valley and lower reaches of major tributaries. The following stand-level management guidelines for Great Blue Herons are recommended for areas of known occurrence:

- i. If herons are present and suspected of breeding, mature timber (conifer, deciduous or mixed with large limb structure) near foraging areas should be checked for the presence of heron nests.

- ii. If a heron nest(s) is discovered and is intact, the nest AND the nest tree (or trees containing nests if part of a nesting colony) are protected YEAR-ROUND from destruction under Section 34 of the *Wildlife Act*. Nest colonies will have multiple nests located in the same tree or in adjacent or nearby trees.

If a heron nest or nests is found, the following guidelines are recommended:

- iii. Where possible, avoid disturbance within 200 m of nests and nest colonies during the breeding season (15 March to 31 August). Minimize access on existing roads and trails (i.e., within 200 m of nests) during this period (types and levels of use should not exceed levels that customarily occur).
- iv. Where possible, establish a forested buffer (WTP or other retention patch) with a radius of approximately 200 m (approximately 12 ha equivalent area) around confirmed nest colonies. Ideally, the colony should be roughly centred within this forested patch. However, if location or orientation of the patch in this manner is not possible for operational or other reasons, then locate the patch so that the nest trees are connected to adjacent forested habitat.
- v. Within retention patches established around nest colonies, do not develop new roads, recreation trails, structures or facilities.

Consult the provincial IWMS guidelines for additional information on the management of Great Blue Heron habitat (i.e., whether to consider establishment of a WHA), especially where large heron colonies are encountered, or in areas where colonies may be isolated geographically or have previously had little exposure to human disturbance or development (i.e., “wilderness” colonies). IWMS guidelines are available at: <ftp://ftp.env.gov.bc.ca/pub/outgoing/Identified%20Wildlife/>.

2.11 Sandhill Crane (*Grus Canadensis*)

Status

Table 11. Status Information for the Sandhill Crane (*Grus canadensis*)

COSEWIC	Not at Risk
BC Provincial	Yellow-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	Yes
Peripheral Category	<5% of global range occurring over <25% of BC

Ecology

The Sandhill Crane is widespread in appropriate habitats across North America, including British Columbia. This species breeds in bogs, marshes and wet meadows with a high proportion of emergent vegetation. Wetlands used tend to be large, free from human disturbance and near suitable foraging habitat. In British Columbia, most nest sites are located near forests, with the forest edge being important for escape cover. In the northeast, Sandhill Cranes have been recorded breeding in the Taiga Plains ecoprovince (Campbell 1990; Cooper 1996) and Boreal Plains ecoprovince (M. Phinney pers. comm.).

The Sandhill Crane's nest consists of a mat of vegetation and may be situated on the ground, attached to emergent vegetation, or floating over water (Tacha et al. 1992). Two eggs are usually laid, although typically only one of the young survives (Campbell et al. 1990; Tacha et al. 1992). Northern populations of Sandhill Cranes are migratory (Tacha et al. 1992); therefore some birds recorded in the northeast represent migrants moving to and from nesting grounds further to the north, while other records may be of breeding birds.

Key Habitat Features

Sandhill Cranes require undisturbed wetland habitat with abundant emergent vegetation for breeding sites. Hardhack, sweet gale, willows, Labrador tea, bulrushes and sedges are all suitable vegetation types for nesting (Campbell et al. 1990). Nesting wetlands are usually surrounded by a meadow fringe, within coniferous forest uplands (Cooper 1996).

Impacted by Forestry Operations?

Although Sandhill Cranes may occasionally use clearcuts, sandhill crane nest sites are not directly impacted by forestry activities. Indirectly, harvesting of the forest edge near nesting wetlands likely disturbs breeding cranes.

Management Guidelines

If Sandhill Cranes are present during the breeding season, nesting nearby can likely be assumed, although non-breeders may occur at some sites. Nesting wetlands are often reused from year to

year so protection of a wetland will have long-term positive consequences for cranes. The following stand-level management guidelines for Sandhill Cranes are recommended where known nests exist:

- i. avoid disturbances (harvesting, brushing, site prep) around the perimeter of wetlands (e.g., within the wetland RMZ) used for nesting during the breeding season 1 May -1 August.
- ii. maintain a visual “screen” around wetlands used for nesting, using part or all of the RMA, to act as a visual buffer from human activities outside of the wetland RMA
- iii. if nesting is suspected in a wetland, assess prior to commencing work in the RMA or RMZ and consider deferring harvest within the RMA.

3 Species Accounts – Mammals

3.1 Fisher (*Martes pennanti*)

Status

Table 12. Status Information for the Fisher (*Martes pennanti*)

COSEWIC	Not Assessed
BC Provincial	Blue-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	Yes
Peripheral Category	<10% of global range occurring over >30% of BC

Distribution

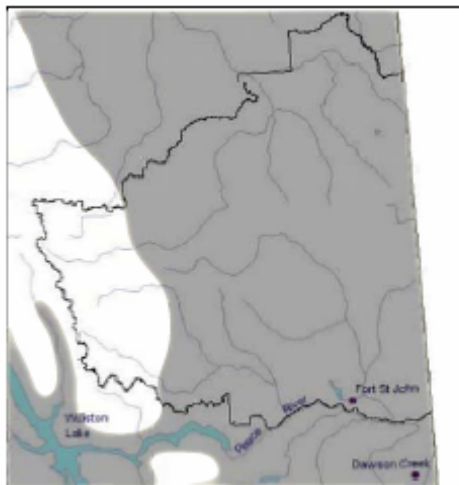


Figure 10. Distribution of Fisher in the Fort St. John TSA. Map Credit: Houde et al. 2004.

Ecology

A variety of habitats, including early seral stages, are used for summer foraging, although summer feeding appears to be strongly associated with CWD and understorey shrub cover . Most winter habitat use is associated with dense late-seral coniferous or mixed wood habitats. Most winter foraging occurs above the snow for species such as snowshoe hare (*Lepus americanus*), porcupine (*Erethizon dorsatum*), American marten (*Martes americana*), and red squirrel (*Tamiasciurus hudsonicus*).

Large-diameter trees with hollow trunk cavities or rotting branch holes, especially riparian cottonwoods are used as maternal den sites. Trees, with broken, rotted tops or large branch hole cavities, are also used. Large diameter spruce with large witches' broom structures (caused by broom rusts) are often used as day beds (resting platforms). During winter, fisher use

subnivean CWD structures for rest and shelter during cold periods, especially when temperatures are below -15°C (Weir et al. 2003). Branch and cavity structures are used for resting/shelter during the remainder of the year and/or during warmer periods.

In general, fishers tend to inhabit low to mid elevations and are usually not found at high elevations.

