COSEWIC
Assessment and Status Report

on the

Williamson's Sapsucker
Sphyrapicus thyroideus

in Canada

ENDANGERED
2005

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

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COSEWIC would like to acknowledge Les W. Gyug for writing the status report on the Williamson's Sapsucker *Sphyrapicus thyroideus* prepared under contract with Environment Canada, overseen and edited by Dick Cannings, the COSEWIC Birds Species Specialist Subcommittee Co-chair.

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Cover illustration:
Williamson's Sapsucker — Male (left) and female (right) Williamson's Sapsuckers at a nest hole in a Trembling Aspen, Copper Mountain Road, Princeton, British Columbia, June 2001. Photos by Les W. Gyug.

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COSEWIC
Assessment Summary

Assessment Summary – May 2005

Common name
Williamson's Sapsucker

Scientific name
Sphyrapicus thyroideus

Status
Endangered

Reason for designation
This woodpecker is associated with mature larch forests in south-central British Columbia; less than 500 individuals breed in Canada. Habitat loss through forest harvest is estimated to have been 23% over the last 10 years and is projected to be about 53% over the next decade.

Occurrence
British Columbia

Status history
Designated Endangered in May 2005. Assessment based on a new status report.

COSEWIC
Executive Summary

Williamson's Sapsucker
Sphyrapicus thyroideus

Species information

The Williamson's Sapsucker, *Sphyrapicus thyroideus*, is a medium-sized woodpecker. Unique among woodpeckers, the male (mostly black and white) and the female (mostly black and brown) exhibit strikingly different plumage. There are two recognized subspecies, *S. t. thyroideus* and *S. t. nataliae*, both of which occur in Canada. However, there are no distinctive morphological features known that can reliably separate individuals of the two subspecies, so the subspecies have not been assessed separately in this report.

Distribution

The breeding range of Williamson's Sapsucker is in the mountains of western North America from southern British Columbia to the southern United States, and northern Baja California in Mexico. All breeding records in Canada are from British Columbia. In British Columbia, *thyroideus* breeds from Manning Provincial Park near the U.S.A. border, north to the Lytton, Cache Creek and Kamloops areas, through the Okanagan Highlands and east as far as Greenwood. The *nataliae* subspecies is found in the Rocky Mountain Trench north to Cranbrook, Kimberley and Whiteswan Lake, and in the Flathead River valley. There is no zone of overlap of the subspecies in Canada.

Habitat

In the United States, Williamson's Sapsucker breeds in coniferous mountain forests at middle to high elevations. In Canada, the majority (80%) of the breeding records have been in, or within 200 m of, Western Larch forests at elevations of 1000 to 1400 m. A smaller proportion (up to 10%) of the breeding adults may be found in Ponderosa Pine forests and Trembling Aspen groves adjacent to Ponderosa Pine or Western Larch forests, generally at elevations of 800 to 1100 m. Suitable habitat in Western Larch forests is defined by the presence of large (>70 cm Diameter-at-Breast-Height or DBH) veteran (>200 yr old) Western Larch nesting trees that have typically survived many fires and have extensive heartrot making them suitable for cavity excavation, coniferous sap well trees (usually medium-sized 20-50 cm diameter-at-

breast-height Douglas-fir), and large trees infected with carpenter ants. Seventy to ninety-nine percent of the diet that the adults feed to nestlings is ants, mainly carpenter ants, gleaned from the surface of decaying trees.

Biology

Williamson's Sapsuckers are migratory birds, only found in Canada during the breeding season, generally late March to September. Breeding home range sizes in Canada in Western Larch habitats are on the order of 17-54 ha, much larger than those reported from Ponderosa Pine and Trembling Aspen habitats in Colorado and Arizona, which were on the order of 4-11 ha, but which were determined by different methods, i.e., the maximum distance from the nest at which the male will respond aggressively to conspecific intruders. Maximum density in Canada is 3.17 pairs/km^2 in old-growth Western Larch forests. This is the highest density reported for the species from census areas at least 100 ha in size. High densities previously reported elsewhere have been derived from very small plots that probably do not yield valid density estimates.

Population sizes and trends

Total Population size of Williamson's Sapsucker in Canada is estimated at 430 breeding adults in five populations. The largest population, making up 85% of the estimated Total Population, is the Okanagan-Greenwood population, with much smaller populations in the Princeton, Merritt and Hat Creek areas. Population size of the *nataliae* subspecies in Canada is estimated at only 10 breeding adults.

There are no quantifiable trends in population numbers because the species is relatively rare, detected too infrequently in most areas on Breeding Bird Surveys (BBS), and there have been no previous population estimates prior to this assessment. Only in Oregon was there enough data (26 routes, abundance >1.0 per route per year, and low variance) to provide a reliable estimate of trends from BBS routes where Williamson's Sapsucker numbers have been decreasing at an annual rate of 3.3% from 1980 to 2003.

Based on decreases in suitable habitat the *thyroideus* Okanagan-Greenwood population is likely declining. There is no known population trend for the *nataliae* subspecies.

Limiting factors and threats

The principal limiting factor to the species is availability of suitable habitat (old-growth Western Larch) which is being reduced by timber harvesting and land clearing. Only 19.5% of the 594 km^2 main Area of Occupancy of the Okanagan-Greenwood population was considered suitable habitat as of the early 1990's. This amount has decreased since then to about 15% in 2004. Timber harvesting is proceeding at the rate of about 1% of this land per year, the majority of which is targeted at the same older forests used by Williamson's Sapsuckers. Estimated habitat loss from logging

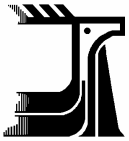
over the next 10 years is up to 53% of the current habitat. Without some considerations for habitat conservation, suitable habitat for the largest population of this species in Canada may be almost entirely gone for this population in as little as 20 years.

Special significance of the species

The species is of interest because of its markedly different male and female plumages. The possible advantages and causes of this adaptation have not been studied. The species is an indicator species of old-growth Western Larch forests in southern British Columbia, the only habitat in which it is relatively common in Canada. Williamson's Sapsucker is a priority species for Partners in Flight in the Great Basin (Partners in Flight British Columbia and Yukon 2003) and for the Canadian Intermountain Joint Venture (2003). It is also a Species of Continental Importance in the Intermountain West Avifaunal Biome, designated by Partners in Flight.

Existing protection

The species is protected under the Migratory Bird Convention Act and the British Columbia Wildlife Act. However, there is no protection of the species' habitat. It is not considered Identified Wildlife under the British Columbia Forest and Range Practices Act (which now is only applied to certain COSEWIC-designated species), so does not qualify for any special protection from timber harvesting. Less than 2% of known breeding sites are in protected areas of any sort.



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government members and the co-chairs of the species specialist and the Aboriginal Traditional Knowledge subcommittees. The Committee meets to consider status reports on candidate species.

DEFINITIONS (NOVEMBER 2004)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and it is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A wildlife species for which there is inadequate information to make a direct, or indirect, assessment of its risk of extinction.

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.
** Formerly described as “Not In Any Category”, or “No Designation Required.”
*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.

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SPECIES INFORMATION

Name and classification

Williamson's Sapsucker was first recorded from Canada in the Similkameen Valley of the southern interior of British Columbia in 1882 (Fannin 1891 cited in Cannings *et al*. 1987). There are two subspecies of Williamson's Sapsucker, *Sphyrapicus thyroideus* (Cassin, 1852). The subspecies occurring in the western part of the range in the Cascade Mountains, Sierra Nevada and the mountains of southern California and northern Baja California is the nominate race, *Sphyrapicus thyroideus thyroideus* (Cassin). The subspecies occurring in the eastern part of the range in the Rocky Mountains is *Sphyrapicus thyroideus nataliae* (Malherbe). Intergradation probably occurs in the only area of contact of the two subspecies in eastern Oregon and Idaho (Cowan 1938; Dobbs *et al.* 1997). The French name for the species is Pic de Williamson (Godfrey 1986).

The plumages of the male and the female are strikingly different (see Morphological Description below). The female was originally described in 1851 by Cassin as the Black-breasted Woodpecker (*Picus thyroideus*) based on specimens from northern California but he had changed the name to *Melanerpes thyroideus* by 1854. The male was originally described as Williamson's Woodpecker (*Picus williamsonii*) by Newberry in 1857 based on a specimen collected in southern Oregon. By 1858 Baird had recognized both as sapsuckers and renamed them to the genus *Sphyrapicus* as *S. thyroideus* and *S. williamsonii*. The male and female were not recognized as the same species (*S. thyroideus*) until 1873 by Henry Henshaw (taxonomic history summarized from Ridgway 1914 and Bent 1939).

The two subspecies are weakly defined with the only quantifiable difference based on bill length and width. Mearns (1890) noticed plumage differences in Arizona Williamson's Sapsuckers that he thought would probably warrant a difference in subspecies designation compared to Pacific Coast specimens. A difference in bill length was first noticed by Ridgway (1914) on 20 specimens from the "Rocky Mountain district" compared to 17 specimens from California, Nevada and Oregon. Swarth (1917) concluded that the difference in bill size was consistent enough to separate the "Pacific Coast" (California to British Columbia) form (*thyroideus*) as a subspecies from the Rocky Mountain (Arizona, Colorado and New Mexico) form (*nataliae*) based on examination of 123 total specimens. While he did describe the coloration of the adult male abdominal patch as "a trifle darker shade of greenish yellow" in the Rocky Mountain specimens, there were no other distinctive plumage characteristics of the two subspecies.

Cowan (1938) quantified the difference in bill length and widths for the two subspecies. Using Cowan's (1938) data (which were presented graphically but not statistically analyzed), there were significant differences in mean bill length among the five regions from which he examined specimens (ANOVA $F_{(4,48)} = 10.4$, $P < 0.0001$) and in mean bill width (ANOVA $F_{(4,52)} = 11.8$, $P < 0.0001$). Using Tukey's multiple means test at the $P = 0.05$ level of significance, mean bill width and length of Arizona-Colorado

nataliae were not significantly different from Eastern British Columbia *nataliae*, and neither were significantly different from the intergrade area in eastern Oregon and Idaho; mean bill width and length of specimens from the above three regions were significantly different from the California *thyroideus* and the western British Columbia *thyroideus*, which were not significantly different from each other.

However, looking at the individual specimen measurements reported by Cowan (1938) all *nataliae* had bill widths ≤7.0 mm, and all *thyroideus* had bill widths ≥6.6 mm, not including specimens from the intergrade region in eastern Oregon and Idaho. The zone of overlap in bill widths between the subspecies (6.6-7.0 mm) contained 4 of 14 nataliae (29%) and 10 of 32 thyroideus (31%). On individual specimens, bill widths would appear unable to reliably distinguish about 30% of the specimens to subspecies. The overlap in bill length was even higher, with 75% of the specimens (34 of 45) in the zone of bill length overlap between 18.9 and 21.6 mm. There have been no further published studies on subspecific status since Cowan (1938).

Morphological description

Williamson's Sapsucker is a medium-sized woodpecker with total length averaging 23 cm (range 21-25 cm; Winkler *et al.* 1995; Godfrey 1986), and weighing 44-64 g (Short 1982). The male and female plumages exhibit distinct sexual dimorphism to a degree that is unique among all woodpeckers (Figure 1). The female is predominantly brown and black reminiscent of the coloration of the Gila Woodpecker (*Melanerpes uropygialis*) or the Northern Flicker (*Colaptes auratus*). The male is predominantly black and white, reminiscent of many of the *Picoides* woodpeckers.

Figure 1. Male (left) and female (right) Williamson's Sapsuckers at a nest hole in a Trembling Aspen, Copper Mountain Road, Princeton, British Columbia, June 2001. Photos by Les W. Gyug.

The male has a glossy black head, breast and underparts with white supercilium, moustache, rump and wing panel, small red throat patch and yellow belly with flanks heavily striped and barred black and white (Winkler *et al.* 1995). The female has a brownish head with obscure moustachial stripes, heavily barred underparts and wings, a white rump, and a blackish breast with yellow belly and heavily barred flanks (Winkler *et al.*1995). The juveniles resemble the adults but the juvenile male lacks the red throat of the adult male and the juvenile female lacks the black breast of the adult female.

