1.0 SPECIES-HABITAT MODEL FOR THREE-TOED WOODPECKER (*PICOIDES TRIDACTYLUS)*

Species Data

Species Name:	Three-toed Woodpecker
Scientific Name:	*Dendroica castanea*
Species Code:	B-TTWO
BC Status:	Not at risk
Identified Wildlife Status:	No
COSEWIC Status:	Not at risk

Project Data

Ecoprovinces:	Northern Boreal Mountains, Sub-Boreal Interior, Taiga Plains
Ecoregions:	Northern Canadian Rocky Mountains, Central Canadian Rocky Mountains, Muskwa Plateau
Ecosections:	EMR, HYH, MUF, MUP, PEF
BGC Units:	AT, BWBSdk2, BWBSmw1, BWBSmw2, BWBSwk2, ESSFmv4, ESSFmvp4, SWBmk, SWBmks
Map Scale:	1:50,000

1.1 Introduction

There is a moderate level of knowledge concerning the ecology of the Three-toed Woodpecker in British Columbia, including some limited data on its distribution and habitat use within the study area. To date, no detailed habitat study has been made of this species in the northeastern portion of the province. However, some aspects of the Three-toed Woodpeckers use of habitats are reasonably well understood by regional experts and some of this knowledge exists in the grey literature (unpublished reports etc…).

1.2 Ecology and Habitat Requirements

Both the Three-toed Woodpecker and its congener, the Black-backed Woodpecker (*Picoides articus*) differs morphologically from all other woodpeckers in having three toes instead of four (Bock and Bock 1974; Godfrey 1986). Anatomical adaptations for pecking and climbing enable these species to better extract wood-boring insect larvae than other members of the *Picidae* (Burt 1930; Spring 1965; Kirby 1980). In British Columbia, both species occur across the same general range and often in the same site associations, although three-toed woodpeckers are believed to be more common, especially at higher elevations (Campbell *et. al*. 1990).

The Three-toed Woodpecker inhabits coniferous forests of spruce, fir, and pine from valley bottoms up to the limit of continuous forest (Campbell *et al.* 1990). While they are

associated with many species of conifer, they show a strong preference for spruce (*Picea engelmanni, P. glauca, P. mariana*) (Bock and Bock 1974). They often frequent forest stands near openings made by ponds, lakes, bogs, muskegs, clearcuts, and burns (Campbell *et al.* 1990). Foraging and nesting occurs in snags, and in live coniferous and deciduous trees (Campbell *et al.* 1990; Watson 1996; Cannings *et al*.1987).

Three-toed Woodpeckers prey on bark beetle larvae and other wood-boring insects (Bock and Bock 1974; Salt and Salt 1976) and is generally regarded as an opportunistic, irruptive species (Crockett and Hansley 1978). They have been frequently known to aggregate in an area in response to increased prey density (Blackford 1955; Koplin 1972; Crockett and Hansley 1978; Yunick 1985). Three-toed Woodpeckers mainly forage on coniferous trees by flaking bark on dead or partially dead trees so as to expose insects beneath (Hogstad 1970; Villard 1994). While they prey predominantly on wood-boring beetles, they also prey on a variety of other arthropods, and spiders, and occasionally feed on the sap from sapsucker wells (Otvos and Stark 1985; Winkler *et al.* 1995).

Three-toed woodpecker forages in coniferous forests and in conifer-dominated mixed-wood stands. They are associated with many species of conifer but show a strong preference for spruce (*Picea engelmanni, P. glauca, P. mariana*) (Bock and Bock 1974). In many studies (summarized in Bock and Bock 1974), it has been found that there is an almost complete identity in the distribution of three-toed woodpeckers and *Picea spp.*

Foraging areas are often adjacent to forest openings associated with ponds, lakes, muskegs, bogs, burns, and clearcuts (Campbell *et al.* 1990). Foraging occurs in snags, and in live coniferous and deciduous trees (including trembling aspen, balsam poplar, paper birch, and willow) (Campbell *et al.* 1990; Watson 1996; Cannings *et al*.1987).

In Alberta, Three-toed woodpeckers were detected in similar abundance in recently burned and old growth forests, but were not present in mature stands (Hoyt 1999). The Three-toed Woodpecker population was highest 0-3 years post fire but decreased between 3 and 8 years post-fire.

Some studies indicate that three-toed woodpeckers may move to lower elevations in winter (Hogstad 1970; Steeger and Machmer 1996), however winter food habitat is thought to be more dependent on the densities of wood-boring insects in infected stands than any specific habitat associations (Crockett and Hansley 1978; Steeger pers. comm. as cited in Chytyk *et al*. 2001). Three-toed woodpecker populations have been known to increase ten-fold in response to beetle infestations (Blackford 1955; Crockett and Hansley 1978).