Key Habitat Features

- i. riparian forest (including streams and wetlands) with moderate to high canopy closure (>30%).
- ii. large diameter black cottonwood or balsam poplar (>75 cm dbh) with internal stem decay/hollows. These types of trees often have large broken limb scars, broken tops, large stem scars, and/or fungal conks along the tree bole.
- iii. large diameter spruce (>45 cm dbh), especially with large witches' broom structures.
- iv. stands with an abundance of CWD, especially with larger diameter pieces (>30 cm diameter).
- v. stands with a well-developed shrubby understorey.

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will complement the specific stand level management guidelines:

- 6.1 (forest type distribution by LU)
- 6.2 (seral stage targets by LU)
- 6.3 (Patch size and rotating reserve provisions)
- 6.5 (snags/cavity sites)
- 6.6 (Coarse Woody Debris)
- 6.7 (Riparian Reserves)
- 6.9 (WTP's)
- 6.15 (Parks and Ecological Reserves)
- 6.18 (Graham Harvest timing),
- 6.19, 6.22 (patch cutting in major river corridors)
- 6.26 (salvage strategy, which allows some damaged stands to persist on the landscape)

Management Guidelines

The following stand-level management guidelines are recommended for areas that have been identified as high suitability fisher habitat:

- i. where forested riparian areas have significant concentrations of large diameter spruce (>45 cm dbh) or cottonwood (>75 cm dbh; these areas will typically have >20% spruce or cottonwood by tree species composition) fall within harvest block boundaries, and where operationally feasible, do not isolate the riparian

zone within the block. Try to connect at least one side of the RMA to an adjacent forested stand.

- ii. where possible retain full RMA widths for S1, S2 and low gradient, low elevation S5 streams.
- iii. WTPs should contain, where present, some mature or old forest with >30% canopy closure, as well as CWD and a well developed shrub layer.
- iv. in mixed wood stands, select WTPs that contain some large diameter deciduous trees (especially black cottonwood > 75 cm dbh) and conifers (especially white spruce >45 cm dbh). Trees of this description are especially important when found in riparian areas (see (i) above).
- v. where present, include large diameter trees (especially spruce and cottonwood) with evidence of internal decay (i.e., visible fungal conks, large broken branch stubs, broken tops or large stem scars), or trees with broom rust or witches' broom branch structures, into WTPs. These trees will function as potential denning and resting sites, and a future source of CWD.
- vi. where present, retain some larger, elevated pieces of CWD (>30 cm diameter) on harvest blocks. Actual CWD volumes will be variable and will depend on average pre harvest levels for the BEC variant, site-specific variables such as stand age and composition, stochastic factors such as windthrow, as well as utilization and silviculture objectives. However, a general guideline where feasible is at least 50% of average pre harvest CWD levels for the BEC variant.
- vii. When completing roadside or landing piling, large diameter CWD may be placed in loosely layered low-height piles (e.g. 1-3 m high) and up to 3 m in width to provide additional shelter and foraging opportunities for fishers. A mix of CWD piece sizes (both diameter and length) will create a loose, layering effect within the pile, thereby providing access and hiding spaces for fishers and potential prey species. Where the opportunity exists during roadside piling position CWD piles near riparian areas and/or other locations that contain suitable habitat trees.

Based on current knowledge, these management guidelines should be applied to stands with high suitability for fisher, specifically to blocks with high loading of large diameter CWD, or stands with significant components of large diameter deciduous or coniferous stems (e.g., more than 20% of the stems greater than 45 cm DBH).

3.2 Wolverine (*Gulo gulo luscus*)

Status

Table 13. Status Information for Wolverine (*Gulo gulo luscus*)

COSEWIC	Special Concern
BC Provincial	Blue-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	Yes
Peripheral Category	<10% of global range occurring over >30% of BC

Distribution

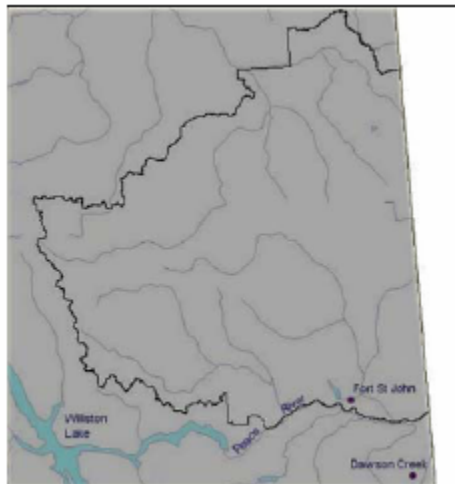


Figure 11. Distribution of wolverine in the Fort St. John TSA. Map Credit: Houde et al. 2004.

Ecology

Wolverine will use all habitat types from valley bottoms to alpine ridges, however preference is for higher elevation habitats (generally >1000 m elevation), with seasonal movements occurring between elevation ranges (Banci 1987; Banci 1994). Wolverines are generally found at higher elevations during summer, and lower elevations in the BWBS, ESSF and SWB during winter. Adult females tend to remain at higher elevations through much of the year, with birthing taking place from February to May. Birth dens are usually found in alpine or subalpine habitats, particularly in the ESSF/ESSF parkland ecotype. However, very little is known about the denning ecology of wolverine in non-mountainous habitats (E. Lofroth, pers. comm.). Birth dens are typically associated with snow caves, uprooted trees, and accumulations of fallen trees or coarse woody debris, overhanging banks, talus slopes or avalanche tracks, steep ravines, log jams, beaver lodges, and beneath fallen logs, dead trees or large rocks (Lofroth et al. 2000).

Wolverines are carnivores that prey on a wide range of mammalian, bird and fish prey. Carrion is an important diet component.

Key Habitat Features

Access to winter food is thought to be the most limiting factor for wolverine (Banci 1994: Lofroth et al. 2000). Certain habitat elements provide the best combination of food, shelter and thermal functions, especially during winter, and contribute to increased winter habitat suitability for wolverine. These include:

- i. forest stands with >50% canopy cover where the canopy has begun to develop layers (i.e., with dominant, intermediate and shrub layers).
- ii. an abundance of larger piece size CWD (>30 cm diameter).
- iii. cliffs, talus slopes, rocky outcrops, shrubby avalanche tracks, ridges, alpine meadows.
- iv. riparian forest.
- v. ungulate winter ranges (i.e., southerly and west facing slopes) or other locations
- vi. where ungulates may congregate (e.g., mineral licks and wallows).

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.2 (seral stage targets by LU)
- 6.3 (Patch size and rotating reserve provisions)
- 6.5 (snags/cavity sites)
- 6.6 (CWD)
- 6.7 (Riparian Reserve zones)
- 6.9 (WTP's)
- 6.16 (WHA's/UWR)
- 6.18(Graham timing)
- 6.19 (Graham merch area)
- 6.20 (Graham Connectivity),
- 6.21 (MKMA harvest)
- 6.22 (River corridors)
- 6.45 (Recreation Opportunity Spectrum).

Impacted by Forestry Operations?