Genetic description

There are four species in the sapsucker genus *Sphyrapicus*, which is limited in distribution to North America. Williamson's Sapsucker is the most distinctive of these genetically with the other three species forming the *Sphyrapicus varius* superspecies: the Yellow-bellied Sapsucker, *S. varius*; the Red-breasted Sapsucker, *S. ruber;* and the Red-naped Sapsucker, *S. nuchalis* (Johnson and Zink 1983; Cicero and Johnson 1995). *S. thyroideus* appeared to have diverged genetically from the *S. varius* superspecies about 3.7-5.2 million years ago, is closer to ancestral stock, and most closely related to *Melanerpes* woodpeckers (Cicero and Johnson 1995). *S. thyroideus* probably evolved in western North America while the ancestral *S. varius* probably evolved in eastern North America and then spread westward, evolving more recently into the currently recognized three species (Short and Morony 1970; Johnson and Zink 1983, Cicero and Johnson 1995). The range and distribution of Williamson's Sapsucker overlaps broadly with the Red-naped Sapsucker with which it occasionally hybridizes (Short and Morony 1970).

Johnson and Zink (1983) in their genetic review of North American sapsucker taxonomy at 39 loci (17 of which showed variation within the genus), could show no genetic differences between the two subspecies of *S. thyroideus* and lumped all *S. thyroideus* together for their analyses although their sample size was very limited. They based their study on 15 specimens from California (presumed subspecies *thyroideus*), 1 from Oregon (location not specified) and 2 from Montana (presumed *nataliae*). Cicero and Johnson (1995) looked at mitochondrial DNA of sapsuckers, but only had specimens of subspecies *thyroideus* from the Cascade Mountains of Oregon and Washington, and therefore could not compare the two subspecies. There have been no genetic studies that have included specimens from the entire range of the species.

Williamson's Sapsucker was found to have a low index of genetic heterogeneity (H = 0.016) using 39 loci. Values for other sapsuckers were all higher, up to H = 0.043, which was the mean value reported for other birds in general (Johnson and Zink 1983). This low index of genetic heterogeneity may indicate that Williamson's Sapsucker has a relatively low ability to adapt to a variety of habitats or to changing habitats.

Designatable units

Although two subspecies of *Sphyrapicus thryroideus*—*S. t. thyroideus* and *S. t. nataliae*—occur in Canada, they are only weakly defined and the species is in need of a modern taxonomic study to confirm that the differences between Pacific Coast and

Rocky Mountain forms are sufficient to recognize actual subspecies. The species will be therefore be assessed as one unit. However, throughout this report, the use of the subspecies designations of *nataliae* have been retained to refer to the population of Williamson's Sapsucker occupying the Rocky Mountain Trench area of British Columbia near Cranbrook (see Figure 3) and of *thyroideus* to refer to populations of Williamson's Sapsucker west of Greenwood.

DISTRIBUTION

Global range

The breeding range has been recently summarized by Dobbs *et al.* (1997). The currently known breeding range is presented in Figure 2 as derived from Dobbs *et al.* (1997), from Sauer *et al.* (2004), and from the information summarized under the Canadian Range section. The breeding range is primarily in the mountain ranges of the western United States north to southern British Columbia. It is absent from the central Great Basin ranges of Nevada. There is one breeding population in Mexico in northern Baja California that is disjunct from other populations.

The species is partially migratory, leaving the northern latitudes of its breeding range north of the California border, the area north of the Mogollon Rim in Arizona, and the area north of the mountains in the Santa Fe area in New Mexico. It winters occasionally in southern Oregon, and at lower elevations in California, in southern Arizona and New Mexico, and in the mountains of western Mexico as far south as Jalisco and northern Michoacan, northwest of Mexico City.

Canadian range

The breeding range of the Williamson’s Sapsucker in Canada is entirely within southern British Columbia, where it is a rare summer resident. There are three accidental records for Alberta (Pinel 1993) and three accidental records for Saskatchewan (Godfrey 1986). Two of the Alberta records were from Waterton Lakes National Park, very close to the known range of *nataliae*, with the other record from Calgary.

The status and range of Williamson's Sapsucker in British Columbia was summarized by Cooper (1995). However, considerable new information on all of the British Columbia populations has been collected or become known since then. The information provided by Cooper (1995) is incorporated into the summary of range and status below, and is cited where it has been used.

There is no zone of contact between the two subspecies in Canada. The most easterly record of *thyroideus* near Greenwood is approximately 200 km west of the most westerly record of *nataliae* near Kimberley. There have been no records of Williamson’s Sapsuckers in any season in the area between Greenwood and Kimberley

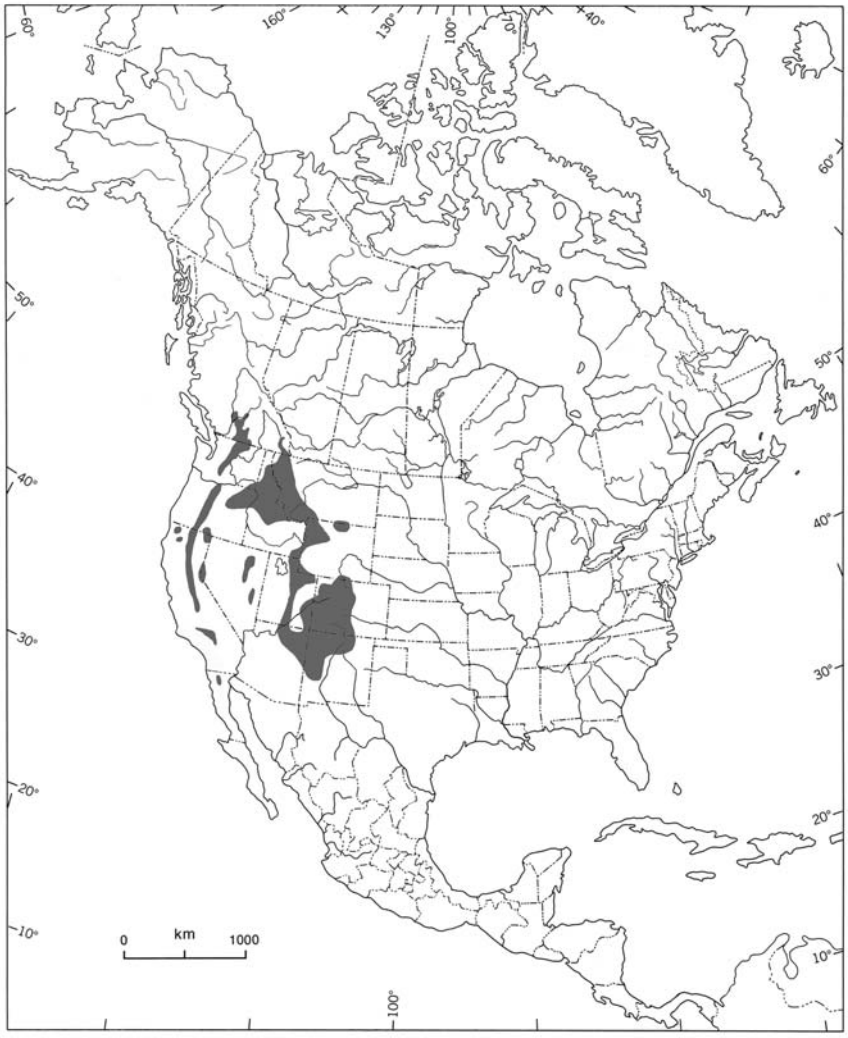

Figure 2. North American breeding range of Williamson's Sapsucker based on Dobbs *et al*. (1997) and Sauer *et al*. (2004), and on Gyug (unpublished data) for the Canadian portion of the range.

based on the 230 records summarized in Campbell *et al.* (1990), the additional records in Cooper (1995), any records reported on the southern interior British Columbia birder's e-mail groups (BCINTBIRD; WKBIRDS; EKOOTENAYBIRDS) from 1997-2004, or any other known sources.

Using COSEWIC (2004) definitions, the Total Population refers to all the Williamson's Sapsuckers in Canada, excluding cases of vagrancy. Within the Total Population, COSEWIC defines a population as "a geographically or otherwise distinct group that has little demographic or genetic exchange with other such groups—typically one successful migrant individual or gamete per year or less". There is no information on genetic exchange of individuals between groups of Williamson's Sapsucker, but it may be relatively low based on the high extent of philopatry, which is based on relatively little

information (see Survivorship/mortality section). Based on the known breeding sites, the Total Population has been divided into five geographically distinct populations. These populations are the four populations of subspecies *thyroideus*: Okanagan-Greenwood, Princeton, Merritt and Hat Creek (west of Cache Creek) and the single population of subspecies *nataliae* in the Rocky Mountain Trench near Cranbrook. Within these populations, separate locations currently known to be occupied have been identified based on gaps of more than 2 km in known or surmised (based on apparently suitable habitat) breeding locations as suggested for woodpeckers in general by NatureServe (2004). There have been additional breeding locations of Williamson's Sapsucker within the Extent of Occurrence but outside any of the defined populations, but these have not been regularly used, and seem to be only occupied by one pair each.

S. t. thyroideus

The *thyroideus* subspecies breeds in southern British Columbia (Figure 3) from Lightning Lakes in Manning Provincial Park north to Botanie Creek and Hat Creek (Cooper 1995; Wayne Campbell pers. comm. 2004), east to Scottie Creek (Cooper 1995), Louis Creek (B.C. CDC) and Greenwood (Gyug unpublished data). The Extent of Occurrence of *thyroideus* based on a minimum convex polygon of all known breeding records is 34659 km^2 (Figure 3).

I have discounted a 1956 nest record that lacks supporting documentation from northern British Columbia (BC Nest Record Scheme, hereafter BCNRS) about 240 km west of Prince George and more than 500 km north of the next nearest known observation of Williamson's Sapsucker. There have been other extralimital observations of Williamson's Sapsucker cited by Cooper (1995): Carpenter Lake (Jones and Gates 1973), 40 km west of the Hat Creek population, and at Pemberton Meadows in 1984, 90 km west of the Hat Creek population. No breeding activities were cited in these records.

Historically, the range of *thyroideus* in British Columbia has probably increased to the west and north. Cowan (1938) reported the range to be from the border north to Schoonover Mountain near Okanagan Falls east to Midway, and west to the Similkameen River. By 1970 the range had extended westward to the eastern side of E.C. Manning Provincial Park (Guiguet 1970), and by 1978 birds were breeding within Manning Park (BCNRS; Campbell *et al.* 1990).

The dates for northward expansion of the range are more difficult to pinpoint. Nesting was observed in one tree for three consecutive years around 1977 about 16 km northwest of Kelowna (Harry Almond pers. comm. 2004, Cooper 1995, Cannings *et al.* 1987). There is one record of a nest west of Cache Creek in 1969 (BCNRS). The small population at Hat Creek, west of Cache Creek, therefore dates back to the 1960's at least. Only in the 1990's were nests reported in the Kamloops area, one of which was still occupied in 2003.

The Area of Occupancy is estimated to be 1016 km^2.