In British Columbia, the three-toed woodpecker's breeding habitats include coniferous forests from 520 to 1,690 m elevation, near openings made by burns, muskegs, clearcuts, ponds, lakes, and bogs (Campbell *et al.* 1990). Within their elevational range, they breed in a variety of forest habitats, from open larch/Douglas-fir woodlands to dense spruce/subalpine fir forests (Cannings *et al.* 1987). In Alberta, three-toed woodpeckers

were often associated with black spruce (*Picea mariana*) stands in both wet and dry muskeg areas (Salt and Salt 1976).

Nests are located in excavated cavities in both dead and living coniferous and deciduous trees. One study found that of 63 nests, 67% were found in conifers (8 species) and 25% in deciduous trees. Spruce (27%), lodgepole pine (15%), and trembling aspen (18%) were the most frequently recorded. Heights of 64 nests ranged from 1 to 24 m with most (58%) between 1 and 4.6m (Campbell *et al.* 1990).

In Alberta, of 30 three-toed woodpecker nests examined, seventy percent were in dead snags or stubs, while 30% were in live trees. Nest tree species included trembling aspen, lodgepole pine, black spruce, white spruce, fir, and larch. The average diameter breast height (dbh) and height were 25 cm (range 18-45 cm) and 16 m (range 4-25 m), respectively. The average dbh and height of the stand surrounding the nest trees were 23 cm (range 10-57 cm) and 20 m (range 6-31m) (Watson 1996). In Oregon, a minimum diameter breast height of 30 cm and a height of 5m was considered necessary for nest trees (Thomas 1979).

In central Oregon, Goggans *et al*. (1989) found 16 three-toed woodpecker nests between 1385 and 1723m elevation in lodgepole pine and mixed conifer stands. All nests were in lodgepole pine, 75% in dead trees and 25% in live trees with evidence of heart rot. On average, nest cavities were found 7.7m from the ground on 23.1m high lodgepole pine with 28cm diameter breast height. In northeastern Oregon, three-toed woodpecker nests were found in lodgepole pine snags that averaged 23m high with 26cm diameter breast height (Bull 1980).

One brood is produced each year (Short 1982). Dates for 12 clutches in British Columbia ranged from 8 May to 13 July (Campbell *et al.* 1990).

A year-round Three-toed Woodpecker habitat suitability index model for the Foothills Model Forest in Alberta was developed by Zapisocki *et al.*. (2000) (Table 58). The model identified 5 stand characteristics that affected Three-toed Woodpecker habitat suitability: average stand dbh, average canopy height, snag density, % conifer composition and % canopy cover.

Table 1. Three-toed Woodpecker habitat suitability index model for the Foothills Model Forest, Hinton, Alberta.

Stand Characteristic	No Suitability	Increasing Suitability	Optimal Suitability
average stand dbh	< 8 cm	8-19 cm	≥20 cm
average canopy height	< 4 m	4-7 m	≥8 m
snag (≥16 cm dbh) density	<0.4 snags/ha	0.4-1.1 snags/ha	≥1.2 snags/ha
% conifer composition	<20% conifer	20-50% conifer	>50% conifer
% canopy cover	<6%	6-49%	≥50%

Source: Zapisocki et al. 2000

1.3 Distribution

The three-toed woodpecker is resident locally from Alaska and across much of forested Canada south to southern Oregon and to south central New Mexico, east locally across the northern United States to Maine. The species also occurs in Eurasia (Campbell *et. al,* 2001). The three-toed woodpecker winters within the breeding range (Salt and Salt, 1976).

1.3.1 Provincial Range

The Three-toed Woodpecker is an uncommon to rare resident throughout most of British Columbia. It is very rare west of the Coast Ranges, including Vancouver Island and is absent from the Queen Charlotte Islands (Campbell *et al.* 1990). It breeds throughout most of the province east of the Boundary Ranges, Coastal Gap, and Pacific and Cascade ranges. It nests less frequently on the coastal slope. It is believed to nest locally in mountains west of Comox on Vancouver Island (Campbell *et al.* 1990).

1.3.2 Distribution in Project Area

With the exception of the Alpine Tundra (AT), three-toed woodpeckers are believed to occur in all of the Biogeoclimatic variants found within the Pre-tenure Planning Areas (Table 59).

1.3.2.1 Elevation Range

In British Columbia, three-toed woodpeckers frequent subalpine, sub-boreal, boreal forests, and the higher elevations of the interior Douglas-fir and western hemlock forests from 450-2100m elevation (Campbell et al.. 1990).

Table 2. Distribution of Three-toed Woodpecker in the project area.

