Wildlife Habitat Assessment for WHA 4-108 in Kimberley Nature Park

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Introduction

A Wildlife Habitat Area (WHA 4-108) has been proposed to protect habitat of the endangered Williamson's Sapsucker[1] (WISA), a species known to breed within and adjacent to Kimberley Nature Park (Manley 2005, Ohanjanian et al. 2006, 2007). Within the proposed WHA, treatments are planned to reduce (1) the spread of mountain pine beetles (MPB), (2) forest ingrowth (i.e., dry ecosystem restoration), and (3) forest fire hazard with respect to the community of Kimberley (i.e., forest-urban interface fire prevention). Based on a stand structure inventory, the WHA has been rated as having a "significant crown fire hazard" (Gray 2007). Due to provincial hazard tree safety procedures (Province of BC 2006), these treatments, although necessary for improving forest ecosystem health and reducing the probability of catastrophic fires, are potentially incompatible with retention of dead and defective live trees that provide essential habitat elements for WISA. The goal of this project is therefore to recommend actions that protect WISA habitat during any future fuel and MPB treatments.

Specific objectives and tasks of this project include:

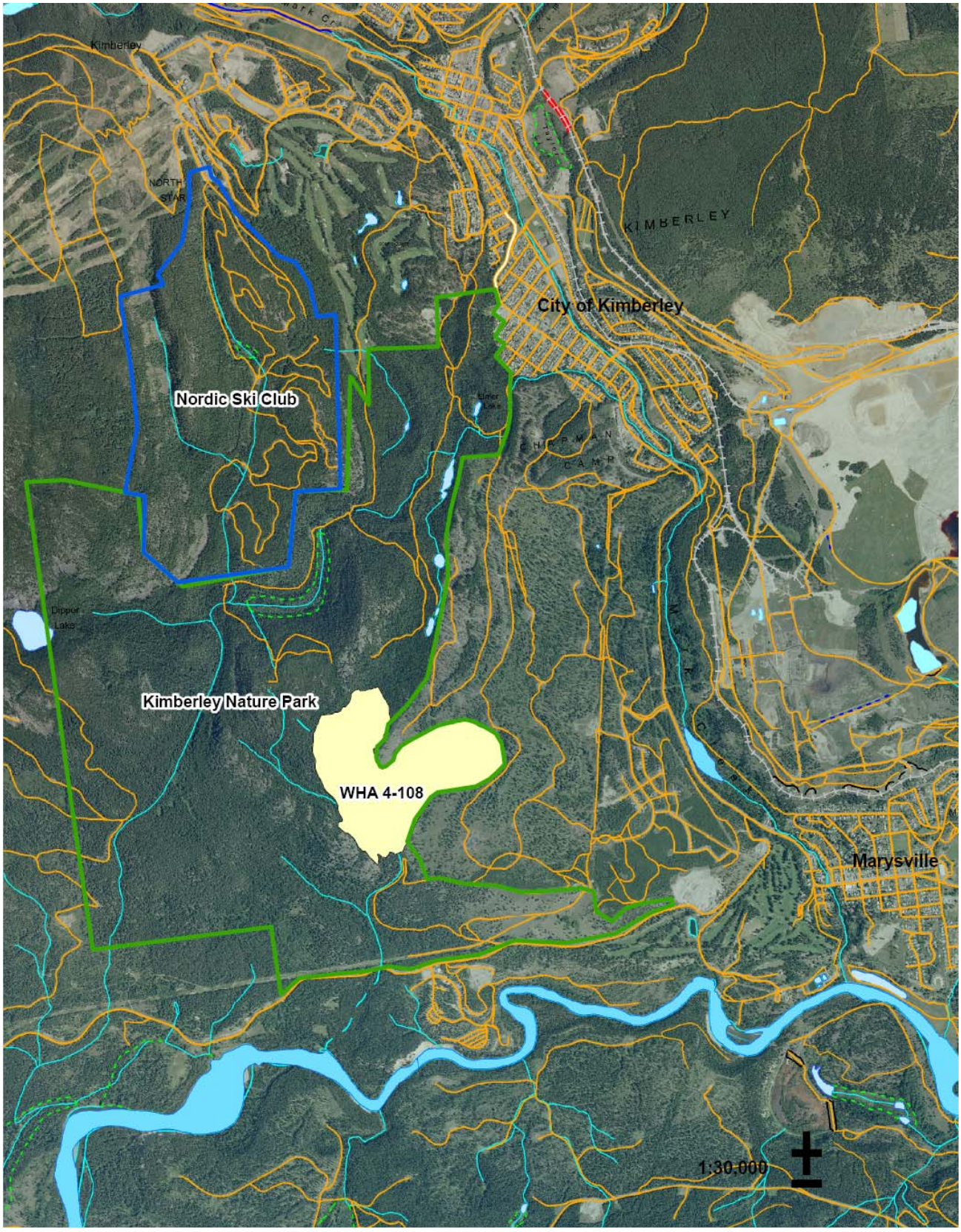
1. Locate and record GPS coordinates for potential nest trees. For each tree, record species, wildlife tree (WT) class, presence of cavities, DBH class estimate, height estimate and estimated size of No-Work Zones required, based on visible defects. Record presence of basal scars that may make the tree more susceptible to damage during prescribed burning.
2. Locate and record GPS coordinates for any areas with high concentration of valuable CWD.
3. Characterize Red-napped Sapsucker use of the proposed WHA area.
4. Determine general cavity use within WHA.