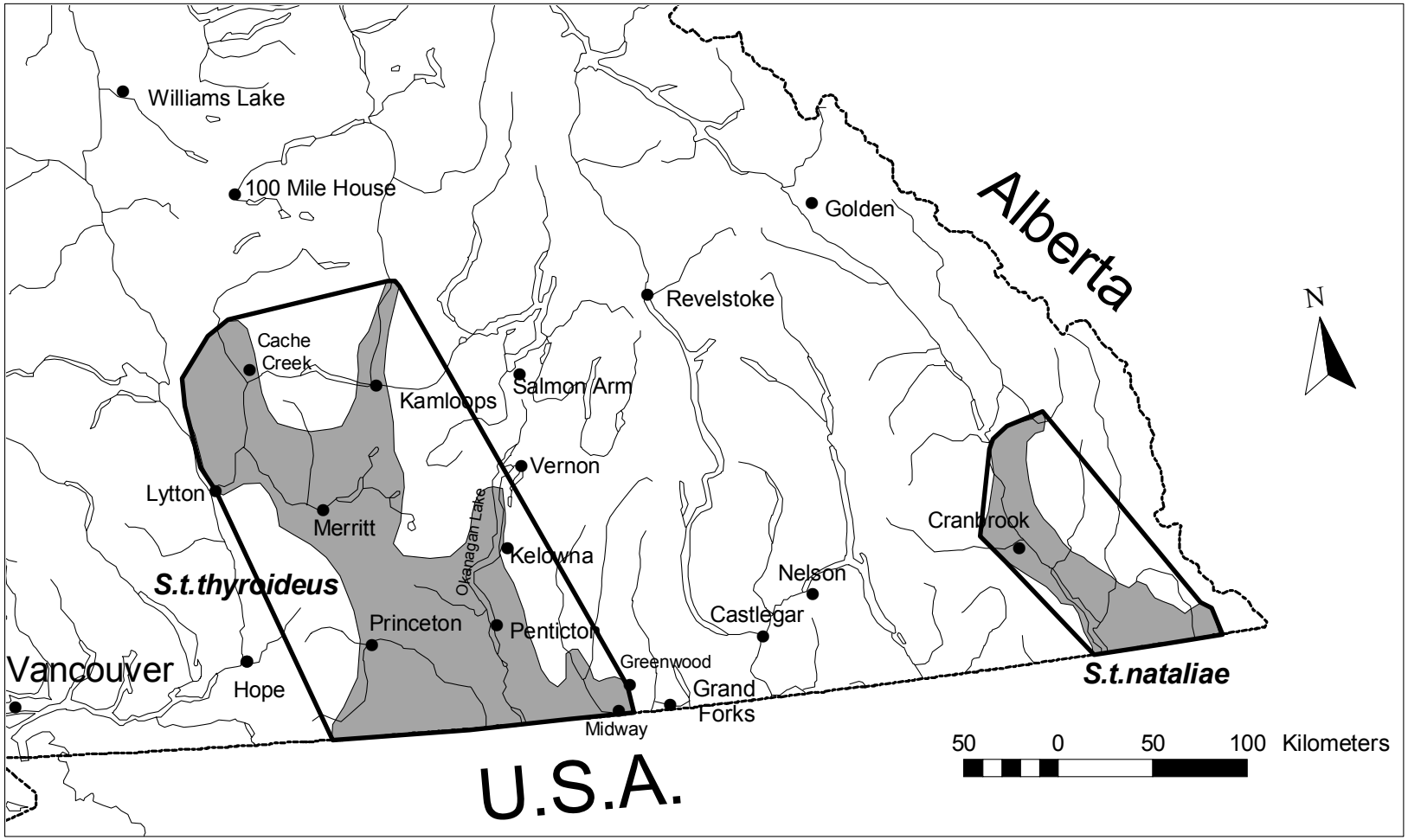

Figure 3. Extent of Occurrence (black line) and breeding range (shaded area) encompassing all known or suspected breeding sites of Williamson's Sapsucker in British Columbia up to, and including, 2004.

The breeding range is not continuous but rather consists of a main population in the area east of Okanagan Lake to the city of Greenwood (Gyug and Peatt 2000; Gyug unpublished data), and three smaller, disjunct populations: near Princeton (Cooper 1995; Gyug unpublished data), Merritt (Cooper 1995; Gyug unpublished data) and Hat Creek (Cooper 1995; Wayne Campbell pers. comm. 2004). There have been occasional breeding records outside of these areas (Cooper 1995; Campbell *et al*. 1990; Gyug unpublished data). Within the three populations for which there are breeding records with locations precise enough to estimate population continuity (Okanagan-Greenwood, Princeton, and Merritt), the populations were not continuous but were found in separate locations in patches of suitable habitat. The Okanagan-Greenwood population consists of at least 15 separate locations (defined as >2-km gap between known occupied sites). The Merritt population consists of at least three locations. The Princeton population consists of one location known to be currently occupied, and at least two other previously occupied locations.

T. t. nataliae

The *nataliae* subspecies is limited in distribution in British Columbia to the southeast corner of the province in the Cranbrook area of the Rocky Mountain Trench and the Rocky Mountains. Historically *nataliae* bred in the Cranbrook area, probably south to Newgate at the U.S. border (Johnstone 1949, Guiguet 1970), but was never very abundant. Specimens or observation records were only available from Newgate and from Cranbrook (Cowan 1938; Munro and Cowan 1947). It was thought the subspecies was in decline or extirpated from British Columbia since there had been no breeding records after 1938 (Johnstone 1949, Campbell *et al.* 1990) and the reason for disappearance from the 1937-38 breeding site was that the site was logged the following year (Johnstone 1949). Cannings (1997) found no Williamson's Sapsuckers south of Cranbrook to Newgate in 11 days of field searches. However, research for the British Columbia provincial status report (Cooper 1995) turned up sparse records from the intervening years, and a breeding record from south of Cranbrook in 1979, that indicated the subspecies may have continually occupied the Canadian portion of its range. A nesting record from 1999 in the Whiteswan Lake area (Campbell *et al.* 2000), 70 km north of Cranbrook, confirmed that the subspecies was still breeding in the area, and may have a range larger than previously thought, or may be expanding its range northwards. Cooper (1995) reported sighting records from the Flathead Valley from 1986-1992, and there have been more recent records in the same area in the late 1990's (Fred Hovey pers. comm. to Ted Antifeau 2003). There was one nesting record from 2004 at Kimberley Nature Park where a female was also seen in 2001 (EKOOTENAYBIRDS 2001-2004).

The Extent of Occurrence of *nataliae* based on a minimum convex polygon around the approximate locations of these records was 8399 km^2 (Figure 3).

The range as might be mapped on a distribution map that excludes large areas of unsuitable habitat was about half that size, 4532 km^2 (Figure 3). There were only 4 known breeding locations from which to estimate Area of Occupancy; a 500-m radius

around each of the four sites yielded an Area of Occupancy of 3.1 km^2. There was one observation, perhaps of a non-breeding bird, reported by Cooper (1995) of a Williamson's Sapsucker at Brisco (Kaiser *et al.* 1978), 130 km north of Cranbrook.

HABITAT

Habitat requirements

Williamson's Sapsuckers are found in coniferous mountain forests throughout their breeding range, usually at middle to high elevations in montane spruce-fir (*Picea-Abies*), Douglas-fir (*Pseudotsuga menziesii*), Lodgepole Pine (*Pinus contorta*), and Ponderosa Pine (*Pinus ponderosa*) forests (Dobbs *et al.* 1997). Mixed coniferous-deciduous forests are also used where Trembling Aspen (*Populus tremuloides*) can also be an important nesting tree (Crockett 1975; Smith 1982; Conway and Martin 1993, Loose and Anderson 1995). Hutto (1995) summarized 200 bird density studies in the northern Rocky Mountain region and found Williamson's Sapsucker to be widespread (detected on 10-36% of the studies in 7 of his 15 habitat classifications), and most common in dry conifer and post-burn habitats. However, in later studies, Hutto and Young (1999) indicated Williamson's Sapsuckers were absent from burns in their widespread surveys in western Montana and northern Idaho. Hutto and Young (1999) found them to be relatively uncommon in general in that area (not found on more than 2% of point counts in any habitat, and only at 0.3% of all the point counts), and most common in harvested forest cover types (partial cuts, patch cuts, seed-tree cuts) and in Cottonwood/aspen types, and less commonly in Mixed-conifer, Douglas-fir, and Wetlands.

Essential breeding habitat elements are:

- Trees suitable for nest cavity excavation, or existing tree cavities,
- Live coniferous trees for sap well creation, and
- Standing live and/or dead trees for gleaning ants (particularly carpenter ants, *Camponotus* sp.) from the bark surface to feed adults and nestlings in summer.

Stand structure and age

Stand structure does not appear to be as important as the individual habitat elements, i.e., these habitat elements can be incorporated into breeding territories in stands of quite differing structure, or in stands adjacent to each other that differ greatly in structure. Bull *et al.* (1986) described nest stand structure of Williamson's Sapsucker habitat in northeastern Oregon coniferous forests as basal area <34 m^2/ha, <75% canopy closure, two or three canopy layers, and more than one dead tree per 0.1/ha. This definition appeared similar to the average “old-growth” Western Larch (*Larix occidentalis*) stand used for nesting in British Columbia (Gyug unpublished data, see later in this section). Stands were almost always multi-storied with a component of old (>200 yr) Western Larch, but most trees in the stand were much younger and smaller having originated after low or medium-intensity wildfires which the older trees survived.

In Colorado, Williamson's Sapsuckers favoured nest sites adjacent to open Ponderosa Pine forest (Crockett and Hadow 1975; Smith 1982) but actual nest stands were typically Trembling Aspen stands of 0.34 ha size with density of 772.4 trees/ha (range 182-1312 trees/ha; Crockett 1975). Conway and Martin (1993) found much lower aspen densities in nesting stands (mean 12.7/ha) probably because conifers made up the majority of the trees in the nesting stands. Crockett and Hadow (1975) and Smith (1982) found Williamson's Sapsuckers nesting in aspens to be foraging in nearby Ponderosa Pine stands, rather than in the aspen stands where they nested.

Stands used for nesting can vary from densely forested stands to very open stands with only occasional scattered trees. Detailed quantitative vegetation data for Williamson's Sapsucker nest stands in British Columbia has not been collected. Forest Cover mapping at 1:20,000 developed by the Ministry of Forests was used to describe the nest stands of 116 nests (Gyug unpublished data) in simple terms: 56.9% of the nest stands were Closed Forest (>30% tree canopy closure); 12.9% were at the edge of Closed Forest adjacent to an opening; 6.9% in Open Forest (10-30% tree canopy closure); 19.0% in Open areas (<10% tree canopy closure); either from logging or land clearing (8.6%), from wildfire (1%), or naturally open (9.5%). However, even though Open areas were used for nesting, almost all foraging trips observed from nests in Open areas were into nearby Forest stands. No nest was further than 140 m from a forested stand. The mean distance of nests from forested stands was 73 m (n = 21, SE = 8.4 m) for those nests in Open areas.

Stands containing old Western Larch appear to be disproportionately important to nesting Williamson's Sapsucker in the Okanagan-Greenwood population of *thyroideus*. Stand age and composition of either the nesting stand or the adjacent foraging stand were examined from Forest Cover mapping by the B.C. Ministry of Forests. Sixty-nine of 92 nests (75%) were in, or within 200 m of, stands where the primary canopy layer, or veteran tree layer, contained some Western Larch at least 170 years old (Gyug unpublished data). The proportion of Western Larch in the stands could be as little as 5%. A further 12.5% were in stands that contained some old (>170 years) or veteran Western Larch, but where this component had been missed in mapping, or was too uncommon to have been mapped. Stands containing old or veteran Western Larch trees accounted in total for 87.5% of the nesting/foraging stands in this population.

Williamson's Sapsucker nest and/or breeding pair density in large (>100 ha) census areas was proportional to the amount of old-growth forest, or old Western Larch trees, within the areas (Table 1). It appears that observed densities were the result of habitat quality, where the highest quality habitat is old-growth Western Larch forest because it contains old Western Larch for nesting and that contains carpenter ants for feeding on, and the stands are typically multi-storied with numerous smaller trees for sap well creation. Retaining the large Western Larch trees of that old forest, either in isolated trees in forested stands, or in patches, can maintain Williamson's Sapsuckers in an area, but only at a density in similar proportion to the amount of old-growth Western Larch forest or trees remaining.

In the Okanagan-Greenwood population in British Columbia, large areas without any suitable nesting Western Larch trees were found to be unsuitable habitat, even if sap well trees were available. There were no nesting Williamson's Sapsuckers in the Okanagan Falls Diameter Limit Cut census area (Table 1) even though the highest density of nesting pairs known in the province was immediately adjacent. This area had been diameter limit cut around 1971, where all conifers above a given diameter, which appeared to be around 25-cm DBH, were harvested. All cull trees and snags appeared to have been cut down as well. Even though there were Red-naped Sapsuckers nesting in this area in Trembling Aspen, no Williamson's Sapsuckers nested there.

Table 1. Nest and pair densities of Williamson's Sapsucker in British Columbia, 1995-2004.

