

Assessment of Williamson's Sapsucker Habitat Suitability Models in B.C. and Recommendations for Management in the East Kootenay

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SUMMARY

Williamson's Sapsucker call playbacks in 2010 provided the data to test the habitat suitability models for the West, Okanagan-Boundary and East Kootenay regions. Relative density in the Moderate, Low and Very Low suitability habitats in the West and Okanagan-Boundary matched the predictions, and those models were considered to be reliable for application to management of WISA habitat in those regions. Relative densities in the East Kootenay did not match the model predictions, and the model was not considered reliable. The suitability models are based mainly on predictions of the presence and abundance of suitable nest trees. In the East Kootenay, the base coverage (VRI), even with additional aerial photo interpretation, was not sufficiently detailed to allow this prediction to be made reliably. I recommend that stands to be managed for Williamson's Sapsucker in the East Kootenay be selected based on field reconnaissance where suitable nest tree densities are $>0.25/\text{ha}$. In the East Kootenay, I recommend a post-hoc contrast of tree sizes and densities in occupied bvs unoccupied harvested sites (seed tree cuts, clearcuts with reserves, and partial cuts) to determine the timber harvest prescriptions that have provided suitable breeding sites for Williamson's Sapsucker.

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INTRODUCTION

Baseline population monitoring in support of the Williamson's Sapsucker (WISA) Adaptive Monitoring Framework (AMF) (Marmorek and Pickard 2010) was conducted between May 20 and June 20 2010 using call playback methods. The call playback (CPB) points were selected randomly from three habitat suitability strata (Moderate, Low, and Very Low) in each of three Areas of Occupancy (West, Okanagan-Boundary, East Kootenay) based on the habitat suitability mapping completed 2009-2010 (Gyug 2009a, 2010a, 2010b, 2010c).

In the Okanagan-Boundary, the Moderate habitat suitability stratum included minor amounts of High and Moderately High suitability habitat because these polygons were too small in area to be sampled as a separate stratum. The suitability mapping was based primarily on Vegetation Resource Inventory/Forest Cover spatial files and the associated databases for each polygon, with adjustments made from stereo aerial photo interpretation. At each CPB point a simple habitat protocol developed by members of the WISA Recovery Team was used to collect reconnaissance-level habitat data to help evaluate habitat suitability model performance.

The baseline monitoring was funded by Environment Canada, Canadian Wildlife Service with the work completed by three contractors: Kestrel Consulting in the West (Gill 2010), Pandion Ecological Services in the Okanagan-Boundary (Steege 2010), and Penny Ohanjanian in the East Kootenay (Ohanjanian 2010). The monitoring portion of that work including analysis of detection rates and assessment of sampling procedures will be described elsewhere (Pickard and Ainsworth, in preparation).

The purpose of this analysis was to assess the reliability of the suitability mapping firstly by examining relative density (detection rates) for each habitat strata and each region, and secondly, by comparing the reconnaissance-level habitat data collected in the field at each positive detection point to the suitability mapping.

METHODS

Relative density by habitat stratum was calculated to assess the reliability of the suitability mapping. I calculated relative densities (detections/100 CPB points) using the "first" call playbacks at randomly selected points, then using the randomly selected points where three repeat call playbacks in total had been done, and then using the points where extended call playbacks had been done. Each CPB visit to a site consisted of one minute of silent listening, three broadcasts of a Williamson's Sapsucker drum and call combination repeated three times over the space of about 1.5 min in three directions, and then a silent listening period for the remainder of the total 5 min period. Detections were considered to be "1" for each adult detected, or each pair of adults (male and female). Where two adults were detected in close proximity to each other, but both were not necessarily seen, they were assumed to be a pair if no antagonistic interactions were noted. The fit of the relative densities of 2010 were compared to the expectations of densities for each stratum compared to benchmark densities.

Preliminary analyses of the reconnaissance-level habitat data at points where WISA were detected were done to compare the predictions of the models to the habitat found at the sites. Habitat data collected at each CPB point in 2010 included a listing of the three most abundant tree species, the main canopy height (0-5 m, 5-10 m, 10-20 m, >20 m), the presence of any trees >57-cm diameter-at-breast-height (dbh) within the ha (58-m radius) around the CPB point, and a generalized description of habitat (mature forest, mature forest with previous harvesting as evidenced by very old stumps, burn, clearcut, clearcut with reserves, seed tree cut, partial cut or other). For each point, I compared the field habitat data to the VRI attributes of the polygon containing the point to see if they matched, or if there was a mismatch.