Project Area

The proposed WHA is 72.8 ha in size and located in the southeast corner of Kimberley Nature Park (Figure 1). Much of the area surrounding the WHA has been logged and some cleared areas east of the WHA are intended for residential developments (Kent Goodwin, pers. comm.). The WHA is part of the Interior Douglas-fir (IDFdm2) ecosystem, a dry ecosystem characterized, under natural fire regimes, by frequent, low-intensity fires. Such a fire regime creates a relatively open stand structure, primarily consisting of large-sized live and dead trees with relatively high fire resistance. Long-term fire suppression however has resulted in an excessively dense stand structure in the area which compromises ecosystem health and may lead to fire of unusually high intensity. Tree species composition within the WHA consists primarily of Douglas-fir, ponderosa pine, western larch, lodgepole pine, trembling aspen, and paper birch. Within and adjacent to Kimberley Nature Park, WISA have been found nesting exclusively in western larch (Manley 2005; Ohanjanian et al. 2006, 2007).

[1] Scientific names of species are provided in Appendix 1.

Figure 1. Location of WHA 4-108 within Kimberley Nature Park and surrounding landscape.



Methods

I conducted the assessment from November 24-28, 2007 by walking transects between previously established plot locations. I recorded the location of potential WISA nest trees, other valuable wildlife trees and patches of CWD, using a handheld Global Positioning System (GPS) unit (Garmin eTrex Personal Navigator; accuracy within 10 m). I collected data on each tree as outlined in the aforementioned project objectives. Although I noted requirements for No-Work Zones (NWZs) in case of obvious tree defects, no detailed hazard tree assessment was possible during this project; therefore, the type, size, and shape of NWZs are not provided for each focal tree. I also noted presence of cavity-nesting species and photographed most habitat features on the site.

Results & Discussion

All data collected and photographs taken are provided digitally in the attached MS Excel and photograph files. Overall, I identified and recorded a total of 46 potential or recruitment nest trees, 20 other valuable wildlife trees, and eight CWD patches. Photos taken (and annotated in an Excel worksheet) also include examples of stand structure within the WHA and pertinent examples of stand and tree-related features that have management implications. Some photographs are embedded in this section to illustrate habitat features and management concepts.

Potential WISA Nest Trees

Based on previous experience with WISA nest tree selection (Steeger 2006, 2007), I located 43 larch, two aspen, and one ponderosa pine that best fit the characteristics of suitable nest trees, both currently and as recruitment nest trees (Table 1, Photos 1-3). Some selected trees are examples for groups of similar trees, although the recorded trees were the most suitable of every group. In general, I identified two types of nest trees: currently suitable and recruitment trees. Most of the identified trees were alive but defective (WT Class 2; Appendix 2), a few were dead but relatively sound and stable (WT Class 3-5). Approximately one third of the identified potential nest trees showed evidence of previous cavity nesting, with some nest cavities likely being those of WISA. Most trees fell within diameter (dbh) class 5 (60-70 cm) or 6 (70-80 cm) while three trees were over 100 cm dbh. The largest western larch located was 126 cm dbh, which gives an indication of the growth potential for larch on this site. Most potential nest trees fell within height class 6 (30-35 m). The relatively tall height of WISA nest trees has implications for hazard tree safety procedures, as required NWZs may cover considerable areas which may not be available for fuel and MPB treatments.

Photo 1. Group of potential larch nest trees.

Photo 2. Potential WISA tree with several old nest cavities in mid section of stem.

Photo 3. The broken-top larch in the centre background is an example of a suitable WISA nest tree.