Ecoprovince	Ecoregion	Ecosection	BGC Unit	PTP Area 1	PTP Area 2	PTP Area 3	PTP Area 4
Northern Boreal Mountains	Northern Canadian Rocky Mountains	EMR	AT				
			BWBSdk2			●	
			BWBSmw2			●	●
			SWBmk	●		●	●
			SWBmks	●		●	●
		MUF	AT				
			BWBSdk2			●	
			BWBSmw2		●	●	●
			BWBSwk2	●			
			ESSFmv4	●			
			ESSFmvp4	●			
			SWBmk	●	●	●	●
			SWBmks	●	●	●	
	Hyland Highland	HYH	BWBSdk2			●	
Sub-Boreal Interior	Central Canadian Rocky Mountains	PEF	AT				
			BWBSmw1	●			
			BWBSwk2	●			
			ESSFmv4	●			
			ESSFmvp4	●			
Taiga Plains	Muskwa Plateau	MUP	BWBSmw2		●	●	
			SWBmk		●	●	

Note: Shaded cells indicate a BGC unit that is not present in a PTP Area.

1.4 Food/Cover Life Requisites and Habitat Uses

Reproductive habitat for Three-toed Woodpecker will be rated (Table 60).

Table 3. Food/cover life requisites rated for Three-toed Woodpecker in the M-KMA project area.

Food/Cover Life Requisite	Habitat-Use	Months	Rating Column Title
Food and Security	General living in all seasons	All months	BTTWO_LIA

1.4.1 General Living in All Seasons

Habitat used for reproducing is generally the same as habitat used for general living all year. For this reason, reproducing habitat will not be rated separately. General living habitat primarily consists of mature and old coniferous forests and in conifer-dominated mixed-wood stands with high structural complexity. Stands with large numbers of snags are preferred.

1.5 Ratings

Final habitat ratings were completed using the 4-class rating scheme (Table 61).

Table 4. Habitat capability and suitability 4-Class rating scheme used for Three-toed Woodpecker.

% of Provincial Best	Rating	Code
100% - 76%	High	H
75% - 26%	Moderate	M
25% - 1%	Low	L
0%	Nil	N

1.5.1 Provincial Benchmark

There is no provincial benchmark for the Three-toed Woodpecker in British Columbia (RIC 1998). Chytyk *et al*. (2001) suggest that this species probably prefers higher elevation conifer stands in British Columbia that are dominated by "thin-barked" coniferous species, i.e. spruce spp., lodgepole pine, western larch and subalpine fir (*Abies lasiocarpa*). They believe that the Engelmann Spruce-Subalpine Fir (ESSF), Boreal White and Black Spruce (BWBS), Interior Cedar-Hemlock (ICH), Montane Spruce (MS), and Sub-Boreal Spruce (SBS) biogeoclimatic zones may all have high habitat values for Three-toed Woodpeckers in British Columbia. We assumed that at an ecosection level, the study area provides up to high (class 1) habitat and therefore expect to give a lot of high habitat ratings.

1.5.2 Assumptions

Table 62 lists the assumptions for habitat use by Three-toed Woodpecker for each season and life requisite. For some attributes, the listed assumptions represent broad patterns only and detailed ratings are contained in the RRM.

Table 5. Assumptions for habitat use by Three-toed Woodpecker in the M-KMA project area.

Ssn and Use	Attribute	Assumption
LI	Biogeoclimatic Zone	• Lower and mid elevation BGC zones (BWBS, SWB and ESSF) may be preferred and are rated up to 100%. • ESSFmvp4 and SWBmks rated up to 5% • AT is rated 0%.
	Site Series	• Stands with average dbh >15 cm and with average canopy height >15 m are preferred. • Submesic to subhydric sites have highest productivity and are therefore rated up to 100%.
	Structural Stage	• Structural stages 06 and 07 are rated up to 100%. • Stages 04 and 05 rated up to 50 and 70% respectively. • Stage 3b rated up to 20%. • Structural stages 01 and 02 rated 0%.
	Stand Association	• Conifer stands are preferred, especially those with spruce, lodgepole pine or subalpine fir. • Conifer stands rated up to 100%. Broadleaf stands are rated down 80%.

1.5.3 Ratings Model

The habitat ratings were generated using Resource Ratings Models (RRMs). (see Section 2.3 for a full description of the modelling approach). The variables included in the models are the ecosystem map attributes described in Table 60. The assumptions for each of the variables are more precisely defined in the accompanying MS Excel® workbook for Three-toed Woodpecker.

1.6 Map Themes and Ratings Adjustments

1.6.1 Habitat Use Maps

A habitat use map showing habitat suitability for general living all year can be produced. Because habitats used for general living are essentially the same as habitats used for reproducing, the general living map will also depict reproducing habitat. Because Three-toed Woodpecker use microsites (relative to the scale of mapping) for nesting, a highest value theme may be the most informative. In a highest-value theme; the highest rating of all ecosystem units within each polygon is displayed, regardless of the area it represents. The highest-value method exaggerates the amount of high value habitat because even if only 10% of a polygon is high value, the whole polygon is coloured high. A highest-value theme is useful though, because it highlights areas that have some potential for high value nesting habitat.