Forest harvesting has the potential to impact wolverine habitats, but may be relatively low. Potential impacts are associated with wintering habitats (for males and sub-adult females) that occur at valley bottom to middle elevation ranges. Mature females give birth during winter/spring in the upper ESSF/ESSFp subzones. Due to low operability, it is expected that these areas will be minimally impacted by forestry activities Potential impacts include direct wolverine mortality from increased human access in roaded areas, and habitat conversion of

mature/old forests to younger structural stages. However, due to fire histories and fire management, the percentage of Old-growth forest is currently increasing in the FSJ TSA.

Management Guidelines

The following stand-level management guidelines for wolverine are recommended for areas that have been identified as high suitability wolverine habitat:

- i. where forested riparian areas fall within harvest block boundaries, and where operationally possible, do not isolate the riparian management area within the block. Try to connect at least one side of the RMA to an adjacent forested stand.
- ii. where available, retain some larger piece size CWD (>30 cm diameter) on harvest blocks. Actual CWD volumes will be variable and will depend on average pre-harvest levels for the BEC variant, site-specific variables such as stand age and composition, stochastic factors such as windthrow, as well as utilization and silviculture objectives. However, a general guideline where feasible is at least 50% of average pre-harvest CWD levels for the BEC variant.
- iii. where available, WTPs should contain some mature or old forest with >50% canopy closure. If present, include rock outcrop complexes and/or locations with abundant CWD within WTPs with this level of mature canopy closure.

Based on current knowledge of the distribution of key habitat features, the management guidelines should be applied specifically to cutblocks above 1,000 m in elevation within Operating Areas #9, #10, #11, #12, #37, and #47. The guidelines may also be applied in other areas where there are known occurrences of Wolverine.

3.3 Grizzly Bear (*Ursus arctos*)

Status

Table 14. Status Information for Grizzly Bear (*Ursus arctos*)

COSEWIC	Special Concern
BC Provincial	Blue-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	Yes
Peripheral Category	<10% of global range occurring over >30% of BC

Distribution

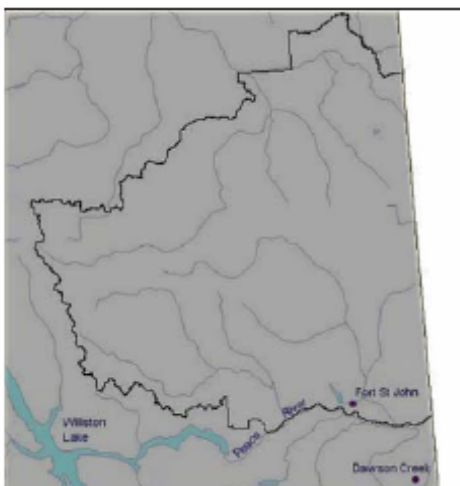


Figure 12. Distribution of Grizzly Bear within the Fort St. John TSA. Map Credit: Houde et al. 2004.

Ecology

Grizzly bears are opportunistic omnivores. They tend to feed on herbaceous plants in avalanche chutes and other moist areas in the spring, but use a wide range of forested habitats throughout the remainder of the year (McLellan and Hovey 2001). Plants with tuberous roots (e.g., *Hedysarum spp.*), as well as cow parsnip (*Heracleum lanatum*), sedges (*Carex spp.*), horsetail (*Equisetum spp.*), and berry producing shrubs (e.g., *Vaccinium spp.*, soopolallie (*Shepherdia Canadensis*, red elderberry (*Sambucus racemosa*), gooseberries and currants (*Ribes spp.*), red-osier dogwood (*Cornus stolonifera*)) all provide important food from spring through late summer. Carrion, ground squirrels, fish and ungulates are fed upon when seasonally available. Bears often use cool, closed canopy stands for thermal and security cover during the day. Hibernation occurs from ~ November to April. Dens are often excavated, and are usually located on moderate to steep north and east-facing subalpine and alpine slopes (Vroom et al. 1977).

Key Habitat Features

Preferred habitats in the Fort St. John District are found in the ESSF (all subzones), BWBSdk, and SWBmk biogeoclimatic units. The following habitat features are preferred by grizzly bear:

- i. moist riparian forest with moderate to high canopy closure (>30%). These areas are often used for feeding, providing day bed sites, and as travel corridors.
- ii. wet meadows, estuaries, skunk cabbage (*Lysichiton americanum*) swamps, and seeps.
- iii. shrubby avalanche chutes.
- iv. stands, often fire successional, with a well developed shrubby understorey (i.e., with *Vaccinium spp.*).
- v. subalpine and alpine areas, especially those that contain potential forage species (e.g., ground squirrels, berry producing shrubs), and suitable topography for location of winter dens.

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.2 (seral stage targets by LU)
- 6.3 (Patch size and rotating reserve provisions)
- 6.5 (snags/cavity sites)
- 6.6 (CWD)
- 6.7 (Riparian Reserve zones)
- 6.9 (WTP's)
- 6.16 (WHA's/UWR)
- 6.18 (Graham timing)
- 6.19 (Graham merch area)
- 6.20 (Graham Connectivity)
- 6.21 (MKMA harvest)
- 6.22 (River corridors)
- 6.45 (Recreation Opportunity Spectrum)

Impacted by Forestry Operations?

Direct, human-caused death is probably the greatest mortality factor for grizzlies, including hunting, poaching, and conflicts with livestock or garbage disposal (McLellan and Hovey 2001; Cannings et al. 1999). Forest harvesting has the potential to increase mortality by increasing road/human access, and by fragmenting seasonal habitats.

Some forestry practices (e.g., variable density planting and spacing regimes) and silvicultural systems (e.g., clearcutting) can be beneficial for production of grizzly bear forage.

Management Guidelines

There are no populations of grizzly bear in the Fort St. John TSA that are considered by the Province to be threatened. Stewardships measures are recommended to be undertaken in this area to ensure population persistence. Therefore, the following stand-level management guidelines are recommended for the Muskwa-Kechika Management Area, Operating Area's #11 (Graham River) and #47 (Minaker R):

- i. leave buffer strips of forested habitat to provide security cover and bedding areas adjacent to known important foraging areas (e.g., avalanche chutes, wet meadows, estuaries, streams/wetlands, skunk cabbage swamps, seeps and alder swales). These areas will often provide additional habitat elements such as mark trees and mark trails, as well as connectivity and escape cover.
- ii. where feasible, provide windfirm visual screening along all-season permanent roads to provide security cover
- iii. minimize new road placement near known important bear foraging areas. Coordinate access management to minimize potential human-grizzly interactions.
- iv. if roads have been previously located near areas important for bear foraging, then permanently deactivate these roads when they are no longer required for access.
- v. remove clover from grass seed mixtures when close to all season roads (<500 m) so that these areas are less attractive to grizzlies for foraging.
- vi. avoid intensive silviculture treatments to address low stocked sites. This will result in a "patchy" stocking density that facilitates production of berry producing shrub species.
- vii. complete brushing activities within 5 years of initial establishment. If brushing is required after that time, use crop-tree centered brush treatments to maintain important forage species.