By definition a WT Class 2 tree is alive but defective. Within the WHA, the most prominent tree defects detected through visual assessments were basal scars (mostly from past fires; Photo 4) and some butt rot, stem damage, and dead or broken tops. Depending on the severity of these defects and the treatment considered in the surrounding area (i.e. raking, piling, pruning, brushing, juvenile spacing, or thinning, and potentially prescribed burns), trees may not pass the safety criteria as per standards of the provincial Wildlife/Danger Tree Assessor's Course (Province of BC 2006). If trees do not pass the criteria for safe work conditions, usually three options are available: remove hazard (e.g., a large hazardous limb), remove entire tree, or establish a NWZ around tree, to prevent forest workers from being exposed to the hazards. As discussed below, this concept does not work for the WHA 4-108, and alternative measures should be explored.

Photo 4. Basal scars are a common feature on veteran larch in the WHA.

Coarse Woody Debris Patches

CWD patches provide substrates for establishment of ant colonies and, because WISA nestlings are primarily fed ants, may provide important habitat elements for WISA. Two types of CWD patches are on site: (1) areas of blowdown, consisting mostly of small to medium-sized pine (CWD Patch #1; Table 2; Photo 5) and (2) areas of relatively high concentration of large-sized Fd, Py, and Lw logs in various stages of decay (Photo 6-7). Currently and over the short term, only the latter are likely contributing substrates for ant colonies while the blowdown patches contain high ground fuel loads that increase fire hazard in the area. In general, due to historic fires, MPB mortality, some windthrow events, and patchy presence of *Armillaria* root rot, a relatively high amount of CWD is currently present in the WHA. However, some patches clearly contain CWD pieces (and sometimes stumps from former high grading) of high ecological value, some of which were identified and GPS located (Table 2).

Table 1. Coarse Woody Debris patches identified and located within WHA 4-108.

CWD Patch #	UTM-Northing	UTN-Easting	Approximate Size	Comments
1	5499720	572239	0.5 ha	Pl blowdown; questionable habitat quality; excessive ground fuel
2	5499853	572225	0.2 ha	large cut Py and other larger, older pieces
3	5499759	571894	0.5 ha	large old stumps and CWD
4	5499655	571983	0.5 ha	large old stumps and CWD
5	5499663	571941	0.2 ha	large old stumps and CWD
6	5499733	572479	0.2 ha	few large old Py pieces
7	5499875	572459	0.2 ha	large and medium-sized pieces
8	5500152	572078	0.7+ ha	abundant very large CWD pieces

Photo 5. CWD patch #1: pine blowdown is generally not suitable as ant colony substrates.

Photo 6. CWD patch # 5: large CWD pieces have highest habitat value.

Photo 7. CWD patch #6: hollow pieces are especially valuable for both vertebrates and invertebrates.

Table 2. Potential WISA nest trees and their characteristics identified and located within WHA 4-108.

Tree #	UTM - Northing	UTM - Easting	Species	WT Class	# Nest Cavities	DBH Class	Height Class	Defect	Comments
1	5499503	572211	Lw	2	2	5	6	BS, SD	may need NWZ, WTP for NT#1-5
2	5499503	572211	Lw	2	4	5	6	BS, BT, SD	may need NWZ, WTP for NT#1-5
3	5499503	572211	Lw	2	0	7	8	DT	may need NWZ, WTP for NT#1-5
4	5499503	572211	Lw	2	0	5	6	DT	may need NWZ, WTP for NT#1-5
5	5499503	572260	Lw	2	0	5	6	DT	may need NWZ, WTP for NT#1-5
6	5499582	572211	Lw	2	0	6	7	DT	recruitment nest tree
7	5499791	571978	Lw	2	0	6	6	DT	recruitment nest tree
8	5499751	571955	Lw	2	0	6	7	DT, BS	recruitment nest tree
9	5499825	572130	Lw	2	8	2	2	BT	previous WISA nest tree
10	5499783	572153	Lw	1	0	6	7	None	NWZ not necessary
11	5499762	572127	Lw	3	0	3	3	BT, BS	NWZ not necessary; very good wildlife tree
12	5499793	572109	Lw	3	15	5	6	BT	NWZ, semicircle due to lean
13	5499622	572110	Lw	2	20	8	5	DT, SD, BS	may need NWZ; currently suitable WISA nest tree
14	5499500	572270	Py	2	1	7	5	DT, BS	may need NWZ
15	5499694	572485	Lw	2	0	6	6	DT, SD	may need NWZ
16	5499859	572494	Lw	2	0	5	6	DT, BS	may need NWZ
17	5499842	572397	Lw	2	0	6	6	DT, BS	Lw beetle attack; no NWZ necessary
18	5499807	572417	Lw	2	7	5	6	DT, SD	NWZ; currently suitable WISA nest tree; protect trees in WTP
19	5500069	572713	At	2	5	3	6	DT, SD	NWZ; currently suitable WISA nest tree; protect trees in WTP
20	5499934	572765	Lw	3	0	3	6	ST, BR	may need NWZ
21	5499939	572828	Lw	5	10	7	6	SD, BR	may need NWZ due to butt rot
22	5499998	572846	Lw	2	10	5	6	DT, SD	currently suitable WISA nest tree; NWZ not necessary
23	5499998	572846	Lw	2	0	6	6	DT, BS	NWZ not necessary