	Year	Nests	Other Pairs	Area (km^2)	Density (/km^2)		Habitat
					Nest	Pair	
Census Area Name							
Okanagan Falls Old Growth[1]	2003	6	1	2.21	2.71	3.17	Old growth (>200 yr) Western Larch-Douglas-fir stand with 21% of area clearcut or clearcut with seedtrees
	2004	7	2	2.95	2.37	3.05	Enlarged census area from 2003; 24% clearcut or clearcut with seedtrees
Gregoire Creek[1]	2004	6	5	5.61	1.07	1.96	Mature Western Larch-Douglas-fir stand with 33% clearcut, clearcut with seedtrees, or hydro-line right-of-way
Johnstone Creek-Woodlot 411-1[1]	1997	3	0	4.14	0.72		0.4 large (>65 cm DBH) veteran Western Larch/ha (George Delisle pers. comm. 2000); Douglas-fir the dominant forest tree, previously partially logged
	1998	4	0	5.0	0.80		
	1999	3	0	4.14	0.72		
Wallace Creek[2]	1995	3	1	7.78	0.39	0.51	85% 25-year old clearcut, 15% mature or Old-growth Western Larch-Douglas-fir patches
Wallace Creek[3]	1996	4	0	11.32	0.35		81% 25-year old clearcut, 19% mature or Old-growth Western Larch-Douglas-fir patches, census area enlarged from 1995
Okanagan Falls Harvested[1]	2004	0	0	1.50	0.00		Diameter Limit Cut in 1971 (see text) adjacent to Okanagan Falls old-growth stand

[1]Gyug unpublished data
[2]Gyug and Bennett 1995;
[3]Manning and Cooper 1996.

Stand size

Williamson's Sapsuckers in the Okanagan-Greenwood population in British Columbia used a variety of closed forest stand sizes, from as small as 0.5-ha to continuous forest (Gyug unpublished data). The minimum size of stand used for nesting was a Wildlife Tree Patch of 0.5 ha, although this was the exception rather than

the rule. Most nests were either in much larger patches, adjacent (within 200 m) to larger patches, or in continuous forest.

At Wallace Creek, Williamson's Sapsucker populations were studied in 1995 and 1996 (Gyug and Bennett 1995; Manning and Cooper 1996). That area had contained some of the largest Western Larch in the entire Boundary Forest District (Randy Trerise pers. comm. 1994). Seed tree patches of a mean size of 3.6 ha (range 1.6-18.9 ha) had been retained throughout the upper drainage, covering about 10% of the gross area. Mean interpatch distance was 201 m. The area was logged in the late 1960's by hand falling. Cull trees and snags, and small non-merchantable trees, were generally not cut. This was in contrast to later cutting in the area by mechanical harvesters where almost all standing trees and snags were felled unless reserving them was specifically part of the timber harvesting prescription. Williamson's Sapsuckers were found nesting in some of the patches, as well as in some of the Western Larch cull trees outside the patches, although most foraging appeared to be in patches of old-growth forest.

In the 1995 census of 24 patches at Wallace Creek, there were no nests or territory centres in patches of 1.6-2.0 ha (N=7; occupancy rate 0.00), 1 nest or territory centre in patches of 2.1-2.6 ha (N=8; occupancy rate 0.13) and 3 nests or territory centres in patches of 3.0-5.9 ha (N=9; occupancy rate 0.33) (Gyug unpublished data). There did appear to be a relationship between increasing patch size and occupancy by Williamson's Sapsucker, but no statistically significant relationship could be shown because of the high number of unoccupied patches. A similar relationship of Williamson's Sapsucker occupancy with increasing patch size of Ponderosa Pine forest was reported by Aney (1984) as cited in Dobbs *et al.* (1997). However, as at Wallace Creek, Williamson's Sapsuckers were probably too uncommon to show any statistical association with stand size since Hejl *et al.* (2002) did not pick out a minimum patch size that could be associated with occupancy by Williamson's Sapsuckers when citing Aney (1984).

Elevation range

Breeding range elevations used by Williamson's Sapsucker are relatively high at the southern end of the range, and decrease at the northern end of the range in British Columbia. Elevation range of breeding sites of *thyroideus* in British Columbia in the main Okanagan-Greenwood population was 860 to 1520 m (n = 89; Gyug unpublished data) with 88% of the nests between 1000 and 1390 m, 2% between 860 and 990 m, and 10 % between 1400 and 1520 m. Elevation range of breeding sites of *thyroideus* north and west of the Okanagan-Greenwood population (n = 27) was 700 to 1250 m (Gyug unpublished data; BCNRS; B.C. CDC; WLAP). The majority (81%) were between 800 and 1100 m. Elevation of 10 nests not included in the above summary near Merritt and Hat Creek (Cooper 1995) ranged from 850 - 1100 m.

The elevation range of breeding sites occupied by *nataliae* in British Columbia is not known. There was insufficient precision in the locations of historical nesting records to estimate an accurate elevation range. The only known nest site occupied in 2004 was about 1100 m elevation.

Biogeoclimatic ecosystem classification

The entire province of British Columbia has been classified and mapped into biogeoclimatic zones, subzones, and variants as part of the Biogeoclimatic Ecosystem Classification (BEC, e.g. Lloyd *et al*. 1990). Williamson's Sapsucker nests in the Okanagan-Greenwood population of *thyroideus* occurred primarily (70%) in the Kettle Dry Mild Interior Douglas-fir variant (IDFdm1, Table 2). In other populations, the nests, or likely breeding locations, were primarily (85%) found in the Okanagan Very Dry Hot Interior Douglas-fir variant (IDFxh1), its grassland phase (IDFxh1a), and the Thompson Very Dry Hot Interior Douglas-fir variant (IDFxh2).

Table 2. Biogeoclimatic Ecosystem Classification (BEC) units (variants and phases) used for nesting by the *thyroideus* subspecies of Williamson's Sapsuckers in British Columbia, 1980-2004.

	Okanagan-Greenwood Population[2]		Other Populations[3]	
	N	%	N	%
BEC Unit[1]				
Interior Douglas-fir				
IDFdk1	0		1	3.0
IDFdk2	0		2	6.1
IDFdm1	64	69.6	0	
IDFxh1	10	10.9	13	39.4
IDFxh1a	0		9	27.3
IDFxh2	0		6	18.2
IDFxh4	1	1.1	0	
Montane Spruce				
MSdm1	15	16.3	0	
Engelmann Spruce – Subalpine Fir				
ESSFmw	0		2	6.1
Total	92		33	

[1] Based on Version 5 BEC Classification (2003), and on draft Version 5 BEC Classification for Kamloops Forest Region provided by Dennis Lloyd (Ministry of Forests, Kamloops), see Lloyd *et al*. (1990) for description of BEC Classification variants and phases.
[2] Gyug unpublished nest site data.
[3] Nest sites (N = 20), drumming males where no return was made to search for nests (N = 3) from Gyug unpublished data; from BCNRS (N = 6); WLAP (N = 2); and CDC (N = 2) where location was known with enough precision to determine BEC Classification of site.

Breaking down the mapped “breeding range” (a subset of the Extent of Occurrence eliminating large areas of apparently unsuitable or unused habitats) and the Areas of Occupancy by BEC Units showed that it is not a random selection of BEC units from within the “breeding range” (Table 3). The IDFdm1, the IDFxh1 and the MSdm1 represent a total of only 15% of the “breeding range” but account for 92% of the Area of Occupancy of the Okanagan-Greenwood population. The IDFdm1 and the MSdm1 are distinguished from other similar BEC units by the presence of Western Larch. The Area

of Occupancy of the other populations include PPxh1 and IDFdk1 in approximate proportion to their overall abundance in the "breeding range" but a disproportionately larger amount of IDfxh1, IDFxh2 and IDFxh2a (68%) compared to general abundance in the "breeding range" (21%). The precise locations of the *nataliae* nest records were not known, but were all either in Kootenay Dry Mild Interior Douglas-fir variant (IDFdm2) or Dry Cool Montane Spruce (MSdk).

Table 3. Area of Biogeoclimatic Ecosystem Classification (BEC) units within the breeding range and within the Areas of Occupancy of the Okanagan-Greenwood and the other populations of the *thyroideus* subspecies of Williamson's Sapsuckers in British Columbia, 2004.

	Breeding Range[1]		Area of Occupancy			
			Okanagan-Greenwood		Other Populations	
	Area (km^2)	%	Area (km^2)	%	Area (km^2)	%
BEC Unit[2]						
Bunchgrass	1421.8	7.4	0.0	0.0	0.0	0.0
Ponderosa Pine	1814.4	9.5	2.8	0.4	27.5	7.3
Interior Cedar-Hemlock	33.0	0.2	20.6	3.3	0.0	0.0
Interior Douglas-fir						
IDFdk1	3060.6	16.0	0.0	0.0	64.0	16.9
IDFdk2	1347.7	7.1	0.0	0.0	21.4	5.6
IDFdm1	663.2	3.5	301.6	48.4	0.7	0.2
IDFxh1	1470.4	7.7	82.7	13.3	72.1	19.0
IDFxh1a	169.7	0.9	0.0	0.0	4.0	1.1
IDFxh2	1802.1	9.4	0.0	0.0	149.1	39.3
IDFxh2a	691.3	3.6	0.0	0.0	38.1	10.0
IDFxh4	200.8	1.1	24.2	3.9	0.0	0.0
other IDF	839.6	4.4	0.0	0.0	1.3	0.3
Total IDF	9554.0	50.0	408.5	65.5	350.7	92.3
Montane Spruce						
MSdm1	703.6	3.7	191.3	30.7	0.1	0.0
other MS	3817.0	20.0	0.0	0.0	0.1	0.0
Total MS	4520.6	23.6	191.3	30.7	0.2	0.0
Engelmann Spruce–Subalpine Fir						
ESSFmw	101.6	0.5	0.0	0.0	0.8	0.2
other ESSF	1610.0	8.4	0.0	0.0	0.7	0.2
Total ESSF	1711.6	9.0	0.0	0.0	1.5	0.4
Alpine Tundra	59.7	0.3	0.0	0.0	0.0	0.0
Total	19115.1	100.0	623.3	100.0	379.9	100.0

[1]Breeding Range, the shaded area of Figure 2, is a subset of the Extent of Occurrence, eliminating large areas of apparently unsuitable or unused habitat.
[2]BEC Units listed in the table from lowest to highest elevations.

Range limitation by habitat requirements

The only dense populations of Williamson's Sapsucker in British Columbia appear to be associated with forest stands that have a component of old veteran Western Larch in them (also see Biology, Nest Trees section). However, small and/or low density populations do occur outside of this area in association with Trembling Aspen and/or Ponderosa Pine stands. It is not known exactly why there might be so few Williamson's Sapsuckers in these other areas, or what may be preventing further expansion of their range into what appears to be an abundance of aspen habitats in southern British Columbia when the same species uses aspen habitat extensively in the southern Rocky Mountains.

If the only habitat requirements of the species were for Trembling Aspen nesting trees, Douglas-fir sap trees, and old Douglas-fir trees or snags with an abundance of carpenter ants for feeding nestlings, then there are many areas in the southern interior of British Columbia that fit this description. However, these appear to be unused by Williamson's Sapsucker. Pileated Woodpeckers have similar requirements for carpenter ants (Bull and Jackson 1995) and large nesting trees (of a variety of species including Trembling Aspen) but are found in a far wider range of habitats than Williamson's Sapsucker, indicating that if these were the only habitat requirements, then Williamson's Sapsucker would probably be much more widespread and/or abundant. The critical factor may be for old-growth Ponderosa Pine stands, which are present in some occupied locations of the Princeton and Merritt populations, but are currently relatively rare throughout the southern interior of British Columbia because these were logged over the past 100 years.

Habitat trends

The primary population centre of *thyroideus* in British Columbia is in the Okanagan-Greenwood population where 85% of the estimated Total Population occurs (see Population Sizes and Trends section below). Loss of old-growth Western Larch stands to logging and land clearing is the primary habitat threat, with extensively logged areas and intensively logged stands unsuitable for breeding. Habitat loss from timber harvesting and land clearing in this range is continuing. Based on the B. C. Broad Ecosystem Inventory (BEI) and adjustments for recent forest harvest and fires, the report writer estimated that the Williamson's Sapsucker Area of Occupancy contains about 89 km^2 (15.0%) of older forests, and that over the past 10-14 years, there has been a loss of 23% of the older forests in this Area of Occupancy.