3.4 Woodland Caribou (*Rangifer tarandus*)

3.4.1 Boreal Ecotype

Status

Table 15. Status Information for Woodland Caribou (*Rangifer tarandus*), Boreal Ecotype

COSEWIC	Threatened (SARA Schedule 1)
BC Provincial	Red-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	Yes
Peripheral Category	Breeding habitat occurs in ~15% of BC

Distribution



Figure 13. Distribution of Boreal Ecotype Woodland Caribou in the Fort St. John TSA. Map Credit: Houde 2004.

Ecology

Two ecotypes of woodland caribou occur in the Fort St. John TSA, they are distinguished based on differences in habitat use (Houde et al. 2002, BC CDC 2010). Boreal ecotype caribou are limited to the lowlands of northeastern British Columbia and they utilize muskeg/spruce peat bog habitats in the Boreal White & Black Spruce biogeoclimatic zone throughout the year (BC CDC 2010). They use forested habitat less frequently, but commercial forests may be a significant habitat feature during critical periods (BC CDC 2010).

This ecotype primarily feeds on terrestrial lichens on raised microsites; they sometimes forage for arboreal lichens in black spruce (*Picea mariana*) stands (D. Seip, Min. Forests, pers. comm.). Boreal Caribou also utilize a variety of grasses, sedges, horsetails, flowering plants and shrubs when they are available (Darby & Pruitt 1984). Since boreal caribou utilize a dispersed

distribution strategy to avoid predation, the availability of large areas of habitat is important to their survival (BCC 2001).

Woodland Caribou are polygamous, dominant bulls breed with several females from late September through mid October, gestation lasts approximately 230 days and single calves are born in early to mid May (BC CDC 2010). Boreal Woodland Caribou prefer large muskegs or islands on lakes for calving habitat due to the low density of predators at these sites (Fuller & Keith 1981, BC CDC 2010). In British Columbia they have also been observed during calving season in small patches of mature black spruce or mixed wood surrounded by peatlands, wetland edge habitat at old burn sites, lakeshores and alder thickets with standing water (Culling et al. 2006). Boreal Caribou show strong calving site fidelity, productivity is low and calf mortality is high so population growth is slow (Culling et al. 2006, BC CDC 2010).

Key Habitat Features

The boreal population is restricted to the northeast corner of British Columbia, extending into Alberta and the Northwest Territories. Key habitat features include large areas of lower elevation muskeg/spruce peat bogs and islands on lakes (Fuller & Keith 1981, BC CDC 2010). Boreal Caribou avoid recently disturbed sites and early successional forest habitats (Stuart-Smith et al. 1997). They rely upon mature coniferous stands with arboreal lichens and closed canopies which reduces snow depth and provides winter forage (Thomas & Armbruster 1996).

Linkages to SFMP Indicators and Associated Strategies:

The following SFMP indicators and the implementation of the associated strategies will complement the specific stand level management guidelines:

- 6.2 (seral stage targets by LU)
- 6.3 (Patch size and rotating reserve provisions)
- 6.5 (snags/cavity sites)
- 6.6 (CWD)
- 6.7 (Riparian Reserve zones)
- 6.9 (WTP's)
- 6.12 (Caribou)
- 6.16 (WHA'a/UWR)
- 6.18 (Graham timing)
- 6.19 (Graham merch area)
- 6.20 (Graham Connectivity)
- 6.21 (MKMA harvest)
- 6.22 (River corridors)
- 6.45 (Recreation Opportunity Spectrum)

Impacted by Forestry Operations?

Increased human access (i.e., from roads, pipelines and seismic lines) which can lead to disturbance and mortality, increased predation, or reduced access to areas for feeding/dispersal, are perhaps the biggest threats to caribou. The decline and fragmentation of mature and old pine/spruce forests (i.e., reduction of lichen and other winter forage), and reduction of peat bog foraging habitats, can also impact caribou populations (BCC 2001, Simpson et al. 1997).

Management Guidelines

Because of their status and migratory behaviour, management of caribou habitat should be described in higher-level plans (e.g., LU Plans, LRMP plans) and sustainable forest management plans. Recovery plans are currently being developed for all caribou herds within the southern mountain national ecological area (D. Seip, Min. Forests, pers. comm.). **Once recovery plans are completed, conservation strategies will be revised to be consistent with these plans.**

Ecosystem-based, landscape level objectives for patch size and seral stage distribution targets can be used to provide coarse-level mature and old forest habitat, as well as landscape connectivity functions. These will provide dispersal opportunities and feeding and security values for caribou.

The following stand-level guidelines should be considered in areas of known caribou use associated with:

- a. operating area # 13, 14, 15, 22, 39, 40, 42 for the boreal ecotype
- b. operating area # 9, 10, 11, 12, 20, 36, 37, 46, and 47 for the northern ecotype

Access

- i. within access management plans, include road deactivation recommendations to minimize vehicle access to, and isolation or fragmentation of ungulate winter ranges or wildlife habitat areas for caribou.
- ii. to reduce barrier effects of roads, road design (height) should accommodate the ability of caribou to have a clear line of sight to habitat on the other side of the road, at least along portions of the road at regular intervals and where topographically feasible.

Harvesting and Silviculture

- iii. maintain approximate pre-harvest tree species composition.
- iv. on sites with significant terrestrial lichen cover, care should be taken to minimize surficial disturbance. In these stands, winter logging when snow cover is present may be appropriate.
- v. do not create excessive physical obstructions (such as windrows) during site preparation

- vi. limit use of broadcast-brushing techniques such as herbicides in areas that contain significant amounts of terrestrial lichens, unless being used to control moose forage near caribou UWRs or WHAs to support caribou recovery.
- vii. light scarification and/or prescribed burning (post-harvest) may be considered in order to enhance suitable ground conditions for lichen colonization (BCC 2001).
- viii. where the achievement of seral stage targets may be a concern, patch clearcut or group selection silvicultural systems may be used on a trial basis to create stand openings that enhance light penetration to the forest floor, thereby enhancing lichen colonization.