Diameter classes: 1=20-30, 2=30-40, 3=40-50, 4=50-60, 5=60-70, 6=70-80, 7=80-90, 8=90-100, 9>100;
Height classes: 1=<10, 2=10-15, 3=15-20, 4=20-25, 5=25-30, 6=30-35, 7=35-40, 8=40-45,
Tree defects: DT = Dead top; BT=broken top/trunk, FT = forked top, MC=mushroom/conk, SD=stem damage, BS=basal scar, BR = butt rot

Table 1. …continued

Tree #	UTM - Northing	UTM - Easting	Species	WT Class	# Nest Cavities	DBH Class	Height Class	Defect	Comments
24	5499669	572571	Lw	2	0	9	7	DT	NWZ not necessary
25	5499563	572288	Lw	4	1	5	6	SD, BS	currently suitable WISA nest tree; NWZ necessary due to hazardous top
26	5499713	572473	Lw	2	0	4	7	DT, BS	may need NWZ for hazardous top; recruitment nest tree
27	5499701	572443	Lw	3	0	3	6	DT	may need NWZ for hazardous top; recruitment nest tree
28	5499701	572443	Lw	2	0	3	6	DT	may need NWZ for hazardous top; recruitment nest tree
29	5499800	572425	Lw	2	0	7	8	DT, BS	important WISA tree; create WTP for NT#29-31 - good habitat
30	5499800	572425	Lw	2	0	6	8	DT	important WISA tree; create WTP for NT#29-31 - good habitat
31	5499800	572425	Lw	2	4	6	8	DT, BS	important WISA tree; create WTP for NT#29-31 - good habitat
32	5499894	572452	Lw	2	0	8	7	BS	important WISA tree; NWZ likely not necessary
33	5499921	572428	Lw	2	0	9	5	DT, BS, FT	NWZ required; semicircular due to lean
34	5499966	572141	At	2	4	3	5	SD	tree located in wetland; PIWO cavity start; potentially also suitable for WISA
35	5500042	572090	Lw	2	0	9	6	DT, BS	important WISA tree; good habitat at north end of wetland patch
36	5500343	572113	Lw	2	1	6	6	DT, CM	may need NWZ due to stem rot; just outside WHA boundary but could affect work area
37	5500252	572225	Lw	2	1	6	6	DT, BS	good anchor tree for WTP
38	5500197	572231	Lw	2	5	6	6	BT, SD	2007 WISA nest tree; create WTP
39	5500099	572181	Lw	2	0	6	6	DT, BS	located adjacent to trail; may require NWZ for forestry operations
40	5500073	572165	Lw	2	0	6	6	BT, BS	located adjacent to trail; may require NWZ for forestry operations
41	5500124	572149	Lw	2	0	5	7	DT	important WISA tree; create WTP for NT#40-42; WTP would benefit from thinning
42	5500108	572126	Lw	2	0	6	6	DT	important WISA tree; create WTP for NT#40-42; WTP would benefit from thinning
43	5500152	572078	Lw	2	3	7	7	DT, SD	currently suitable for WISA nesting; cavity could be WISA; NWZ for hazardous top
44	5500027	571866	Lw	2	0	6	6	DT	NWZ likely not required
45	5500020	571945	Lw	2	0	6	3	BT	NWZ likely not required but other pot WISA trees nearby; protect patch
46	5500064	571897	Lw	2	0	6	4	BT, SD, BS	NWZ required but tree relatively small

From a management perspective, large-sized CWD pieces and stumps will not likely be affected by prescribed fires if ground fuel conditions are prepared such as to minimize damage to current ant habitat. Accordingly, the identified patches may be used as a guideline for general CWD retention on site. Also, an assessment of ant habitat is better conducted in summer when ants are active. This winter assessment is therefore preliminary and requires follow up surveys during summer months.

Other Valuable Wildlife Trees

Evidence of Red-naped Sapsuckers - Red-naped Sapsuckers (RNSA) belong to the same genus as WISA and may be a competitor for limited resources (Environment Canada 2007), thereby influencing the population size of WISA where these two species coexist. The Excel worksheet "Other Valuable WTs" lists several nest and sap trees that indicate use of the site by RNSA (see also Table 3 and Photo 8). Areas with evidence of RNSA use are primarily wetland or riparian types, as RNSA are often associated with aspen (for nesting), and birch, willow, alder and other broadleaf species for sap sucking. Based on the evidence observed during the site visit, RNSA do not appear to be very abundant within the WHA. Note however that both sapsucker species are migratory and were not present during the assessment.