Land clearing on private land at Anarchist Mountain has contributed to the loss of local breeding sites in the Okanagan-Greenwood population where they were formerly common (see Population Trends below). In the 1990's the private land property taxation methods were changed in British Columbia. The standing timber on the land now forms part of the property value to be assessed, and annual property taxes on rural land are based on this new assessment (B.C. Assessment 2004). There is now very little incentive to keep standing timber on private land because it is being taxed without

providing any revenue unless cut down, and is not taxed as part of the property value once it has been cut down.

In the Princeton population, the majority of trees in the old-growth (>200 yr old) Ponderosa Pine nesting stand at August Lake were harvested in 2003 to combat Mountain Pine Beetle (*Dendroctonus ponderosae*) infestations. While a pair was in the area on 25 May, 2004, they were not present on 14 June, and nesting was probably not successful (Gyug unpublished data). This stand had been noted as the most reliable place to find nesting Williamson's Sapsuckers in the Princeton area for over 15 years (BCNRS, B.C. CDC, Jerry Herzig pers. comm. 2000, Dick Cannings pers. comm. 2004, Gyug unpublished data).

Also in the Princeton population, nesting had been recorded in 1984 (BCNRS) at Whipsaw Creek. This old-growth Ponderosa Pine stand on private land south of Princeton was logged in the spring of 2004. Every large Ponderosa Pine was removed from the site, and the habitat rendered completely unsuitable for Williamson's Sapsucker. An adjacent Ecological Reserve is too small (29 ha), has few suitable old-growth Ponderosa Pines and would probably not be suitable habitat for Williamson's Sapsucker on its own.

Loss of habitat to timber harvesting is ongoing. Timber harvesting on Crown lands from 1997-2003 has resulted in the loss of local sites in lower Ingram Creek north of Midway in the Arrow-Boundary Forest District that appear to have been occupied in the past (Gyug unpublished data from 1996; WLAP unpublished data) but are now unoccupied (Gyug unpublished data from 2003 and 2004). In other areas, the 2004 field surveys (Gyug unpublished data) found the area around 6 active nests to have been surveyed out for future timber harvesting, 3 to have been logged within the past 2 years but with enough residual standing timber and nest trees remaining to keep Williamson's Sapsuckers nesting (at least on the short-term), and 2 of the 4 areas occupied by apparently unmated males to be surveyed out for logging.

Timber harvesting has been proposed, and the boundaries have been surveyed, for about 30% of the forested area of the Okanagan Falls Old-Growth Western Larch census area which is approximately 230 ha in size (see Table 1). This site has the highest density of Williamson's Sapsuckers known in Canada and in its entire range, and is already bounded by unsuitable logged habitat. The site (formerly known as Schoonover Mountain, now most commonly referred to on BCINTBIRD birder's e-mail group as Venner Meadows Road) has been known as one of the most reliable places to find Williamson's Sapsuckers in Canada for 90 years. Based on personal knowledge of the Okanagan-Greenwood Area of Occupancy and other areas throughout the Okanagan surveyed for this and other species and projects from 1990 to 2004, review of aerial photography of the entire area, review of the digital forest cover mapping for the Okanagan-Shuswap Forest District, Boundary TSA and Merritt TSA, and the Terrestrial Ecosystem Mapping of Tree Farm Licence 15, there are no other old growth Western Larch patches of this size (>200 ha), age (>200 yr) and apparent habitat

quality for Williamson's Sapsucker in the Area of Occupancy of the *thyroideus* subspecies in British Columbia. The site would appear to be irreplaceable.

Timber harvesting rates can be estimated at about 1% of the forest land base per year using a very simplistic model based on clearcutting, and on an approximate 100-year rotation age between harvesting entries in any given location. Actual projected timber harvesting rates for the last year (2002) in which they were publicly available on the British Columbia Ministry of Forests website (they are no longer publicly posted as GIS files that can be overlaid over other GIS habitat layers), were 1.26% per year for the portion of the *thyroideus* Williamson's Sapsucker Area of Occupancy in the Okanagan-Shuswap Forest District. This was calculated based on the five-year planning timeframe of 2002-2007 in the Area of Occupancy (233.8 km^2) where 12.97 km^2 or 6.3% of the Crown Land portion (205.7 km^2) of this Area of Occupancy was proposed for timber harvesting in that time period. Most of this area proposed for timber harvest (10.27 km^2 or 79%) was in forests with an older Western Larch component in general areas known to be occupied by breeding Williamson's Sapsuckers.

The old trees that are the primary nesting sites and ant foraging sites may take hundreds of years to reestablish, given that the veteran Western Larch nesting trees are typically 200 to 600 years old. Of 18 nest trees found in 1996, 1997 or 1998, and followed until 2000, 5 were used for more than one year of nesting with one used for 4 years in a row (Gyug unpublished data). Three of these trees fell over in that period—a Black Cottonwood (*Populus balsamifera* subsp. *trichocarpa*), a birch (*Betula* sp.) and a Ponderosa Pine—but none of the 11 Western Larches fell over. In general, Western Larch nest trees may be longer lived, and therefore more stable and predictable, nesting substrates than other tree species in this area.

There are also threats to individual trees, as well as to whole stands. One veteran Western Larch nesting tree used from 1997 to 1999 was felled by firewood cutters in 2003. The tree had extensive heart rot, a dead and broken off top, and extensive burn and perhaps lightning scars on its trunk, but was still alive. About half of the tree was abandoned on site because it was too rotten to cut with a chainsaw.

While habitat is being lost, no new habitat is being created. Most timber harvesting in the area does not leave enough residual standing timber to satisfy Williamson's Sapsucker habitat requirements. If there were no adjacent old-growth Western Larch/Douglas-fir stands for foraging and/or nesting, then the habitats were generally found to be unoccupied (Gyug unpublished data). In the 1980's and 1990's, the Ministry of Environment (now the British Columbia Ministry of Water, Land and Air Protection) negotiated extensive leaves of mature Western Larch in clearcuts at densities up to 60-100/ha, but more typically 5-10/ha. While initially forest licensees had been leaving these as seed trees for natural regeneration of clearcuts, the regeneration was too unpredictable and has given way to the widespread planting of seedlings on all cutover sites. The value of these mature seed trees was recognized by wildlife managers in the 1980's and 1990's, and these trees were being reserved from harvest, even though they no longer were required for conifer regeneration.

However, in the past few years the reserve of mature trees from harvest in clearcuts appears to have changed with the advent of the British Columbia Forest Practices Code (now replaced by the Forest and Range Practices Act) and with the imposition and enforcement of Worker's Compensation Board (WCB) safety rules. The Wildlife Tree Guidelines developed under the Forest and Range Practices Act have been developed separately for each Forest District to recognize the unique situations in each district. However, these are generally area-based and only recognize patches of trees as meeting requirements. Areas that would have had Western Larch or Douglas-fir reserved only a few years ago in partial imitation of the ground-fire disturbance regimes which would have naturally left many of these older trees standing are now generally cutover completely, with no standing residual timber. Salvage harvesting of areas burned in wildfires in 2003 are coming under the same system, with many large Western Larches surviving the fire, but being salvage logged along with the standing dead trees.

The WCB safety rules apply to any stands where people or machinery are working, and generally do not permit the retention of trees with obvious defects, which would formerly have been cull trees and often left standing. Large veteran Western Larch nesting trees—most of which have obvious defects such as fire scars and dead or broken tops—as well as the trees that may have become the next generation of nesting trees, are a quickly disappearing component of the timber harvesting landscape in British Columbia.

Habitat trends in the *nataliae* population have not been quantified in the 1996-2004 studies which only examined the *thyroideus* populations. However, Johnstone (1949) identified logging in 1939 as the agent which destroyed the habitat at the only nesting site known to be occupied in 1938. Only 95.6 km^2 (3.4%) of the *nataliae* breeding range was estimated to be in forests older than 140 years as of the early 1990's based on Broad Ecosystem Inventory. This is much lower than the estimated 19.5% suitable habitat in the Okanagan-Greenwood population for the same time period.

Habitat protection/ownership

Only one currently occupied nest site of Williamson's Sapsucker in British Columbia is in a park. The nest near Kimberley in 2004 was in a park of leased Crown land managed as a park by the City of Kimberley (Kimberley Nature Park Society 2004). Two other nesting sites, one at Lightning Lakes in E.C. Manning Provincial Park (BCNRS), and one at Cathedral Provincial Park (Campbell *et al.* 1990) were not occupied in 2004, and seem not to have been occupied for a number of years. Some appear to be on private ranch land at Hat Creek (although the exact location of the nests was not available), and at Merritt and Princeton, and along Highway 3 at Anarchist Mountain (Gyug unpublished data). All other known sites are in Crown-owned forest.

No breeding sites are known from any First Nations Reserve lands. The only First Nations Reserve Lands within Williamson's Sapsucker Area of Occupancy were 11 km^2 in the Okanagan-Greenwood population east of Oliver. These particular areas have not

been inventoried for Williamson's Sapsucker, but certainly may contain Williamson's Sapsucker based on nests in similar habitat <200 m from these lands.

Planning is currently underway for Old-Growth Management Areas (OGMA) as reserves from timber harvesting under the Biodiversity Guidelines of the Forest and Range Practices Act. Sixty-five of the currently planned 1421 OGMAs (draft 3, October 2003, coverage provided by British Columbia, Ministry of Sustainable Resource Management) in the Okanagan-Shuswap Forest District intersect the Williamson's Sapsucker Area of Occupancy in the Okanagan-Greenwood population. However, only one of these OGMAs contains a known Williamson's Sapsucker nest site. There were also two other observations of Williamson's Sapsuckers in other draft OGMAs: one at Anarchist Mountain, and one at Micah Creek. Only four of the 50 known nest sites in the Arrow-Boundary Forest District were within draft OGMAs (May 2004 version available at http://tfic1. timberline.ca/ kbhlpo/index/boundary.html). In general, the currently planned OGMAs will do little to protect Williamson's Sapsucker populations.

BIOLOGY

A comprehensive review of recent sources of the biology of Williamson's Sapsucker was undertaken by Dobbs *et al.* (1997). Prior to 1997, there was one comprehensive review of Williamson's Sapsucker biology (Crockett 1975) that used many earlier sources which were not cited directly in Dobbs *et al.* (1997). The information presented below relies mainly on those reviews, but where original, more recent, or information not cited in those reviews has been used, the source is cited here. There are no known biological differences between the two subspecies, and they will be treated jointly here for most aspects of their biology. There is no information on life span, diseases, parasites or physiology of the species.

Life cycle and reproduction

The males establish territories when they arrive on the breeding grounds in the spring; females arrive 1-2 weeks later (Crockett and Hansley 1977). Excavation of a nest cavity in a standing tree or snag begins shortly after pair formation and lasts 3-4 weeks. They may on occasion re-use an old cavity rather than excavating a new one. There is only one brood per season. Back calculation of egg dates from dates when nestlings were found indicates eggs could be found from 23 April to 15 June (Campbell *et al.* 1990). Incubation period is 12-14 days in Colorado (Crockett and Hansley 1977) and Arizona (Dobbs *et al.*1997) with no information available for Canada. Clutch size is usually 4-6, occasionally 3-7 (Dobbs *et al.* 1997) with 4 and 5 eggs found in the only two nests for which there are records in Canada (BCNRS). Nestlings fledge after 26-33 days in the nest. After fledging, the adults and young may stay in the vicinity of the nest for a few days or weeks, or may disperse widely (Dobbs *et al.* 1997; Gyug personal observations).

Nest trees

Cavities are excavated in nesting trees or snags, although occasionally an old nesting hole may be reused. Crockett (1975) found 15% of 40 nests and Conway and Martin (1993) 21% of 28 nests, to be in reused holes. This has also been seen in British Columbia at one nest site in a small Trembling Aspen grove where only three nest holes in two trees have been used, and each of the holes reused at least once, from 1998-2004 (Jerry Herzig pers. comm. 2000; Gyug unpublished data).