1.7 References

Blackford, J.L. 1955. Woodpecker concentration in burned forest. Condor 57: 28-30.

Bull, E.L. 1980. Resource partitioning among woodpeckers in northeastern Oregon. Ph.D. Thesis. Univ. of Idaho. 109 pp.

Burt, W.H. 1930. Adaptive modifications in woodpeckers. Univ. Calif. Publ. Zool. 32: 455-524.

Campbell, R.W., Dawe, N.K., Cowan McTaggart-, I., Kaiser, G.W., Stewart, A.C., and M.C.E. McNall. 1990. The birds of British Columbia. Vol. 2: nonpasserines, diurnal birds of prey through woodpeckers.

Cannings, R.A., R.J. Cannings, and S.G. Cannings. 1987. Birds of the Okanagan valley, British Columbia. Royal British Columbia Museum, Victoria. 420 pp.

Chytyk, P., Cooper, J.M., and E.T. Manning. 2001. Three-toed woodpecker (*Picoides tridactylus*) species-habitat model for Canfor TFL 48, Dawson Creek Forest District. Manning, Cooper and Associates, Victoria, B.C.

Crockett, A.B. and P.L. Hansley. 1`978. Apparent response of *Picoides* woodpeckers to outbreaks of the pine bark beetle. Western Birds 9: 67-70.

EBA. 2001. Proceedings of a workshop on wildlife habitat use of selected species in the Muskwa-Ketchika Management Area. EBA Engineering Consultants Ltd.

Ehrlich, P.R., D.S.Dobkin, and D. Wheye. 1988. The birder's handbook. Simon and Shuster, New York.

Godfrey, W.E. 1986. The birds of Canada. Natl. Mus. Can., Ottawa, ON. 595 pp.

Goggans, R., R.D. Dickson, and L.C. Seminara. 1988. Habitat use by three-toed and black-backed woodpeckers. Oregon Dept. Fish and Wildl. Nongame Rep. 87-3-02.

Goggans, R.; R.D. Dixon; and L.C. Seminara. 1989. Habitat use by Three-toed and Black-backed Woodpeckers, Deschutes National Forest, OR. USDA, Deschutes National Forest. Technical Report No. 87-3-02. 43 pp.

Hogstad, O. 1970. On the ecology of the three-toed woodpecker *Picoides tridactylus* outside the breeding season.

Hoyt, J. 1999. Habitat associations of black-backed and three-toed woodpeckers in Alberta's boreal forest. Unpubl. Report. University of Alberta, Edmonton, AB. Website. http//www.biology.ualberta.ca/biodiversity/report/Progress/Hoyt.htm.

Kirby, V.C. 1980. An adaptive modification in the ribs of woodpeckers and piculets (*Picidae*). Auk 97: 521-532.

Koplin, J.R. 1967. Predatory and energetic relations of woodpeckers to the Engelmann spruce beetle. Ph.D. Thesis. Colorado State University. 187 pp.

Meidinger, D. and J. Pojar. 1991. Ecosystems of British Columbia. BC Ministry of Forests, Victoria, B.C.

Otvos, I.S. and R.W. Stark. 1985. Arthropod food of some forest-inhabiting birds. Can. Entomol. 117:971-990.

Short, L.L. 1982. Woodpeckers of the world. Delaware Museum of Natural History, Greenville, DE. 676 pp.

Spring, L.W. 1965. Climbing and pecking adaptations in some North American woodpeckers. Condor 67: 457-488.

Steeger, C. and M. Machmer 1996. Pilot project to investigate the ecology of three-toed woodpeckers and their role as biological control agents of bark beetles in interior forests of British Columbia. Unpubl. Report for Science Council of British Columbia, Burnaby, BC by Pandion Ecological Research Ltd., YHYH, B.C. 22 pp.

Thomas, J.W. 1979. Appendix 19-21. Pages 382-387 *in* Wildlife habitats in managed forests in the Blue Mountains of Oregon and Washington. U.S.D.A. Forest Service Agriculture Handbook.

Winkler, H. D.A. Christie and D. Nurney. 1995. Woodpeckers: a guide to the woodpeckers of the world. Houghton Mifflin Co. New York, NY. 406 pp.

Yunick, R.P. 1985. A review of recent irruptions of the black-backed woodpecker and three-toed woodpecker in eastern North America. J. Field Ornithol. 56: 138-152.

Villard, P. 1994. Foraging behavior of black-backed and three-toed woodpeckers during spring and summer in a Canadian boreal forest. Can. J. Zool. 72:1957-1959.

Watson, D. 1996. Habitat use by woodpeckers in the boreal forest region of Alberta. Foothills Model Forest draft annual report. Foothills Model Forest, Hinton, AB.