WISA Sap Trees – A total of eight WISA sap trees were detected within the WHA (Table 3), all of which were medium-sized, apparently healthy Fd (Photo 9). These trees showed evidence of both old and recent (possibly 2007) sap wells. Based on personal experience with both sapsucker species, I assume that Fd with sap wells are WISA sap trees while birch, cottonwood, alder, and willow with sap wells are RNSA sap trees. Again, a site assessment in summer would confirm this assumption.

Veteran Wildlife Trees – Large-sized veteran snags have multiple ecological values for wildlife tree users (e.g. nesting, roosting, perching, foraging, and drumming). Such trees occur within the WHA, and several examples of high value snags are listed in Table 3. The data in Table 3 indicate that veteran snags (Lw and Py) have more wood decay (WT class 4-7), are of relatively large diameter (DBH class 6-9) but medium height (height class 4-7) (Photo 10), and most contain multiple former nest cavities (up to 30). While these trees generally have high habitat value (including for WISA via provisioning of substrates for ant colonies), retaining them during forestry operations will likely require establishment of NWZs, depending on treatment requirements within the surrounding stand.

Photo 8. Aspen patch with Red-naped Sapsucker sign.

Photo 9. The Douglas-fir in the centre of photo has sign of recent WISA sap wells.

Photo 10. WT #16 in Table 3 - Veteran ponderosa pine snag.

Table 3. Valuable wildlife trees identified and located within WHA 4-108.

WT #	WT Type	UTM-Northing	UTN-Easting	Species	WT Class	# Nest Cavities	DBH Class	Height Class	Defects	Comments
1	Nest tree	5499323	572164	At	2	4	1	5	SD	potentially RNSA nest tree
2	RNSA sap trees	5499648	572252	Ep (5)	2 to 4	5 x 2	1 and 2	2 and 3	DT, SD	patch of RNSA sap trees
3	Forage tree	5499648	572252	Lw	4	0	3	5	BS	woodpecker forage tree
4	Lw vet	5499637	571944	Lw	7	30	9	4	SD, BS	old Lw vet; generally of high WT value
5	WISA sap tree	5499812	572134	Fd	1	0	3	5	none	patch of WISA sap trees; recently used
6	WISA sap tree	5499795	572143	Fd	1	0	4	5	none	patch of WISA sap trees; recently used
7	WISA sap tree	5499776	572148	Fd	1	0	3	4	none	patch of WISA sap trees; recently used
8	RNSA sap tree	5499436	572176	Alder	1	0	1	1	none	old RNSA use in riparian type
9	Py vet	5499452	572242	Py	2	10	8	7	DT, SD	PIWO feeding; marked with WT sign
10	Py vet	5499535	572278	Py	6	30	8	5	SD, BS	butt and stem rot; monitor tree with respect to trail
11	Nest tree	5499516	572394	Py	6	5	2	2	SD	old but valuable; other Py and At with cavities; protect patch
12	WISA sap tree	5500125	572105	Fd	1	0	2	5	none	mostly old but a few fresh sap wells
13	Open nest	5499846	572041	Se	2	0	4	4	SD	possible open nest on broom; good WTP with WT#13-15
14	Lw vet	5499846	572041	Lw	6	0	6	4	SD	too old for WISA nesting but valuable WT
15	Lw vet	5499846	572041	Lw	5	4	7	6	SD	too old for WISA nesting but valuable WT
16	Py vet	5499742	572428	Py	6	5	6	4	SD, BR	too old for WISA nesting but valuable WT
17	WISA sap tree	5499875	572459	Fd	1	0	2	5	none	protect sap trees in WTP around plot 26
18	WISA sap tree	5499875	572459	Fd	1	0	3	5	none	protect sap trees in WTP around plot 26
19	WISA sap tree	5500319	572276	Fd	1	0	2	5	none	possibly 2007 sap wells
20	WISA sap tree	5500314	572262	Fd	1	0	2	5	none	possibly 2007 sap wells