Trembling Aspen is the most commonly used nest tree of *nataliae* in the southern Rocky Mountains but not in the northern Rocky Mountains. In Arizona and Colorado Trembling Aspen is the primary nesting tree (95% of the 257 published records in Crockett and Hadow 1975, Conway and Martin 1993, Dobbs *et al*. 1997) with Ponderosa Pine used in stands without suitable Trembling Aspen for nesting (Crockett and Hadow 1975). Trembling Aspen were not selected randomly for nesting as they form a minority (12-14%) of the available trees in the stands studied (Conway and Martin 1993). Individual aspens were selected for nesting based on being larger than average (Conway and Martin 1993), and if infected with heart rots or otherwise softer than average (Crockett 1975, Schepps *et al.* 1999), or if they were already dead (Conway and Martin 1993). Even when aspen was used for nesting, the adults would still forage primarily in adjacent coniferous stands (Dobbs *et al.* 1997).

In contrast, in the northern Rocky Mountains of Montana, there have been fewer nesting records reported but generally *nataliae* seems to nest in Western Larch (McClelland *et al.* 1979 give a nest tree size range of 43 – 94 cm DBH for the 4 Williamson's Sapsucker nests found out of 308 total cavity nests – these were more likely to have been Western Larch than Trembling Aspen given that size range). The only nesting records of *nataliae* in British Columbia are three from Western Larches (Johnstone 1949, EKOOTENAYBIRD 2004) and one from a Black Cottonwood (BCNRS). In the subspecies contact zone in northeastern Oregon, all 86 nests were in conifers, 41% in Western Larch, 40% in Ponderosa Pine, 10% in Douglas-fir and 9% in Grand Fir (*Abies grandis*) (Bull *et al.* 1986). The majority (74%) of Western Larches used for nesting were live. More than half of the Ponderosa Pines used for nesting were dead.

The nesting trees of *thyroideus* are primarily coniferous. In California, these are primarily Ponderosa Pine and Lodgepole Pine (citations from Crockett 1975). Lodgepole Pine in California are the non-serotinous Sierra-Cascade subspecies, and more similar in growth form to the Ponderosa Pine than to the serotinous Rocky Mountain Lodgepole Pine which occurs in the range of Williamson's Sapsucker in British Columbia. In the Cascades of western Oregon and Washington, nest trees were primarily Ponderosa Pine (citations from Crockett 1975).

In British Columbia, nesting trees used in the Okanagan-Greenwood population of *thyroideus* were primarily Western Larch (77%; Table 4) with 80% of these Western Larch live nesting trees being >69 cm DBH (Figure 4). Western Larch trees >69 cm DBH would typically be at least 200 years old. An 80-cm DBH live veteran Western

Larch nest tree cut down for firewood in 2003 was 543 years old. Since the Western Larch nesting trees are typically still alive, scar tissue forms over the nesting holes and many of them eventually close over. Up to 98 nesting holes were seen in one Western Larch indicating the nesting trees will be used over many years. Western Larch is unique among the dry-belt and mid-elevation conifers of British Columbia in that heartwood decay can persist for many years with the very hard sapwood maintaining the tree (see McClelland and McClelland 1999).

Table 4. Nest tree species and Diameter at Breast Height (DBH in cm) of nest trees of the Okanagan-Greenwood population of the *thyroideus* subspecies of Williamson's Sapsucker in British Columbia, 1996-2004, based on Gyug (unpublished data).

	Live Trees			Dead Trees			Total
	N	Mean DBH	Range DBH	N	Mean DBH	Range DBH	N
Tree Species							
Western Larch	63	82.4	29-125	8	56.9	34-86	71
Trembling Aspen	4	48	38-54	2	36.5	26-47	6
Birch	1	32	-	5	29.6	24-33	6
Spruce (*Picea* sp.)	1	63	-	2	44	43-45	3
Black Cottonwood	0	-	-	2	96	96	2
Douglas-fir	1	60	-	1	49	-	2
Ponderosa Pine	1	86	-	1	70	-	2
Total	71			21			92

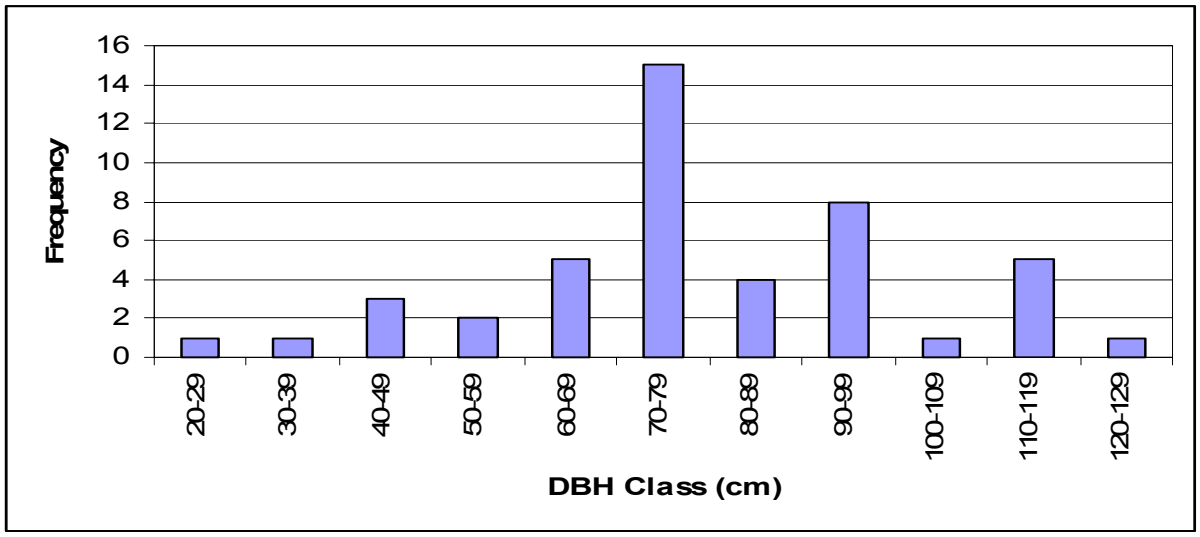

Figure 4. Frequency of live Western Larch in 10-cm Diameter-at-breast-height (DBH) classes used for nesting by the *thyroideus* subspecies of Williamson's Sapsuckers in the Okanagan-Greenwood population, 1996-2004, based on Gyug (unpublished data).

Western Larch is widespread in the southern interior of British Columbia from Okanagan Lake eastward to the Alberta border, and as far northward as Salmon Arm (see Figure 2), so it would seem to be an anomaly that a species that seems to associate so highly with Western Larch as Williamson's Sapsucker would be so limited in distribution in British Columbia. However, only at the drier southern edges of the range of Western Larch in British Columbia is there an abundance of veteran Western Larches--trees that have survived multiple fires.

Outside of the Okanagan-Greenwood population in British Columbia, nesting trees of *thyroideus* (n = 36) were primarily Trembling Aspen (64%) followed by Ponderosa Pine (28%). This trend is similar to the trends for nesting trees found in the southern Rocky Mountains for *nataliae* where Trembling Aspen is the primary nesting tree followed by Ponderosa Pine. The choice of nesting trees is clearly not related to subspecies of Williamson's Sapsucker, but is related to the available and suitable trees in a given area. The other three reported nesting trees were a Black Cottonwood, a Douglas-fir, and (apparently) a Lodgepole Pine. Three BCNRS cards were submitted by separate observers on this last nest: one not identifying the species of nest tree, one identifying it as an Engelmann Spruce, and one (on the most meticulously filled-in card) identifying the tree as a Lodgepole Pine.

Height of nesting trees varied from as low as 5 m for a broken-trunk spruce snag to as high as 49 m for a Western Larch (Table 5). Nest heights covered a wide range as well, from as low as 1 m above ground to as high as 42 m above ground (Table 5). General heights of mature Douglas-fir canopy trees in the Okanagan-Greenwood Area of Occupancy are in the 24 to 28-m range. The mean height of Western Larches used for nesting was 29 m (Table 5), even though many of these had broken tops. The veteran Western Larches typically used for nesting could often be spotted from hundreds of meters away because they stood out above the main tree canopy layer.

Table 5. Nesting tree and nest heights of the *thyroideus* subspecies of Williamson's Sapsucker in British Columbia, 1996-2004, based on Gyug (unpublished data).

	Nesting Tree Height (m)					Nest Height (m)				
	N	Mean	Min	Max	SE	N	Mean	Min	Max	SE
Western Larch										
Dead	7	16.4	7	31	3.8	7	8.3	3	20	2.4
Live	59	29.1	16	49	0.9	54	17.8	5	42	1.0
Other Conifers[1]										
Dead	6	18.2	5	40	5.5	5	14.8	5	26	4.2
Live	4	27.0	20	32	2.6	4	12.8	2	20	3.9
Deciduous[2]										
Dead	9	13.7	8	20	1.3	9	5.4	3	10	0.8
Live	9	22.0	10	32	2.5	9	11.1	2	18	1.9

[1]Ponderosa Pine, Douglas-fir, spruce
[2]Trembling Aspen, birch, Black Cottonwood

Diet and foraging

Sapsuckers are specialized for feeding on the sap and phloem fibres of trees with brush-like tufted tongue tips, rather than the barbed tongue-tips of most woodpeckers (Winkler *et al.*1995). Williamson's Sapsucker feeds exclusively on conifer sap and phloem during the pre-nestling period, shifting to mainly carpenter ants after hatching of the young.

Williamson's Sapsuckers were observed feeding on 12 Douglas-fir sap trees during nest searches in 2004 in British Columbia (Gyug unpublished data). Ten of these sap trees were between 15 and 39 cm DBH, one was 55 cm DBH, and one was 62 cm DBH. For nine of the sap trees, the location of the nest of the bird or pair feeding on the tree was located. Distance of the sap trees to nest ranged from 6 m to 258 m with a mean of 88 m (SE = 26.2 m). The majority of the sap trees (6 of 9) were between 32 and 91 m from the nest.

During the nestling period, carpenter ants form the majority (75-99%) of the diet of Williamson's Sapsucker based on the four studies that have examined detailed food habits (Beal 1911; Otvos and Stark 1985; Stanford and Knowlton 1942; Crockett 1975). Carpenter ants only nest in downed trees, stumps and snags >30-cm DBH, and in live trees >20-cm DBH (Sanders 1970).

Other insects besides ants are taken opportunistically during the breeding season (Crockett 1975; Dobbs *et al.* 1997; Gyug personal observations) but the main adult food items, and the main food items fed to nestlings, are carpenter ants. These are primarily gleaned from tree trunks (84% of the time, Crockett 1975; 97% of the time, Stallcup 1968). Sap and phloem fibres constitute the primary diet during the non-breeding season although berries may provide a substantial part of the diet during winter.

Home ranges

Males establish breeding territories around the chosen nest site. Published breeding territory sizes have only been calculated for *nataliae* in the southern Rocky Mountains. Crockett (1975) reported territory sizes of 4 to 9 ha (mean 6.75 ha); Conway and Martin (1993) reported inter-nest distances of 175 to 375 m in Arizona which would be similar to the distances implied by Crockett. Young (1975, cited in Cooper 1995) found a minimum territory size of 0.8 ha; this seems impossibly small, and may have been based on too few observations to be valid. Six territorial radii in British Columbia ranged from 150-425 m (based on territorial challenges, Gyug unpublished data). Calculations based in inter-nest differences give a mean territory size of 17 ha for British Columbia pairs (Gyug unpublished data), suggesting that territories are larger at the northern end of the range. The only radio-tracking study of Williamson's Sapsucker ever undertaken was on one nesting male in British Columbia (Manning and Cooper 1996), so this range size of 54 ha should probably be given more credence than estimates based on indirect measures of territorial responses.

Density

Williamson's Sapsucker nest densities range up to 2.83/100 ha (100 ha = 1 km^2) based on larger plots in the U.S.A (Table 6), and up to 2.71 based on larger plots in British Columbia (Table 1). Highest densities in British Columbia were just over 3 pairs/100 ha.

Table 6. Nest and pair densities of Williamson's Sapsucker reported from large (>100 ha) plots outside of Canada.