An additional analysis was done for all CPB points in each region for veteran or very large trees, because the assumption of their presence based on VRI stand attributes was one of the key factors used to model WISA habitat suitability. The presence and density of very large trees is assumed to reflect suitable nest tree density.

Additional habitat analyses were done for all 135 CPB points for the East Kootenay because initial review comparing the sampling results to the suitability modeling indicated the modeling did not appear reliable. The habitat model was assessed and recommendations made to revise or replace the model.

RESULTS AND DISCUSSION

Relative Density

Relative densities by strata in the West and Okanagan-Boundary regions were in the order expected, i.e., highest in Moderate, lower in Low, and absent from Very Low (Table 1). Relative densities in the East Kootenay did not match the expectations of the model with none found in the Moderate strata, and they were only rarely detected on any CPB points. Relative densities at repeat and extended points in each strata were consistent with the first visits in each stratum in the Okanagan-Boundary and the West. Not enough repeat visits were done in the Moderate and Very Low strata in the East Kootenay to make any conclusions about relative density in those strata.

Relative densities based on three visits to a site were two to three times higher than on just one visit, indicating detectability may be in the range of 33-50% on just one visit in the time period when these were done (late May to early/mid June). Relative densities at extended CPB points were very similar to just the first visit, indicating that extending the CPB period did not result in more detections.

Table 1. Relative density of Williamson's Sapsucker based on detections at call-playback (CPB) points by region and habitat suitability strata, 2010. Repeat CPB points were visited three times in total in the space of one week with the site considered occupied if WISA were present on any one of the three visits. Extended CPB points were extended by 10 minutes after the first 5 minute CPB.

	First CPB Points			Repeat CPB Points			Extended CPB Points		
	Points	WISA	WISA/100 points	Points	WISA	WISA/100 points	Points	WISA	WISA/100 points
	n	n		n	n		n	n	
West									
Moderate	50	11	22.0	18	9	50.0	20	5	25.0
Low	50	3	6.0	9	2	22.2	21	2	9.5
Very Low	50	0	0.0	NA			15	0	0
Okanagan-Boundary									
Moderate	45	8	17.8	11	7	63.6	11	3	27.3
Low	45	4	8.9	16	2	12.5	15	1	6.7
Very Low	45	0	0.0	NA			13	0	0
East Kootenay									
Moderate	30	0	0.0	3	0	0	8	0	0
Low	60	1	1.7	18	2	11.1	9	0	0
Very Low	45	1	2.2	2	1	50.0	7	0	0

Based on census areas, absolute densities (see Gyug 2010a) of the Moderate were 0.8-2.3 pairs/km², Low were 0.2-0.8 pairs/km², and Very Low were <0.2 pairs/km². Distance sampling methods (Thomas et al. 2009) were used to estimate Effective Detection Radius (EDR) for nests found after nest searches when WISA were detected at CPB points. The EDR was 318.2 m (n = 141 nests, CV = 2.7%; 95% CI = 301.9 - 335.4 m, unpublished data from 2003-2010). This EDR is equivalent to a "mean detection area" of 0.318 km² for a pair at a nest. Therefore, for a Moderate density of 0.8-2.3 nests (or pairs) per km², and for a sample placed randomly within any given sq. km., the expected frequency of detection should be between 25% and 73% if probability of detection was 100%. For Low densities of 0.2-0.8 nests per km², expected frequency of detection is in the range of 6% to 25%.

Relative densities in the West and Okanagan-Boundary were consistent with the expectations derived from absolute densities given three visits to a site, even for the Low stratum in the East Kootenay (Table 1). Relative densities were lower than expected based on only one site visit (First CPB Points) because detectability appeared to be much lower when only one CPB was done at a site. On that basis, the suitability models in the West and Okanagan-Boundary regions would be considered reliable and suitable for management application.