Cavity Nesters of the WHA and Kimberley Nature Park

A total of eight primary cavity nesters used the WHA during the assessment period in late November: Black-capped and Mountain Chickadee; Red-breasted and White-breasted Nuthatch; Three-toed, Hairy and Pileated Woodpecker, and Northern Flicker. Three-toed Woodpeckers were feeding on MPB larvae and were very abundant in the WHA. Hairy Woodpeckers were foraging on dead Lw and Fd, presumably feeding on woodboring beetle larvae (Photo 11). Both of these woodpeckers are species known to contribute to the regulation of endemic bark beetle populations (Machmer & Steeger 1995). Red squirrels are also abundant in the WHA and are secondary cavity users for nesting and shelter. Other cavity nesters known to occur in Kimberley Nature Park include Barred and Northern Pygmy-Owl, Tree Swallow, Chestnut-backed Chickadee, Brown Creeper, and Mountain and Western Bluebird (KNP Bird Checklist 2004). Overall, I noted much evidence of cavity nesting during the assessment, based on the presence of numerous nest cavities in dead and live defective trees (especially Py, Lw, Fd, and At). In general, the WHA currently provides excellent habitat conditions for cavity-nesting species, including WISA.

With respect to WISA habitat, it is worth noting that Pileated Woodpecker feeding sign was observed throughout the WHA (Photos 12-13). Pileated Woodpeckers almost exclusively feed on ants and their feeding excavations indicate where current and former ant colonies are located. Retention of trees containing ant colonies will be important for maintaining habitat quality for WISA during the nesting period.

Photo 11. Hairy Woodpecker feeding on wood-boring beetle larvae in larch.

Photo 12. Pileated Woodpecker ant foraging excavations in basal scar of larch.

Photo 13. Pileated Woodpecker ant foraging excavations on base of larch.

Habitat Protection and Treatment Options

WISA Habitat - WISA habitat structure and elements in active East Kootenay territories have been summarized by Ohanjanian et al. (2006, 2007) and Gyug et al. (2007a, b, c). Aside from retention of known nest and sap trees in and adjacent to the WHA 4-108 (Ohanjanian et al 2007; this study), several metrics and inventory results from the East Kootenay WISA population are useful for WISA-specific management of the WHA (Table 4). The values for WHA 4-108 in Table 4 are either based on this study or a subset of the East Kootenay-wide inventory. Overall, the assessment of habitat structure and elements of the WHA indicates high habitat suitability for WISA. Considering the function of WHAs as a tool for protection of habitat of *species at risk* and the generally degraded habitat of the endangered WISA in the East Kootenay (and elsewhere in BC), no treatments should be conducted in the WHA that compromise current and future suitability of WISA habitat.

MPB and Fuel Treatments - Some areas of the WHA clearly require treatments such as removal of MPB-attacked Pl and fuel reduction, to reduce the spread of MPB and the risk of catastrophic fire in the vicinity of Kimberley. Furthermore, treatments would also restore the more typical stand structure of dry, fire-maintained forests. Treatment options include ground fuel reduction (e.g., raking, piling, and pile burning), ladder fuel reduction (e.g., pruning, brushing, slashing, juvenile spacing), and crown cover reduction (i.e.,

stand thinning). As the natural stand structure of dry forests (especially if terrain aspect is generally south facing) is characterized by a relatively low density of large-sized trees, a diameter limit will have to be applied for treatments involving tree cutting.

The Management Conundrum – Retention of the large-sized Lw and other valuable wildlife trees is critical for maintaining habitat suitability for WISA. However, most of the trees identified have defects (for example Lw with > 25% stem damage on basal scars) that, according to current hazard tree standards established by the provincial Wildlife Tree Committee and disseminated via the Wildlife/Danger Tree Assessor's Course (Province of BC 2006), may not allow treatments (pruning of stem > 20 cm dbh, slashing, spacing, tree falling and yarding) in the vicinity of these leave trees without establishment of NWZs. Due to the nature of the defects (e.g., basal scars) and the distribution and tallness of the WISA habitat trees, these NWZs would remove so much treatment area that MPB, fuel reduction, and ecosystem restoration treatments are hardly feasible. This situation may cause further spread of MPB and increase in the risk of catastrophic fire for the community of Kimberley.

In the author's opinion, this forest management conundrum is best resolved via a variance to current WorkSafe BC regulations. The variance would permit workers to operate near suspect trees, if the difference in diameter between the intended leave tree and the trees, regen, brush, or logs intended for removal is sufficiently large (Photo 12) such that ground disturbance caused by the work activity (tree felling) will not compromise the safety of workers (i.e., potentially causing the leave tree to break or fall). Additionally hazard spotters may be employed to further increase worker safety. Such a variance would be required because the procedures of the Wildlife/Danger Tree Assessor's Course do not differentiate between hazard trees of different diameters and, as a result, many large-sized NWZs would have to be established.

Photo 12. Despite the large scar on the potential WISA nest tree, felling of the small trees in its vicinity would unlikely pose a safety hazard as the targeted leave tree is unlikely to fall or break during the work activities.