3.4.2 Northern Ecotype

Status

Table 16. Status Information for Woodland Caribou (*Rangifer tarandus*), Northern Ecotype

COSEWIC	Special Concern
BC Provincial	Blue-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	Yes
Peripheral Category	~24% of global range occurring over <30% of BC

Distribution

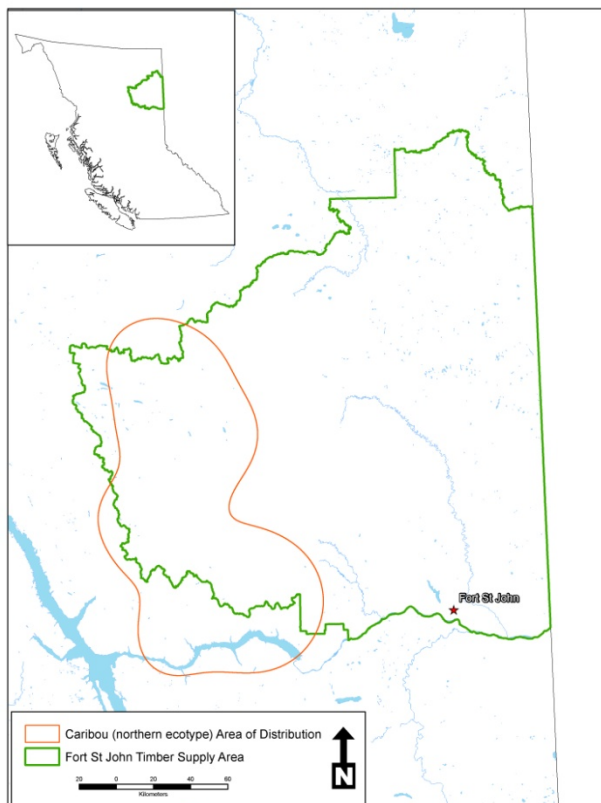


Figure 9. Known distribution (delineated in red) of the Northern Ecotype Woodland Caribou within the Fort St. John TSA (delineated in green). Map Credit: Gill 2010.

Ecology

The northern ecotype (or northern caribou) mainly uses mountainous open alpine and subalpine habitats in summer, where they feed on grasses, sedges, forbs and terrestrial lichen. Calving takes place primarily at high elevations, although some animals disperse throughout forested habitats as well (Stevenson 1990). In winter they are found in mature coniferous forest, especially lower elevation (midslope) lodgepole pine (*Pinus contorta*) or pine/spruce stands, where they feed primarily on terrestrial lichens. Dry meadows are used when the snow depth is low or moderate, but are abandoned during periods of deep snow. Under deep or heavily crusted snow conditions where it is difficult to crater for terrestrial forage; northern caribou may switch to arboreal lichens. Some herds seem to prefer windblown alpine slopes in winter, where high winds minimize snow accumulation and expose terrestrial forage. During spring migration, caribou tend to use low elevation movement routes and feed on green vegetation in openings. Immature forests (<80 years) are usually avoided, while mid-successional fire originated stands (~80-120 years) and old forest stands (>140 years) are preferred because of the presence of terrestrial lichen (Stevenson 1990). However, Brown et al. (2000) found that younger to mature (~50-110 years), relatively short (7-17 m in height) pine or pine-dominant stands growing on shallow duff (<5 cm) and on shallow slopes (<5%), had high amounts of terrestrial lichen cover (>10% ground cover) and therefore have the potential to be

high suitability caribou winter habitat. As well, Ahti (1977) suggested that forests beyond about 110 years of age tend to have declining lichen abundance levels. Consequently, stand-opening disturbances such as fire and logging can, in some cases, be an important factor in meeting forest age-class objectives to ensure adequate supply of lichen producing stands through time (Brown et al. 2000).

Key Habitat Features

Where northern caribou occur, key habitat features are:

- i. open canopied (25-55% crown closure) mature and old pine and pine/spruce stands that contain abundant terrestrial lichen (especially *Cladina* spp.) as winter forage.
- ii. exposed, windblown alpine slopes with abundant terrestrial lichen.

Linkages to SFMP Indicators and Associated Strategies:

The following SFMP indicators and the implementation of the associated strategies will complement the specific stand level management guidelines:

- 6.2 (seral stage targets by LU)
- 6.3 (Patch size and rotating reserve provisions)
- 6.5 (snags/cavity sites)
- 6.6 (CWD)
- 6.7 (Riparian Reserve zones)
- 6.9 (WTP's)
- 6.12 (Caribou)
- 6.16 (WHA'a/UWR)
- 6.18 (Graham timing)
- 6.19 (Graham merch area)
- 6.20 (Graham Connectivity)
- 6.21 (MKMA harvest)
- 6.22 (River corridors)
- 6.45 (Recreation Opportunity Spectrum)

Impacted by Forestry Operations?

Increased human access (i.e., from roads, pipelines and seismic lines) which can lead to disturbance and mortality, increased predation, or reduced access to areas for feeding/dispersal, are perhaps the biggest threats to caribou. The decline and fragmentation of mature and old pine/spruce forests (i.e., reduction of lichen and other winter forage), and reduction of peat bog foraging habitats (for boreal populations); can also impact caribou populations (BCC 2001, Simpson et al. 1997).

Management Guidelines

Because of their status and migratory behaviour, management of caribou habitat should be described in higher-level plans (e.g., LU Plans, LRMP plans) and sustainable forest management plans. Recovery plans are currently being developed for all caribou herds within the southern mountain national ecological area (D. Seip, Min. Forests, pers. comm.).

Once recovery plans are completed, conservation strategies will be revised to be consistent with these plans.

Ecosystem-based, landscape level objectives for patch size and seral stage distribution targets can be used to provide coarse-level mature and old forest habitat, as well as landscape connectivity functions. These will provide dispersal opportunities and feeding and security values for caribou.

The following stand-level guidelines should be considered in areas of known caribou use associated with:

- a) Operating area # 9, 10, 11, 12, 20, 36, 37, 46, and 47 for the northern ecotype

Access

- i. within access management plans, include road deactivation recommendations to minimize vehicle access to, and isolation or fragmentation of ungulate winter ranges or wildlife habitat areas for caribou.
- ii. to reduce barrier effects of roads, road design (height) should accommodate the ability of caribou to have a clear line of sight to habitat on the other side of the road, at least along portions of the road at regular intervals and where topographically feasible.

Harvesting and Silviculture

- iii. maintain approximate pre-harvest tree species composition.
- iv. on sites with significant terrestrial lichen cover, care should be taken to minimize surficial disturbance. In these stands, winter logging when snow cover is present may be appropriate.
- v. do not create excessive physical obstructions (such as windrows) during site preparation
- vi. limit use of broadcast-brushing techniques such as herbicides in areas that contain significant amounts of terrestrial lichens, unless being used to control moose forage near caribou UWRs or WHAs to support caribou recovery.

- vii. light scarification and/or prescribed burning (post-harvest) may be considered in order to enhance suitable ground conditions for lichen colonization (BCC 2001).
- viii. where the achievement of seral stage targets may be a concern, patch clearcut or group selection silvicultural systems may be used on a trial basis to create stand openings that enhance light penetration to the forest floor, thereby enhancing lichen colonization.