The relative densities found in the East Kootenays did not match the expectations of the model, and the model seemed to perform very poorly relative to the West and Okanagan-Boundary regions. With almost no WISA found on any of the CPB points, the model did not just seem to perform poorly at predicting relative densities among strata, the model seemed to be very poor at predicting WISA presence at all. However, 10 of the 60 CPB points in the

Low stratum were within 300 m of past detections of WISA, but WISA were only detected on two of these 2010 CPB points. It is not known whether WISA were absent from these sites in 2010, or just undetected. At any rate, this model would not be judged as reliable, and would require revision before management application.

Stand Attributes at Detection Points

For the 45 CPB points with WISA detections, tree species recorded in the reconnaissance-level habitat data matched those listed in the VRI database for 38% of these. 38% had minor inconsistencies (two of three species matched) in tree species with some species noted in the field that were not noted in the VRI database, or vice-versa. Overall, for tree species composition, 76% of the sites had a good or fairly good match between what was recorded in the field and what was listed in the VRI database. 4% had no tree species listed in the VRI database as these had been partial cuts in which the tree species layer had been cleared, but there were trees present

For canopy height, 93% were a match between the field data and the VRI database attributes. 7% had the field height estimated incorrectly (e.g., 5-10 m for Mature Forest, or 10-20 m for Mature Forest which was >20 m tall). Some surveyors gave the tree height for the seed trees, while others gave the tree height for the dominant layer, i.e. the regenerating conifer layer. Since this field was not used consistently, it would only be useful if it divided the crown at each site into the separate layers present. However, when used in combination with the habitat description, it was useful for determining the general character of a site.

Inconsistencies in field methodology found one surveyor making a habitat call as Mature Forest with old high-grading, while the next person to sample the point called it a Partial Cut. Without clear definitions of the habitat descriptions, these tended to be used inconsistently, and were therefore not useful in determining consistency with mapping. However, there were clear inconsistencies in 4 of the 45 points. In the East Kootenay, one point was mapped as “Open Range-Very Low” based on aerial photo interpretation, while the field call was for Partial Cut, and the VRI database put the site as logged 1996. This was an error in the mapping at the manual revision stage, as it should have been interpreted as Seed Tree cut with vets, and rated as Low suitability, not Very Low. Two other errors were in the Boundary where ST Cuts were not mapped, i.e. the FC/VRI polygons had not been modified to show ST Cuts that had occurred prior to 2004. However, this difference in habitat would not have changed the suitability rating. The last site in the Boundary had the partial cut boundaries correctly mapped, but it appeared the crown closure in the VRI database had not been adjusted to reflect the partial cutting, although this, again, made no difference to the suitability rating.

The presence/absence of very large trees (>57-cm dbh) was consistent with the mapped assumptions at 75% of sites. At 16% of the sites, presence of very large trees had been assumed in the mapping based on an age layer >180 years, or age >150 years and height >30 m, but very large or veteran trees were not recorded at these sites. There may have been such trees in the polygon, but not in the hectare around the CPB point. At the final 9% of sites, very large trees were recorded in the field, but there was no indication in the VRI

database that these would be present, and these were not recognized during aerial photo interpretation.

Very large tree presence at CPB points by strata were highest in the Moderate, and progressively lower in the Low and Very Low (West: 82%, 58%, 48%; Okanagan-Boundary: 67%, 31%, 16%). This was as expected because stand age in the VRI attributes, and presence of veteran trees determined from aerial photo interpretation was one of the attributes used to determine habitat suitability. However, the relatively high presence of veteran or very large trees at Very Low sites in the West (48%) was not expected, and since no WISA were detected at these sites, presence of veteran trees alone may not be the best indicator for WISA suitability. Presence of very large trees in the East Kootenay (43%, 52%, 29%) did not fit neatly into the expected scheme with very large or veteran trees present at more of the Low than Moderate sites. The presence of very large trees alone without consideration of their density, tree species, tree condition or other habitat features may not be the best indicator of habitat suitability.

Habitat Attributes in the East Kootenay

The poor performance of the suitability modeling to predict WISA presence in the East Kootenay called for additional examination of the modeling compared to the reconnaissance-level habitat field data at all 135 points.