Table 4. Selected habitat attributes of Williamson's Sapsucker breeding territories in the East Kootenay and WHA 4-108, and post-treatment targets for stand structure components.

Habitat Attribute	East Kootenay Inventory	WHA 4-108 (and adjacent area)
Nest tree species	Lw (78%), Fd (17%), and Py (6%); n=18	Lw (75%); Py (25%)
Average dbh of nest trees	58 cm (SD=19.5, n=18)	53 cm (SD=18.5, n=4)
Average height of nest trees	12 m (SD=4.9, n=18)	22 m (SD=11, n=4)
WT Class	WTC 1=1, WTC 2=13, WTC 3=4 (n=18)	WTC 2=2, WTC 3=2 (n=4)
Densities of potentially suitable nest trees (other than the current nest tree) in the hectare surrounding the nest tree and in the remainder of the territory	1.52 and 0.94 / ha, respectively	0.63 / ha (46 identified within 72.8 ha of WHA; this study). Since more potential nest trees are likely on site, the WHA currently contains a density of potential nest trees that falls well within the known suitable range of 0.5-1.5 / ha within active WISA territories (Guyg et al. 2007b)
Sap tree species	No information for East Kootenay. (in Okanagan: 88% Fd, n=68, and Western Region 75% Fd, n=24)	Fd (100%, n=8)
Average dbh of Fd sap trees	36.9 cm in Okanagan, 37.2 in Western Region	41.3 cm (average of dbh class midpoints: class 2 (30-40 cm, n=4), class 3 (40-50 cm, n=3), class 4 (50-60, n=1)

Recommendations

1. Maintenance of WISA habitat elements should have priority over other management objectives.

2. Maintain all 46 potential nest trees and the 20 other valuable wildlife trees identified in this assessment.

3. Maintain valuable CWD pieces (i.e., large-sized pieces in various stages of decay that currently or potentially support ant colonies), using the identified CWD patches as guidance.

4. As part of the post-treatment live tree density targets, maintain healthy or live defective (WT class 1 and 2) Douglas-fir > 30 cm dbh as WISA sap tree resources. This may be achieved through the diameter limit prescription.

5. If MPB, fuel, and ecosystem restoration treatments are to be applied in the WHA, a variance to current WorkSafe BC regulations may be considered to increase availability of treatable area.

6. Without a WorkSafe BC variance, the following step-wise procedure may be implemented: (1) conduct a "visual" or, if required, "detailed" hazard tree assessment according to provincial standards, (2) establish NWZs around all essential WISA trees (starting with the trees identified in this assessment; see Table 1 and 3) that do not pass the standard criteria for safe work conditions, (3) remove all non-target hazard trees located within NWZ that could reach the work area, and (4) apply treatment to areas outside of NWZs, in areas where dead and defective trees passed the safety criteria, or in areas where no valuable WISA trees have been identified. Note that timing of treatments has to be such that no intervening winter or major disturbance occurs between the hazard tree assessment and treatment activities, otherwise the hazard tree assessment has to be repeated.

7. Select forestry operators with sufficient experience such that they are able to closely adhere to the developed treatment prescriptions. In addition, monitor treatment during operations.

8. Avoid any treatments during the WISA breeding season (early April to mid August).

9. Conduct further surveys for WISA and other cavity nesters during the breeding season and identify active nest trees, sap trees, and ant colony trees and logs for protection.

10. With respect to MPB treatments, retain some green-attack and healthy Pl to maintain habitat quality for Three-toed Woodpeckers, as these and other MPB predators are contributing to the regulation of local beetle population levels.

11. Aim for the following post-treatment average stand structure characteristics:

    - Live stems/ha = 180-200 with 10-15% > 50 cm dbh, diameter limit for tree removal = 30 cm;
    - Snags/ha = 8 (preferably large-sized snags);
    - Basal area = 25 m^2/ha; and
    - Volume of logs (> 40 cm dia) = 30 m^3/ha.

    These values fall within the range of those reported for some of the most productive WISA benchmark habitats found in other regions of BC (C. Steeger, L. Gyug; unpubl. data; Appendix 3). Although no benchmark habitats have been identified for the East Kootenay population, these values could be used as targets for the WHA 4-108. However, if stand structure treatments within WHA 4-

108 cannot be conducted without compromising current WISA habitat trees, no treatment may be better than removing critical nest trees.

12. Communicate and collaborate with the Kimberley Nature Park Society. The society frequently uses and promotes use of the Park including the WHA. Development of more trails than currently present within the WHA may need to be discouraged. Heavy use of trails (especially with dogs) in the vicinity of active WISA nests should also be discouraged during the breeding season (early April – early July).