3.5 Wood Bison (*Bison bison athabasca*)

Status

Table 17. Status Information for Wood Bison (*Bison bison athabasca*)

COSEWIC	Threatened (SARA Schedule 1)
BC Provincial	Red-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	No
Peripheral Category	Yes

Distribution

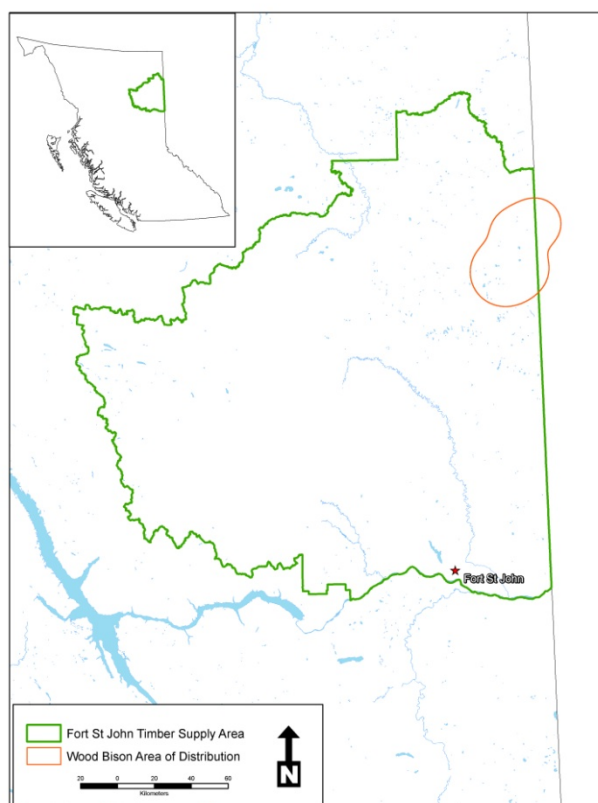


Figure 14. Known distribution (delineated in red) of the Wood Bison within the Fort St. John TSA (delineated in green). Map Credit: Gill 2010.

Ecology

Wood bison, the largest land mammals in North America were extirpated from British Columbia, when the last individual was shot near Fort St. John in 1906 (MacGregor 1952, Harper et al. 2000). Since recovery efforts were initiated with reintroductions in the 1980's Wood Bison have established four small herds in the north-eastern corner of the province (BC CDC 2010). Both the provincially Red-listed Wood Bison (*Bison bison athabasca*) and the slightly smaller,

significantly more abundant Plains Bison (*Bison bison bison*) subspecies are found within the Fort St. John TSA (Harper & Gates 1999).

The Etthithum Wood Bison herd were released from an enclosure near Strom Lake approximately 200km north of Fort St. John in 2002 (Rowe & Backmeyer 2006). Latest Etthithum herd inventory results indicate an expanding range (MCP range 254 km²) (Rowe & Backmeyer 2006) and population growth to at least 156 individuals (Thiessen 2009).

Wood Bison are obligate grazers, closely associated with the boreal forests and parklands of northwestern North America. They prefer productive, wetland sedge and graminoid dominated meadows, but also forage on dry grasslands and in open shrub-lands (Harper et al. 2000, Jensen et al. 2004). The early seral stages brought about by wildfire and industrial disturbances provide excellent foraging opportunities for this species. The Wood Bison's diet is low in protein and high in fibre, consisting largely of sedges and grasses, with herbs, shrubs and terrestrial lichen making up the remainder (WBRT 1987, Larter & Gates 1991). They migrate seasonally in response to changes in weather and food supplies but return annually to the same breeding and calving sites (WBRT 1987).

Wood Bison live for an average of 10 years, but can survive for 40 years; they are gregarious with a social structure involving highly mobile and fluid herds of adult males in small bachelor groups or larger groups consisting of adult females, immature animals and young of the year (Harper et al. 2000). Breeding season begins in June and runs through early September (Harper et al. 2000). Females conceive for the first time between the ages of 1 and 3, fertility in females older than 12 diminishes (WBRT 1987, Harper et al. 2000). They typically produce a single precocious calf in May following a nine and a half month gestation period (WBRT 1987).

Key Habitat Features

Wood Bison select for landscapes dominated by graminoid vegetation, particularly wetlands, meadows and shrubby or grassy fens for foraging (Larter & Gates 1991, Jensen et al. 2004). They also use deciduous and coniferous forests probably for resting, ruminating and avoiding insects (Jensen et al. 2004). Bison control areas and buffer zones are useful tools in limiting the two major threats to this species, hybridization with Plains Bison and the spread of disease (Harper et al. 2000).

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.1 (forest types)
- 6.2 (seral stages)
- 6.7 (riparian reserves)
- 6.22 (river corridors)

Impacted by Forestry Operations?

Timber harvesting and forest management practices provide opportunities to maintain or increase the amount of open habitat available for foraging (Harper & Gates 1999). Post harvest practices which slow regeneration and prescribed burns are useful tools in arresting successional stages and may provide some mitigation for wildfire suppression which reduces the availability of foraging habitat (Harper & Gates 1999). Whilst Wood Bison often select for grassy areas along roadsides, seismic lines and other linear features, industrial road traffic is a significant mortality factor for the Etthithum herd (Churchill & Maundrell 1998).

Management Guidelines

The following stand-level management guidelines for wood bison are recommended:

- i. High quality foraging habitats (coarse grass and wet sedge meadows) should not be impacted by harvesting or road-building activities
- ii. Ensure a forested buffer remains where mixedwood stands occur adjacent to high quality foraging areas

4 Species Accounts - Amphibians

4.1 Western Toad (*Anaxyrus boreas*)

Status

Table 18. Status Information for Western Toad (*Anaxyrus boreas*)

COSEWIC	Special Concern
BC Provincial	Yellow-Listed
Forest Dwelling	Yes
Potential for Negative Impacts from Forestry Operations	Yes
IWMS	No
Peripheral Category	No

Distribution

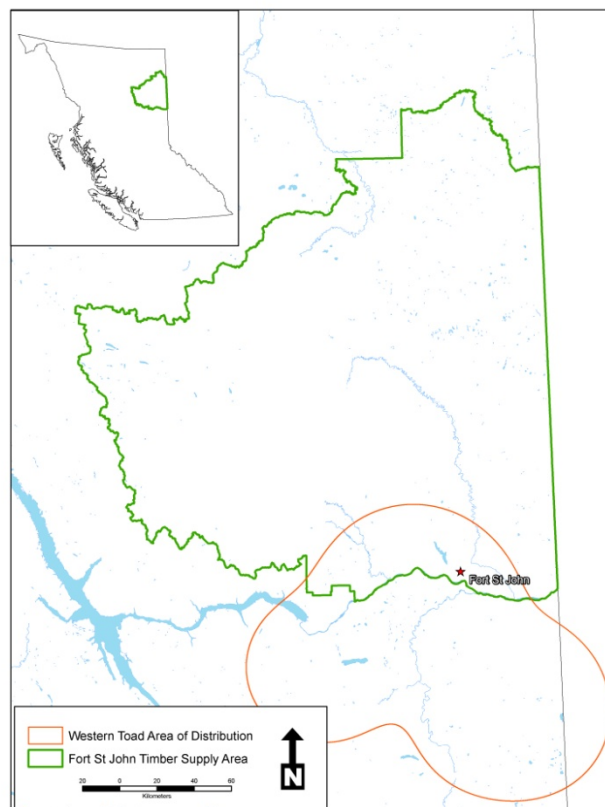


Figure 15. Known distribution (delineated in red) of the Western Toad within the Fort St. John TSA (delineated in green). Map Credit: Gill 2010.