State	Census Area Name	Year	Nests	Other Pairs	Area (km^2)	Density (/km^2)		Comments
						Nest	Pair	
WA[1]	Okanogan-Wenatchee							
	Ramsey	2002	4		4.00	1.00		
	Tripod	2002	4		3.68	1.09		
	Finley	2002	1		3.91	0.26		
	Little Buck	2002	4		3.42	1.17		
	Mills Flat	2002	2		2.53	0.79		
	Hunter/Zwar	2002	3		3.51	0.85		
	Mean	2002				0.86		
	Ramsey	2003	4		4.00	1.00		
	Tripod	2003	7		3.68	1.90		
	Finley	2003	3		3.91	0.77		
	Little Buck	2003	3		3.42	0.88		
	Mills Flat	2003	2		2.53	0.79		
	Hunter/Zwar	2003	3		3.51	0.85		
	Mean	2003				1.03		
CO[2]	Rocky Mt. Nat. Park	1972-74	16		5.66	2.83		
CO[3]	San Juan Nat. Forest							
	Park Bench	2003	1		1.716	0.58		
	Sheep Creek North	2003	4		1.974	2.03		
	Sheep Creek South	2003	0		1.648	0.00		
	Davis Creek	2003	1		1.75	0.57		Area not stated, assumed similar
	Total Area	2003	6		7.088	0.85		
CO[4]	Hot Creek Resource Natural Area IBA	N/A		10	7.5		1.33	Average no. pairs-source of data not stated.
OR[5]	Upper Klamath Sycan Marsh							
	CN	2003	7		3	2.33		
	CS	2003	2		3	0.67		
	TN	2003	0		3	0.00		
	TS	2003	3		3	1.00		
	Total Area	2003	12		12	1.00		

[1]Lemkuhl *et al*. 2004
[2]Crockett 1975
[3]Vos and Yoder 2003
[4]Audubon Colorado 2004
[5]Bienz *et al*. 2004.

Dispersal/migration

Williamson's Sapsucker is a migratory woodpecker that returns to British Columbia between mid-March and mid-April. Fall migrants generally depart by mid-September with occasional records from October (Campbell *et al.* 1990. There is very limited information on dispersal of young based on six young banded in nests by Crockett (1975, also see discussion under Survivorship below). Two of the six returned to his study areas in their first spring after migration, and a third was found returned in its second year.

Survivorship/mortality

Nesting success, i.e., percentage of nests fledging at least one young, averaged 96.1% in Arizona (Dobbs *et al.* 1997). Successful nests averaged 3.67 fledged young in Arizona (Dobbs *et al.* 1997) and 3.17 young per nest in Colorado (Crockett 1975). No information is available for Canadian Williamson's Sapsucker populations. Lifetime reproductive success is unknown because there is no information on life span for Williamson's Sapsuckers, and relatively little information on adult survivorship (see below). For the Red-naped Sapsucker, a similar-sized migratory woodpecker, the maximum age on record is at least six years (Walters *et al.* 2002).

One-year survivorship of Williamson's Sapsuckers banded as adults of unknown age was 54% (recalculated from Crockett 1975 using all his year-to-year data, not just the "first-year of data" subset he used to calculate survivorship of 48%). This one-year adult survivorship is similar to estimates for Red-naped Sapsucker of 43% in Nevada (Fleury 2000) and 56% in British Columbia (Walters *et al.* 2002). For the nine adults banded in the first-year of Crockett's (1975) study, five were still on his study sites two years later. Some of the banded adults may have dispersed to other sites outside of his study areas, so this is a minimum survivorship estimate. Two of his banded pairs remated, four adults used the same nest hole, two adults the same nest tree, and six used the same territory.

The only information on survivorship of juvenile Williamson's Sapsuckers is from Crockett (1975). A total of six young were banded in nests of which three returned in following years to nest. Juvenile survivorship of fledged young was much lower for a much larger sample of Red-naped Sapsuckers with only 7 of 82 young returning to breed within 2 years in Nevada (Fleury 2000) and 8 of 141 young returning in British Columbia (Walters *et al.* 2002).

Williamson's Sapsucker is a prey species for all three of the *Accipiter* species of western North America – Sharp-shinned Hawk (*A. striatus*), Cooper's Hawk (*A. cooperii*) and Northern Goshawk (*A. gentilis*)—with remains found in the pellets of each species in Oregon (Reynolds and Meslow 1983). Nest predators include Red Squirrels (*Tamiasciurus hudsonicus*; Dobbs *et al.* 1997), Long-tailed Weasels (*Mustela frenata*; Crockett and Hansley 1977) and Black Bears (*Ursus americanus*; Walters and Miller 2001), and probably include snakes when nests are fairly close to ground level

(Crockett and Hansley 1977). Based on observations of nest predation on other species of woodpeckers in British Columbia in areas where Williamson's Sapsuckers were found, other possible nest predators may include Deer Mice (*Peromyscus maniculatus*) and House Wrens (*Troglodytes aedon*; Walters and Miller 2001).

Interspecific interactions

Pairs are territorial during the breeding season with little toleration of other conspecifics. Other woodpeckers and sapsuckers also occasionally experience hostility from territorial males (Dobbs *et al.* 1997) but closest inter-nest spacing can be much smaller than for conspecifics. When Williamson's and Red-naped Sapsuckers interact, Young (1975 cited in Walters *et al.* 2002) considered the Williamson's to be aggressive toward, and behaviourally dominant to, the Red-naped.

POPULATION SIZES AND TRENDS

Search effort

Quantitative studies of the distribution and abundance for the *thyroideus* subspecies have been undertaken from 1996 to 2004 (Gyug unpublished data). This included 1400 call playback points with 400 to 500-m interpoint spacing completed in 1997 (206), 1998 (46), 2003 (161), and 2004 (987) in areas between Grand Forks and Merritt, British Columbia (Gyug unpublished data). Most points with call playback responses of Williamson's Sapsuckers were searched later for nests, the only exception being the call playback points near Merritt in 2004, where there were three responses to the call playbacks but no later nest searches. An additional 37 areas (of 100 to 200 ha each) were searched intensively for nests between 1996 and 2004, even though no call playbacks had been done in these areas previously. Complete census was attempted in five areas (see Table 1). The nest site data at Wallace Creek from Gyug and Bennett (1995) and Manning and Cooper (1996) were used as additional census areas, even though they were not initially attempted as censuses.

Using a 250-m radius (the mean distance from the call playback points where Williamson's Sapsuckers were initially detected to the discovered nest) as the sampled area for each call playback point, and the actual areas of search areas and census areas, 162 km^2 (27%) of the 594 km^2 of the Area of Occupancy of the main locality of the Okanagan Greenwood population was sampled. An additional 182 km^2 were searched outside of this Area of Occupancy, but these searches had negative results and were used to refine the boundaries of the Area of Occupancy. Given that only 20% or less of the Area of Occupancy of this locality is estimated to be high quality habitat for Williamson's Sapsucker (see Abundance estimate below), and that most of this high quality habitat in this Area of Occupancy was searched, there remain very few areas of suitable habitat that have not been searched at all within that area.

The report writer is fairly confident that there are no large populations (i.e., certainly not >3 or more pairs) of Williamson's Sapsucker outside the known Areas of

Occupancy. Extensive records of other species of sapsuckers and woodpeckers throughout southern British Columbia (as summarized in Campbell *et al*. 1990) indicate that the lack of records of Williamson's Sapsucker outside the Areas of Occupancy is not because of a lack of searching, but is a true reflection of the absence or rarity of Williamson's Sapsuckers outside these areas.

Prior to these fairly intensive and extensive searches for Williamson's Sapsuckers, there had been no quantitative basis on which to make any population estimate of Williamson's Sapsuckers in British Columbia. Gyug and Peatt (2000) published an estimate in 2000 which should no longer be viewed as authoritative since the density estimates were based on only one census area (Johnstone Creek 1997-1999) which we later found to be lower than the density in other areas (see Table 1).

Search effort for *nataliae* in 1996 was 52 call playback points and 14 intensive search areas (Cannings 1997). No *nataliae* were found on these searches. All current locations and knowledge of the *nataliae* subspecies come from incidental observations from a wide range of sources.

Abundance

The Area of Occupancy of the main group of locations of the Okanagan-Greenwood population was 594 km^2 in size in 2003-2004. The current total is about 89 km^2 (15.0%) of older forests within this Area of Occupancy (see Habitat Trends section). The mean Williamsons Sapsucker breeding pair densities of each of the three census areas (Okanagan Falls 3.11; Gregoire Creek 1.96; Johnstone Creek 0.75; see Table 1) were averaged to estimate the mean density found in older Western Larch/Douglas-fir forest in the area. The mean density estimate was 1.94 breeding pairs/km^2. Multiplying this estimate by the area estimated to be in older forest yields an estimate of 173 breeding pairs in this locality. Additional localities in the Okanagan-Greenwood population north of Shuttleworth Creek would add nine breeding pairs to this estimate. There were therefore 182 breeding pairs estimated in the Okanagan-Greenwood population in 2004.

Additional localities in the other *thyroideus* populations must be added to this estimate. There would be up to six breeding pairs in the Hat Creek population based on three nests found in one year, and others probably missed (Wayne Campbell pers. comm. 2004). The report writer estimates that there would be up to eight breeding pairs in the Merritt population based on estimates of two in the Sunshine Valley locality, four at Midday Creek and two at Kane Valley/Aspen Grove. I would estimate up to ten breeding pairs currently in the Princeton population based primarily on 3 known nests, one breeding pair and two other adult males in 2004 in the Copper Mountain Road/August Lake locality, and possibly a few others in unsurveyed locations. There would be a few nesting pairs not included in any of the above populations. I would estimate these at four breeding pairs in 2004 based on the one known from Trout Creek in 2004, and possibly up to three northwards to the area near Kamloops that may remain undiscovered.

There is insufficient information to provide a reliable estimate of the number of breeding pairs in the *nataliae* Williamson's Sapsucker population in British Columbia. Based on the rarity of nest records, or any other sightings, of this subspecies, a best estimate would be that there are fewer than five breeding pairs, or 10 breeding adults. This population would be similar in size and extent to the Princeton population of the *thyroideus* subspecies, although there is no known nucleus or single location where *nataliae* is relatively abundant as is the case in Princeton.

The estimated breeding pairs in the Williamson's Sapsucker Total Population in British Columbia in 2004 is 215. This is based on 182 in the Okanagan-Greenwood population (85% of the Total Population), and 33 in four other populations, and in locations outside any population centres. The estimated number of breeding adults in the Total Population is 430, i.e., double the estimate of breeding pairs.

Only 95.6 km^2 (3.4%) of the *nataliae* breeding range was estimated to be in forests older than 140 years (see Habitat Trends section). There is insufficient density information from which to extrapolate population numbers from this estimate of potential habitat size. However, given that only 3.4% of the breeding range might be considered currently potentially suitable habitat, this may indicate that significant loss of older forests may have already occurred in the breeding range of the *nataliae* subspecies, and this could be one of the reasons it is very rare.

Fluctuations and trends

No long-term population numbers are known for Williamson's Sapsucker in Canada. However, based on decreases in suitable habitat, the population is probably declining. There are sketchy long-term population records for only two areas of the Okanagan-Greenwood population of *thyroideus*. At Schoonover Mountain (east of Okanagan Falls), they were first collected in 1913 (Munro and Cowan 1947), and are still common there—probably because the stand of veteran Western Larch has remained. However, this stand is much smaller now than it once was, is now isolated from similar stands, and a substantial portion is proposed to be timber harvested (see Habitat Trends section).

The only other area for which there is a long-term record is Anarchist Mountain which was the “centre of abundance” of this subspecies in the province (Guiguet 1970), and where the species has been “Common in all the heavy timber from Midway to Osoyoos Lake, B.C., at an altitude of about 4000 ft [1200 m]” (Spreadborough, cited in Macoun and Macoun 1909). That area is no longer the centre of abundance because of extensive land clearing and logging in the past 50 years. The area formerly colloquially known as “Sapsucker Woods” on Anarchist Mountain (Dick Cannings pers. comm. 2004) has been entirely cleared and no longer has any breeding Williamson's Sapsuckers (Gyug unpublished data). A few veteran Western Larch that appear to be former Williamson’s Sapsucker nesting trees were left standing after land clearing, but the habitat around them is completely unsuitable. Overall numbers appear to be

decreasing because of habitat loss in this population, but there are no prior estimates of population numbers to quantify this numerical loss.