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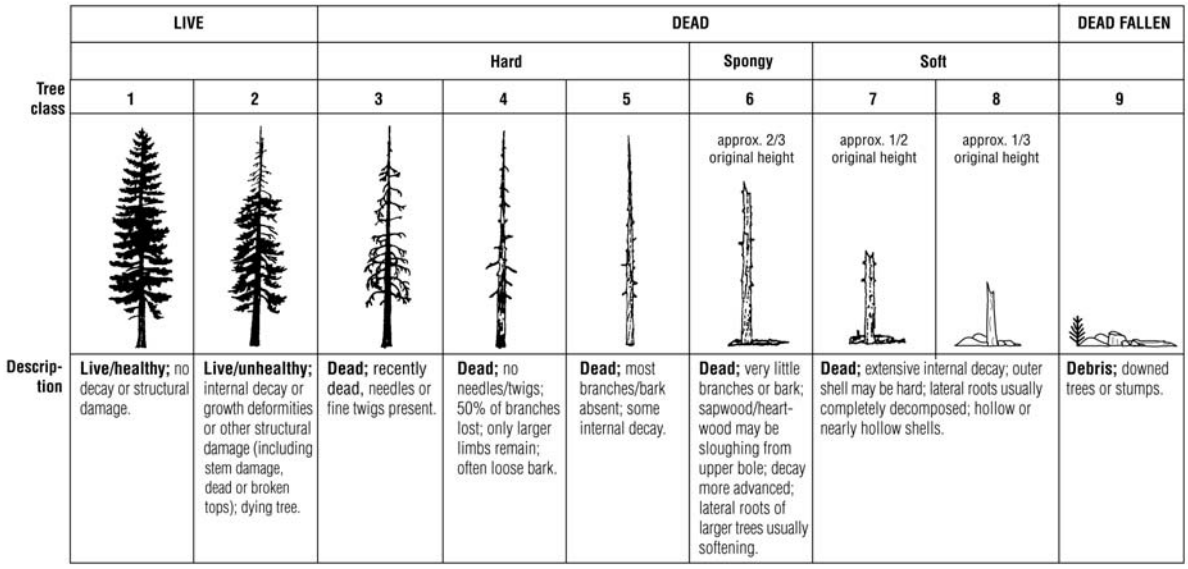
Appendix 1. Common and scientific names of species mentioned in the report.

Common Name	**Scientific Name**
Black-capped Chickadee	*Poecile atricapilla*
Hairy Woodpecker	*Picoides villosus*
Northern Flicker	*Colaptes auratus*
Pileated Woodpecker	*Dryocopus pileatus*
Red-breasted Nuthatch	*Sitta canadensis*
Mountain Chickadee	*Poecile gambeli*
Three-toed Woodpecker	*Picoides tridactylus*
White-breasted Nuthatch	*Sitta carolinensis*
Red-naped Sapsuckers	*Sphyrapicus nuchalis*
Williamson's Sapsucker	*Sphyrapicus thyroideus*
Barred Owl	*Strix varia*
Northern Pygmy-Owl	*Glaucidium gnoma*
Tree Swallow	*Tachycineta bicolor*
Downy Woodpecker	*Picoides pubescens*
Western Bluebird	*Sialia mexicana*
Mountain Bluebird	*Sialia currucoides*
Chestnut-backed Chickadee	*Poecile rufescens*
Brown Creeper	*Certhia americana*
Red Squirrel	*Tamiasciurus hudsonicus*
Mountain pine beetle	*Dendroctonus ponderosae*
Western larch	*Larix occidentalis*
Douglas-fir	*Pseudotsuga menziesii*
Ponderosa pine	*Pinus ponderosae*
Lodgepole pine	*Pinus contorta*
Engelmann spruce	*Picea engelmanii*
Trembling aspen	*Populus tremuloides*
Paper birch	*Betula papyrifera*
Alder	*Alnus sp.*

Appendix 2. Wildlife tree classification system.



Appendix 3. Habitat element values and WISA nest densities of three benchmark habitats from the Okanagan and Boundary regions (L.Gyug, C Steeger, unpubl. data).

Census Area / Habitat Element	Okanagan Falls Okanagan Region	Woodlot 411 Boundary Region	Lehman Springs Boundary Region
Nest Density (# nests/km2)	3.1	0.9	16.7
Basal Area (m2/ha)	36.5	18.1	27.8
Trees >57cm dbh (stems/ha)	35	2.2	30
Trees 23-57cm dbh (stems/ha)	108	147	151
Snags (stems/ha)	11.2	4.9	7.1
Volume of Logs (>22cm dia)(m3/ha)	54.7	18.7	32.4