Ecology

British Columbia's only Bufonid toad, Western Toads are found west of the Rocky Mountains, from Mexico north to Alaska and into southern parts of Yukon Territory. Though present within the Fort St. John TSA, they are absent from the north-eastern corner of the province (Jones 2000, Wind & Dupuis 2002). They can be found from sea level to elevations well above 3000 metres (Jones 2000). Whilst generally nocturnal, Northern Toads tend to be diurnal at higher elevations (Carey 1978).

Western Toads may live as long as 11 years, with males typically reaching maturity at 2-3 years and females at 4-6 years of age (Carey 1993). Though capable of excavating burrows in loose soils, Western Toads typically hibernate from November through April (depending on elevation and latitude) in the burrows of small mammals, or underneath logs and rocks. Burrow sites are located below the frost line to a depth of approximately 1.3m (Mennel & Slough 1999). Adults emerge from hibernation in early spring and migrate to communal breeding sites in a variety of wetland and aquatic habitats, with or without canopy cover, woody debris or emergent vegetation. Western Toads often return to the same breeding areas annually (Wind & Dupuis 2002). Breeding occurs over a very short time, sometimes just one to two weeks sometime between April and July, once the snow and ice have melted and often following rain events (BC MWLAP 2002). They are explosive breeders with females laying up to 15,000 eggs per breeding season. Eggs are deposited underwater in strings attached to aquatic or emergent vegetation usually no more than 1 metre below the surface. Adults then disperse into terrestrial habitats (Bartelt & Peterson 1994). Tadpoles hatch 3 – 12 days following oviposition, dependent on water temperature. Metamorphosis takes as little as three weeks again dependent upon water temperature; toadlets form large aggregations along the shorelines before following the adults towards the summer range (Wind & Dupuis 2002). Adult and juvenile toads are highly susceptible to predation and to being crushed during these migrations.

Whilst tadpoles are herbivores, relying on plants, detritus and algae, following metamorphosis, 95% of a Western Toad's diet consists of insects and invertebrates (Sullivan 1994).

Key Habitat Features

Western Toads use wetland and aquatic areas for breeding and disperse to terrestrial habitats for summer range and to hibernate (Wind & Dupuis 2002). Lakes, beaver ponds, stream edges and shallow, seasonal pools and road ditches are typically used as breeding sites (Corkran & Thomas 1996, Wind & Dupuis 2002). Breeding pools must be large and deep enough to ensure that the water does not evaporate prior to the completion of metamorphosis (Gyug 1996). Western Toads occur in semi-arid areas, often roaming considerable distances from standing water, but they prefer moist conditions and favour dense shrub cover to protect them from predation (Bartelt & Peterson 1994), summer ranges often include forests, clear-cuts, grasslands, alpine meadows, avalanche slopes and wetlands (Gyug 1996). Western Toads do not tolerate disturbance or habitat fragmentation well (Cooke 2000, Ostergaard & Richter 2001).

Linkages to SFMP Indicators and Associated Strategies

The following SFMP indicators and the implementation of the associated strategies will augment or complement the specific stand level management guidelines:

- 6.7 (riparian reserves)
- 6.9 (wildlife tree patches)
- 6.22 (river corridors)
- 6.36 (protection of streambanks and riparian values on small streams)

Impacted by Forestry Operations?

Riparian management zones assist in the maintenance and protection of aquatic breeding habitat for the Western Toad (Wind & Dupuis 2002). Forestry practices that accommodate connectivity between wetland sites and between wetland and upland habitats are highly beneficial for this species (Bartelt & Peterson 1994). Where possible harvesting should be avoided during periods when local mass migrations occur (spring and fall). This species migrates relatively long distances to get to and from aquatic habitats during the breeding season, juveniles follow similar routes when they disperse from the natal sites, they are therefore highly susceptible to being crushed by industrial and vehicular traffic as they cross roads and enter upland areas with increased access for industrial and recreational use. Forestry operations, particularly the ruts and disturbance caused by industrial traffic produce attractive small shallow breeding pools which potentially act as population sinks due to a lack of cover and the fact that they dry up prior to the completion of metamorphosis (Gyug 1996). Toads do not tolerate disturbance and habitat fragmentation as well as some other amphibian species (Cooke 2000, Ostergaard & Richter 2001).

Management Guidelines

The following stand-level management guidelines for western toad are recommended:

- i. Ensure adequate buffers around wetland areas, small ponds, and riparian areas with extensive low-gradient banks and adjacent wetland complexes
- ii. Use WTPs to protect sites with standing water or shallow pools in moist forest areas
- iii. In moist forest sites, especially those adjacent to wetland areas, winter logging is preferred to avoid damaging sensitive habitats.
- iv. Retain coarse woody debris in moist forest areas to provide cover

5 Species Accounts – Fish

5.1 Bull Trout (*Salvelinus confluentus*)

Status

Table 19. Status Information for Bull Trout (*Salvelinus confluentus*)

COSEWIC	Not Assessed
BC Provincial	Blue-Listed
Forest Dwelling	No
Potential for Negative Impacts from Forestry Operations	Yes
IWMS (2004)	No
Peripheral Category	50-70% of global range in BC

Ecology

Bull trout are widely distributed throughout the interior of British Columbia. Distribution and abundance of bull trout are strongly influenced by channel and hydrologic stability, substrate composition, cover, temperature, and the maintenance of migration corridors (Cannings and Ptolemy 1998). Riverine habitat requires deep pools associated with an array of in stream and over stream cover elements, as well as large woody debris. Changes in pool volume and depth as a result of channel destabilization have been shown to be detrimental (Cross and Everest 1994). Bull trout spawn in flowing water (McPhail and Baxter 1996), and clean gravel and cobble substrates are required for spawning and juvenile cover. Spawning often occurs in smaller, lower order rivers and streams. Bull trout in the Fort St. John TSA are largely confined to the low turbidity, moderate gradient systems of the Rocky Mountains and Foothills, lying west of the Halfway River main stem and south of the height of land between the upper Halfway and upper Sikanni drainages (MELP, 2001).

Key Habitat Features

- i. large deep river pools for shelter
- ii. in stream and over stream cover objects for creation of sheltered pools (i.e., thermally buffered and security/hiding cover). These include cutbanks, logjams or other large woody debris, and overhanging trees and shrubs.
- iii. clean gravel and cobble substrates for spawning, especially with nearby pools.

Impacted by Forestry Operations?

Human activities that lead to changes in water temperature, substrate composition, channel or bank stability, loss of aquatic and riparian habitat complexity, and increased erosion, infilling and sedimentation, can impact bull trout populations. Over fishing also threatens some populations.