Williamson's Sapsuckers are detected too infrequently on Breeding Bird Survey (BBS) routes to develop reliable overall population trends (Sauer *et al.* 2004), but in the only place where there is a reliable trend (Oregon), the species is declining at an annual rate of 3.3%.

Rescue effect

There are populations of *thyroideus* Williamson's Sapsuckers in adjacent areas of Washington State. However, while there is a possibility of rescue effect from immigration should populations in British Columbia decline to unsustainable levels, the principal population limit for the Okanagan-Greenwood population is currently habitat, and the rescue effect is not relevant. At any rate, even if the rescue effect should be required to repopulate suitable habitat, there is probably relatively little long-distance dispersal of young in Williamson's Sapsucker based on the only banding study of six nestlings (Crockett 1975) where half the young returned to his study area to breed within two years. Given that the overwinter mortality of young is unknown, but could easily be equal to half the fledglings, most or all of the young that survived to their first year may have returned to near the natal site, and there may be almost no long-distance dispersal.

Populations of *nataliae* Williamson's Sapsucker are relatively low south of the Canadian border in Montana (Sauer *et al.* 2004; Hutto and Young 1999; Weydemann and Weydemann 1928; McClelland *et al.* 1979). Even if suitable habitat was abundant, or more was created, in Canada, there may not be large enough populations in Montana with much long-distance dispersal to provide a rescue effect to this population.

LIMITING FACTORS AND THREATS

The principal limiting factor to Williamson's Sapsucker populations in Canada appears to be limitations of amount of suitable breeding habitat. In the Okanagan-Greenwood population (89% of the *thyroideus* Total Population) primary habitat consists of old-growth stands with large veteran Western Larch nesting trees with heartrot, smaller (20-40 cm DBH) Douglas-fir and Western Larch for sap well creation, and older trees with abundant carpenter ants for feeding nestlings. All three habitat components must be present to create suitable habitat. Most (88%) of the Williamson's Sapsucker nests found in this population were associated with stands >170 years old, or with Western Larch trees >170 years old in multi-aged stands (see Habitat section).

The primary habitat threat to these old-growth Western Larch stands is timber harvesting on Crown Land, and land clearing on private land. Old trees that Williamson's Sapsucker use for nesting and foraging for carpenter ants will not be replaced under current timber management schemes based on approximate 100-year

rotations. Even if these individual trees may be replaced by retaining seedtrees or reserved mature trees in clearcuts, these clearcut stands will not be suitable habitat for Williamson's Sapsucker throughout most of the rotation period since adjacent stands containing old-growth trees will still be required to meet most foraging needs.

The trend in habitat over the past 10-14 years, and the next 10 years can be estimated from available data for the Okanagan-Greenwood population. The reduction in suitable habitat from the early 1990's to 2004 was 23%, i.e. reduced from 19.5% to 15% of the Okanagan-Greenwood population Area of Occupancy (see Habitat Trends section). Over the next 10 years, timber harvesting in this area is expected to proceed at the approximate rate of 1% of the area per year, 80% of which is being directed at the older Western Larch stands occupied by Williamson's Sapsucker (see Habitat Trends section). In 10 years, this could reduce the suitable habitat from 15% to 7%, or a reduction of 53%. At that rate of timber harvesting, suitable habitat for Williamson's Sapsucker in this Area of Occupancy could be almost completely eliminated within 20 years, or at least reduced to an amount that may not be able to sustain a population, as may have already happened in the Rocky Mountain Trench near Cranbrook.

SPECIAL SIGNIFICANCE OF THE SPECIES

Williamson's Sapsucker is of scientific interest as the oldest line, and the least genetically variable, of the North American sapsuckers. It is also of interest as the most sexually dimorphic of all species of woodpeckers, enough so to cause the misidentification of males and females as different species for the first 24 years for which the species was known.

In British Columbia, Williamson's Sapsuckers in the largest population (with 85% of the estimated species numbers in the province), may act as a representative, or an indicator, of the rapidly disappearing old-growth multi-storied Western Larch habitat. The species is of interest to birders because of its rarity, and because of its association in the province with the now-rare, old-growth Western Larch forests. The species is largely unknown to people without an interest in birding because of its relative rarity, and its general limitations to middle-elevation coniferous forests in British Columbia.

Williamson's Sapsucker is a priority species for Partners in Flight in the Great Basin (Partners in Flight British Columbia and Yukon 2003) and for the Canadian Intermountain Joint Venture (2003). It is also a Species of Continental Importance in the Intermountain West Avifaunal Biome, designated by Partners in Flight (Rich *et al*. 2004).

There is no known Aboriginal traditional use or knowledge of this species.

EXISTING PROTECTION OR OTHER STATUS DESIGNATIONS

As a migratory bird Williamson's Sapsucker is protected under the Migratory Bird Convention Act. It is also protected under the British Columbia Wildlife Act. However,

there are no known direct threats to the species since it is not hunted, or in any other way directly used by people. Neither of these acts protects Williamson's Sapsucker habitat, and habitat loss is the main population threat.

The habitat of Williamson's Sapsucker in British Columbia does not receive any sort of consideration under the current (Version 2004) Identified Wildlife Management Strategy (IWMS) of the Forest and Range Practices Act of British Columbia (British Columbia Ministry of Water, Land and Air Protection 2004). A Williamson's Sapsucker species account and habitat measures were prepared for Volume 1 (B.C. Ministry of Forests and B.C. Environment 1999), and again for inclusion in the next volume (which is now called a version because instead of adding to the protections afforded in Volume 1 as originally anticipated, Version 2004 now replaces Volume 1 entirely). However, in neither case was Williamson's Sapsucker included in the final edition.

The current stated objectives of the IWMS (Version 2004) are only to address COSEWIC-listed species as Identified Wildlife to receive any specific habitat protection under the Forest and Range Practices Act. The first volume addressed a wide range of species that required some form of habitat management under timber harvesting and silvicultural schemes, but has been superseded by the second version. Since Williamson's Sapsucker has not been previously assessed by COSEWIC, no protection has been afforded it under the IWMS despite its current assessment within the province of British Columbia by the B.C. Conservation Data Centre (Table 7).

Table 7. Global, national and local status of Williamson's Sapsucker in Canada and the United States based on NatureServe (2004) and B.C. Species and Ecosystem Explorer (2004).

	Taxonomic Unit	Status[1]	Other Status
Global	*Sphyrapicus thyroideus*	G5	
National	"		
Canada	"	N3B	Not yet assessed by COSEWIC
United States	"	N5B, N3N	
State/Province			
British Columbia	*S. t. thyroideus*	S3B	Blue-listed
Washington	"	S4B	
California	"	S3	
Oregon	*S. thyroideus both ssp.*	S4B,S3N	
Nevada	"	S5	
British Columbia	*S. t. nataliae*	S1, S2B	Red-listed
Arizona	"	S4	
Colorado	"	S4B	
Idaho	"	S5B	
Montana	"	S4B	
New Mexico	"	S5B,S5N	
Texas	"	S2N	
Utah	"	S2B	
Wyoming	"	S3B	

[1]1 = Critically imperiled; 2 = Imperiled; 3 = Vulnerable; 4 = Apparently Secure; 5 = Secure.
B suffix indicates breeding season only; N indicates non-breeding season only; no suffix indicates both breeding and non-breeding seasons.

Of the currently known Williamson's Sapsucker nest sites, only two are in provincial protected areas, and neither of these are currently occupied. Some nest sites may receive some protection from timber harvesting if draft Old-Growth Management Areas are established under the Forest and Range Practices Act of B.C. However, these have yet to be implemented, and may only protect five of the approximate 170 total nest sites known. The single currently known nest site of the *nataliae* subspecies is in a municipally-managed park, which does afford some level of habitat protection, but not to the extent of the legislated habitat protection available in Class A provincial parks.

While Williamson's Sapsucker is considered globally secure (G5; Table 7), none of the states or provinces in which *thyroideus* occurs in abundance (British Columbia, Washington, Oregon and California) considers it secure, but list it as either Apparently Secure (S4) or Vulnerable (S3). British Columbia lists the status of *nataliae* as S1,S2, i.e., Critically Imperiled or Imperiled. The states where only *nataliae* breeds have variously assessed the status as S2, S3, S4 or S5, although the states where it is most common (Arizona, Colorado and New Mexico) have listed is as Secure or Apparently Secure.

TECHNICAL SUMMARY

Sphyrapicus thyroideus
Williamson's Sapsucker — Pic de Williamson
Range of Occurrence in Canada: British Columbia

Extent and Area Information	
• *Extent of occurrence (EO)(km²)* Developed from published and unpublished data sources (see Distribution section of Report).	43058 km²
• *Specify trend in EO*	Increased historically, now stable
• *Are there extreme fluctuations in EO?*	No
• *Area of occupancy (AO) (km²)* Based on known habitat use around currently used locations, primarily based on Gyug (unpublished data) and on other published and unpublished sources (see Distribution section of Report), and on 500-m radius to define habitat use around locations with a single known breeding site (not necessarily currently occupied), and an assumption of the existence of undiscovered nest sites outside known Areas of Occupancy that were included in the Total Population estimate.	1016 km²
• *Specify trend in AO*	Unknown, probably decreasing
• *Are there extreme fluctuations in AO?*	No
• *Number of known or inferred current locations*	23 locations 22 *S. t. thyroideus* 1 *S. t. nataliae*
• *Specify trend in #*	Unknown
• *Are there extreme fluctuations in number of locations?*	No
• *Specify trend in area, extent or quality of habitat*	Decreasing from timber harvesting and land clearing
Population Information	
• *Generation time (average age of parents in the population)*	Unknown (minimum of one year to first reproduction)
• *Number of mature individuals*	Estimated 430
• *Total population trend:*	Decreasing
• *% decline over the last/next 10 years or 3 generations.* Habitat loss estimated for Okanagan-Greenwood population Area of Occupancy, which represents about 85% of the Total Population numbers.	Habitat loss estimated at 23% in last 10 years due to timber harvest, and at up to 53% in the next 10 years based on projected timber harvest.
• *Are there extreme fluctuations in number of mature individuals?*	No
• *Is the total population severely fragmented?*	?
• *Specify trend in number of populations*	Increasing historically from 1950 to 1970 but stable since then.
• *Are there extreme fluctuations in number of populations?*	No
List populations with number of mature individuals in each: Okanagan-Greenwood 364; Princeton 20; Merritt 16; Hat Creek 12; Other *thyroideus* 8; *nataliae* 10.	

Threats (actual or imminent threats to populations or habitats)	
Habitat Loss from land clearing and timber harvesting.	
Rescue Effect (immigration from an outside source)	
• *Status of outside population(s)?* **USA**: Arizona (S4), California (S3), Colorado (S4B), Idaho (S5B), Montana (S4B), Nevada (S5), New Mexico (S5B,S5N), Oregon (S4B,S3N), Texas (S2N), Utah (S2B), Washington (S4B), Wyoming (S3B).	
• *Is immigration known or possible?*	Yes
• *Would immigrants be adapted to survive in Canada?*	Yes
• *Is there sufficient habitat for immigrants in Canada?*	No, main threat is habitat loss
• *Is rescue from outside populations likely?*	No
Quantitative Analysis	Not determined
Current Status COSEWIC: Endangered (May 2005) British Columbia: Blue-listed as sensitive or vulnerable (S3B)	

Status and Reasons for Designation

Status: Endangered	**Alpha-numeric code**: A4c, C1
Reasons for Designation: This woodpecker is associated with mature western larch forests in south-central British Columbia. Less than 500 adults breed in Canada. Habitat loss through forest harvest is estimated to have been 23%over the last 10 years and is projected to be about 53% over the next decade.	
Applicability of Criteria **Criterion A** (Declining Total Population): Endangered A4c **Criterion B** (Small Distribution, and Decline or Fluctuation): Threatened B2abiii if one considers the population fragmented (otherwise does not meet criterion) **Criterion C** (Small Total Population Size and Decline): Endangered C1 **Criterion D** (Very Small Population or Restricted Distribution): Threatened D1 **Criterion E** (Quantitative Analysis): Not done	

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