For 60% of the points overall, canopy height estimated in the field and in the VRI database matched (Table 2). An additional 20% were a close match (e.g. 21 m height in the VRI, but 10-20 estimated in the field). However, for 19% there was a mismatch. This occurred for only 7% of Moderate sites, because most of these were closed forest, and there was no confusion about which layer the height applied to. For Low or Very Low sites, there were more mismatches, because sometimes it was not clear in the field which layer the height would apply to, e.g. scattered seed trees, or the younger layer. Unless heights were estimated for each layer in the field, this will be difficult to match to the VRI layers.

In 65% of the sites, the tree species present were either a complete match, or at least the top two species matched (Table 2). The match was considered fair, i.e. either one of two species reported was the same, or two of the three species reported were the same, for another 26% of the sites. Only for 9% of the sites was there a poor match (only one of three species the same, or no species the same). For the three sites that were completely wrong, two of them appeared to be in spruce-balsam stands that were not mapped in larger polygons, and in other one, the surveyors estimated conditions for a reserve layer of trees where the VRI only had one regeneration layer of 3 m height. For the seven sites that were poor matches, five had the presence of spruce, balsam and/or cottonwood that were not in the VRI, i.e., may have been small inclusions of wetter stands in larger polygons, and the other two just did not match well.

Table 2. Comparison of field-collected and VRI-database habitat variables at WISA CPB points in the East Kootenay, 2010, by habitat suitability strata.

	CPB Points ¹ (n)	Correct (%)	Incorrect (%)			
Canopy Height			Ht. close	Mismatch		
Moderate	30	43	50	7		
Low	54	65	15	20		
Very Low	<u>41</u>	66	7	27		
<i>Total</i>	<i>125</i>	<i>60</i>	<i>21</i>	<i>19</i>		
			Noted in field, but not VRI	In VRI, but not noted in field		
Larch presence						
Moderate	30	87	7	7		
Low	52	90	4	6		
Very Low	<u>33</u>	85	3	12		
<i>Total</i>	<i>115</i>	<i>88</i>	<i>4</i>	<i>8</i>		
Very Large Trees						
Moderate	30	43	0	57		
Low	54	69	31	0		
Very Low	<u>39</u>	74	21	5		
<i>Total</i>	<i>123</i>	<i>64</i>	<i>20</i>	<i>15</i>		
Tree Species			Top 2 sp. match	1 of 2 sp or 2 of 3 sp	1 of 3 sp	Mismatch
Moderate	30	60	13	20	7	0
Low	52	40	29	25	4	2
Very Low	<u>34</u>	26	26	32	9	6
<i>Total</i>	<i>116</i>	<i>41</i>	<i>24</i>	<i>26</i>	<i>6</i>	<i>3</i>

¹ CPB points only used that were applicable, i.e., if necessary VRI attributes were in database.

The presence of western larch (Lw) was a very good match between the field estimates and the VRI database (Table 2). Lw was one of the key species upon which the suitability model was based so that was not likely to be a source of error in the modeling.

There was a 65% match between the prediction of very large (dbh >57.5-cm) trees from the VRI database and the field site data. VRI does not predict the presence of very large trees directly, but these are one of the key nest trees for WISA, so for modeling the age and height of the stand was used to predict very large tree presence. Stands with heights >25 m and ages >180 years were assumed to have very large trees. However, there was a 35% mismatch and, because this is one of the key attributes upon which the modeling is based, this mismatch might indicate a problem with the assumptions upon which the model was based.

For only 1 of the 25 points mismatched for very large trees had I altered the polygon attributes during aerial photo interpretation to contain veteran trees. Nor could I find any other VRI attributes listed in the database that would allow prediction of the presence of these very large trees in these sites. In general, once forested stands have reached an overall

height of about 25 m, it becomes very difficult to pick out individual veteran trees in aerial photos. The presence or absence of very large trees is very hard to predict with remote interpretation methods in forested sites, and on-the-ground methods will be required in about 35% of the cases in the East Kootenay