Management Guidelines

Various landscape level forest management strategies will by default protect some bull trout habitat. These include ungulate winter ranges, old growth management areas, and targets for patch size and seral stage distribution in landscape units. However, additional stand-level guidelines are recommended for **riparian areas adjacent to high suitability bull trout habitat**:

- i. follow riparian regulatory standards for streams, rivers and lakes (see Min. Forests 1995, and Forest Planning and Practices Regulation (2004, sections 8, 47-58) for additional detail).
- ii. Follow SFMP stream crossing guidelines.
- iii. When within WHA's follow general wildlife measures.
- iv. In S4 RMZs with low windthrow risk, target retention of 50% or more of the total basal area of the RMZ. This will include the existing tree and shrub species composition (including range of species, vegetation layers and ages). This will help ensure long-term recruitment of LWD to the riparian system, provide overhanging streambank vegetation (i.e., shade and nutrient input), and buffer runoff and potential sediment or pollutant input.
- v. when building new roads, minimize road length and the number of stream crossings.
- vi. where stream crossings are required in the summer, use clear span structures if feasible.
- vii. where culverts are required, use open-bottom structures or otherwise ensure structures will maintain fish passage.
- viii. ensure culverts or other in stream structures are adequately sized and placed (i.e., not perched) to handle seasonal water flows.

Based on current knowledge of the distribution of bull trout, these guidelines would apply to the operating areas west of the Halfway River and south of the height of land between the Halfway and the Sikanni River. This includes Operating Areas # 9, 10, 11, 12, 20, 37, 44 and 45.

6 List of Acronyms

Following, is a list of acronyms of technical terms used in this report.

BEC – biogeoclimatic ecosystem classification
BWBS – boreal white and black spruce biogeoclimatic zone
CDC – BC Conservation Data Center (Victoria, B.C.)
CWD – coarse woody debris
ESSF – Engelmann spruce subalpine fir biogeoclimatic zone
IWMS – Identified Wildlife Management Strategy
LU – landscape unit
LRMP – land and resource management plan
MOF – BC Ministry of Forests
MWLAP – BC Ministry of Water, Land and Air Protection
RMA – riparian management area
SARA – Federal Species at Risk Act
SBS – sub-boreal spruce biogeoclimatic zone
SBPS – sub-boreal pine-spruce biogeoclimatic zone
SWB – spruce-willow-birch biogeoclimatic zone
UWR – ungulate winter range
WHA – wildlife habitat area
WHF – wildlife habitat feature
WTP – wildlife tree patch

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Appendix 1. Summary of Rankings and Status for 18 Forest-dwelling Species in the Fort St. John TSA.

BIRDS							
Latin Name	Common Name	COSEWIC Status	Provincial Listing	IWMS Species	Global Rank	Regional Rank	Stewardship
<i>Ardea herodias herodias</i>	Great Blue Heron (interior subspecies)	None	Blue	No	G5T5	S3B,S4N (2009)	Sensitive to harvest of mature trees used for nests and human disturbance at colonies.
<i>Chordeiles minor</i>	Common Nighthawk	Threatened (2007)	Yellow	No	G5	S4B (2010)	Timber harvesting increases breeding habitat. Sensitive to increased access and vehicular traffic.
<i>Contopus cooperi</i>	Olive-sided Flycatcher	Threatened (2007)	Blue	No	G4	S3S4B (2009)	Harvest of mature coniferous and mixedwood forests, especially riparian areas, reduces breeding habitat.
<i>Coturnicops noveboracensis</i>	Yellow Rail	Special concern (2009)	Red	No	G4	S1B (2005)	Sensitive to loss/degradation of wetland habitat.
<i>Dendroica castanea</i>	Bay-breasted Warbler	None	Red	Yes (2006)	G5	S2B (2005)	Harvest of mature spruce reduces breeding habitat. Sensitive to forest fragmentation.
<i>Dendroica tigrina</i>	Cape May Warbler	None	Red	Yes (2006)	G5	S2B (2005)	Harvest of mature spruce reduces breeding habitat. Sensitive to forest fragmentation.
<i>Dendroica virens</i>	Black-throated Green Warbler	None	Blue	Yes (2006)	G5	S3B (2005)	Harvest of mature spruce and mixedwoods, especially riparian, reduces breeding habitat. Sensitive to forest fragmentation.
<i>Euphagus carolinus</i>	Rusty Blackbird	Special concern (2006)	Blue	No	G4	S3S4B (2005)	Harvest of mature coniferous and mixedwood forests, especially riparian areas, reduces breeding habitat.
<i>Grus canadensis</i>	Sandhill Crane	Not at risk (1979) G. Canadensis tabida assessed	Yellow	Yes (2006)	G5	S4B (2009)	Sensitive to human disturbance at nesting wetlands. Forest around wetland edge required for seclusion (visual screen) for nesting birds.
<i>Oporornis agilis</i>	Connecticut Warbler	None	Red	Yes (2006)	G4	S2B (2005)	Harvest of aspen stands, and brushing of deciduous stands, reduces breeding habitat. Sensitive to forest fragmentation.
<i>Wilsonia canadensis</i>	Canada Warbler	Threatened (2008)	Blue	No	G5	S3S4B (2005)	Loss/degradation of riparian areas particularly in hardwood forests, reduces breeding habitat.

MAMMALS							
Latin Name	Common Name	COSEWIC Status	Provincial Listing	IWMS Species	Global Rank	Regional Rank	Stewardship
<i>Gulo gulo luscus</i>	Wolverine, luscus subspecies	Special concern (2003)	Blue	Yes (2004)	G4T4	S3 (2006)	Landscape level management required. Sensitive to forest fragmentation.
<i>Martes pennanti</i>	Fisher	None	Blue	Yes (2006)	G5	S2S3 (2006)	Landscape level management required. Sensitive to forest fragmentation.
<i>Rangifer tarandus pop. 14</i>	Caribou (boreal population)	Threatened (2002)	Red	Yes (2004)	G5TNR	S2 (2010)	Landscape level management required. Sensitive to forest fragmentation.
<i>Rangifer tarandus pop. 15</i>	Caribou (northern mountain population)	Threatened/special concern (2002)	Blue	Yes (2004)	G5T4Q	S3 (2010)	Landscape level management required. Sensitive to forest fragmentation.
<i>Ursus arctos</i>	Grizzly Bear	Special concern (2002)	Blue	Yes (2004)	G4	S3 (2006)	Landscape level management required. Sensitive to forest fragmentation.
<i>Bison bison athabasca</i>	Wood Bison	Threatened (2000)	Red	No	G4T2Q	S2 (2010)	Landscape level management required.
AMPHIBIANS							
<i>Anaxyrus boreas</i>	Western Toad	Special concern (2002)	Yellow	No	G4	S4 (2007)	Loss/degradation of riparian and aquatic areas reduce breeding habitat. Sensitive to disturbance and vehicular access.
FISH							
<i>Salvelinus confluentus</i>	Bull Trout	None	Blue	Yes (2006)	G3	S3 (2004)	Loss/degradation of riparian and aquatic areas reduces habitat quality.

G = Global
N = National
S = Provincial
1 = Critically Imperiled
2 = Imperiled
3 = Vulnerable
4 = Apparently Scarce
5 = Secure