ASSESSMENT OF EAST KOOTENAY SUITABILITY MODEL

Gyug (2009) examined closed forest of age >180 years containing Lw (i.e., a very simplistic WISA Moderate habitat suitability model), but found only four patches of very large Lw veterans currently suitable for WISA nesting in the 176 plots examined. WISA were at two of these four patches in early May, but no nests or WISA were found when examined in June (Ted Antifeau, MOE, pers. comm. 2009). While WISA presence was significantly associated with the higher densities of very large trees, and very large western larch, this is not consistently mapped within the VRI database. Even if larger larch were predictable, very few of them in the EK appear to be actually suitable for WISA, i.e., they tend to be of intermediate age rather than the highly suitable 400-600 year old trees that are much more common in the Okanagan-Boundary. While the Moderate algorithm was effective in the West and the Okanagan-Boundary, the density of potentially suitable nest trees were higher there than in the East Kootenay (Gyug 2009). Random sampling (2008) showed density of suitable nest trees in the East Kootenay was 0.07/ha in general, and 0.38/ha around nests (and that was not including the nest tree itself).

None of the known WISA nests upon which the modeling was based were found in Moderate suitability habitat in the East Kootenay (Gyug 2010). Therefore the assumptions of Moderate habitat suitability modeling in the Okanagan-Boundary simply do not fit the East Kootenay. Most of the Moderate habitats that were modeled in the EK were done using the borrowed concept for the algorithm from the Okanagan-Boundary, and do not appear to be Moderately suitable for WISA at all.

Almost half of the WISA nests in larches in the EK were in larches that were not large veterans but were co-dominant trees (Gyug et al. 2009), probably from extensive fires in the same era (1900-1950) that the area was logged. These trees seem to have stopped putting on much further growth after fire scarring, but some have become suitable nest trees as heart rots have progressed up the trunk from basal fire scars (Gyug 2009b). There is no way to predict the presence of these trees in a stand using any coverages available because they are part of the co-dominant layer, even if these trees might generally be much older than their cohorts in that layer.

The modeling of WISA suitability in the East Kootenay needs to be revised and revamped, but there is no clear method to do this. If, for instance, very dense stands ($\geq 60\%$ crown closure) were down-rated in suitability, this would result in a poor fit to the existing nest data. Moving dense crown closure (non-aspen) stands from Low to Very Low moved 7 of 44 nests (16%) from the Low suitability class into the Very Low suitability class, so this is not a simple remedy. Nor could I find any other VRI attributes which would provide any other algorithm that would be successful and efficient at predicting the locations of nests.

Reliable suitability mapping for WISA breeding habitat in the East Kootenay may not be possible because it relies so heavily on being able to predict where suitable nest trees occur. Assessment of the field-collected and VRI database attributes from the random points in the East Kootenay from 2010 showed there was no way to reliably predict their presence or absence in 35% of the sites, even with scanning aerial photos to check for veteran presence. Combined with the overall poor performance of the model to predict the presence of WISA, I conclude that remote sensing methods and the VRI database cannot be used to make a reliable habitat suitability model for WISA in the East Kootenay.

RECOMMENDATIONS

I recommend abandoning the current East Kootenay WISA suitability model based on VRI attributes (Gyug 2010a), in favour of a capability/suitability model based on field-collected data. Management direction would be driven by on-the-ground calls before timber harvesting within the Area of Occupancy in the East Kootenay. This would result in more effective management of WISA habitat in locations where management would be effective than relying on an unreliable suitability model to dictate location and schemes for timber harvesting.

Capability Model

Long-term capability would reflect the ability of a site to grow trees capable of being used for nesting by WISA. Long-term would be in the range of 200 years and more since veteran trees take at least that long to reach large size, and 100-200 years longer to develop into a suitable condition for WISA nesting (Gyug et al. 2009). Any potentially forested stands in the Area of Occupancy with stand indices ≥ 12 (Gyug 2009) may be capable in the long term. This would include about 90% of the potentially forested stands in the East Kootenay Area of Occupancy, i.e., would be very inclusive but not very efficient at predicting current WISA presence. The Okanagan and Boundary models used stand indices ≥ 15 to define High suitability habitat where very large veteran larches were more likely to be found (Gyug 2009a, 2010b), but even this still includes 65% of the East Kootenay Area of Occupancy. This extremely simple model gives an indication of where management would apply in the long-term, i.e. where suitable nesting trees may be developed to replace previously logged veteran Lw.

Short-term capability would be defined as sites that have currently suitable WISA nest trees, but may not be suitable because the stands have a very dense (>400 stems/ha) mid-aged (80-200 years) co-dominant layer. These types of sites do not contain many WISA in the East Kootenay (Gyug 2009b). About 60% of the nests in the East Kootenay are in recently logged stands with reserves of seed trees, or reserves across all sizes of trees, so their presence is certainly compatible with some types of timber harvesting in many cases. Gyug et al. (2010) recommended an average of 100 trees/ha be left after logging as tree densities lower than 100/ha were correlated with reduced nest productivity, which most often occurred by complete nest failure. However, this density of 100 trees/ha included any adjacent unharvested areas within 225 m of the nest, not just the harvested portions. Just

looking at the densities of trees in the harvested areas, there was an average of 48 trees >22 cm dbh/ha (n = 21) around previously known WISA nests in the EK.

Information Gaps—Suitable Timber Harvesting

Applying a single blanket timber harvesting prescription for WISA in the East Kootenay would not be recommended at this time. In particular, WISA do not occupy every harvested site in the East Kootenay, and we cannot yet distinguish reliably why one harvested site should be occupied and another unoccupied. The random habitat sampling (Ohanjanian 2008) and the forest-directed habitat sampling (Gyug 2009b) in the East Kootenay sampled too few unoccupied open sites with <150 trees/ha to draw any conclusion about what constitutes occupied vs. unoccupied habitat within harvested sites. Since WISA nest productivity can be sensitive to tree densities (Gyug et al. 2010) effective timber harvest strategies in the East Kootenay depend on properly defining suitable conditions. This comparison was previously recommended by Gyug (2009b) as well. The tree attributes of these sites tend to be very poorly mapped in the VRI coverage, and this could not be entirely redressed by aerial photo interpretation alone as attempted in the existing modeling (Gyug 2010a).

To determine why some relatively open cuts (partial cuts, clearcuts with reserves, and seed tree cuts) seem to be preferred to others, I recommend additional field plots so that we can contrast tree densities and sizes at unoccupied sites vs. occupied sites. As of 2010, there were 19 known WISA nests in harvested areas where tree densities have been estimated from sample plots. Sample plots should be done at an additional 6 known nests in harvested areas where no plots have been done yet. Tree size and density should be compared at these 25 occupied sites to 25 unoccupied harvested areas selected randomly from harvested areas (partial cuts, clearcuts with reserves and seed tree cuts) within the Area of Occupancy.

Unoccupied site selection may be from all harvested sites in the East Kootenay, with WISA absence confirmed in early May, 2011, or alternatively, could be from sites already known to be unoccupied based on previous call playback surveys. However, whichever selection is made, absence should still be confirmed again in early May 2011. Presence at the 25 previously known nests should be confirmed in early May, and nest success confirmed by late June. It is not necessary to collect nest productivity since lower nest productivity in low tree density sites was mostly the result of nest failures (Gyug et al. 2010). A contrast could be made not only of WISA nest sites to unoccupied sites, but also of successful and occupied (in 2011) WISA nests to unsuccessful and unoccupied (in 2011) WISA nests.

Estimated total field time required would be 24 days. This includes 5 days WISA call playback sampling in early May to assess presence/absence, and an additional 4 days in mid to late June to assess nest success for any of the 25 WISA territories still occupied in 2011. 15 days would be required for tree density plots at 31 sites (6 WISA nests and 25 unoccupied sites). Sampling protocol would be the same for trees as used by Gyug (2009b), i.e., exclude logs, and simplify the number of tree dbh classes. Tree density plots could be conducted at the same time as presence or absence is confirmed in early May, or could be conducted later in the year, and would only be in harvested sites, not adjacent forests.

The very low WISA response rate to call playbacks in the East Kootenay in June 2010 that led to a very low reliability rating for the suitability models in general (not just the Moderate suitability), should be verified. If the same sites are still unoccupied in early May 2011, then the result in 2010 was correct, and the models are really not very useful. But if the call playbacks were attempted when most pairs were incubating and not very responsive, then that may partially explain the low response rate compared to the West and Okanagan-Boundary.

Information Gaps—Where to Manage

The purpose of the habitat suitability modeling was to determine within what portion of the Area of Occupancy the timber harvesting guidelines for WISA should be applied. Without a reliable model, additional guidance will need to be supplied to forest managers to locate areas where WISA guidelines for management would apply. Management would be firstly at any breeding territories known to be occupied by WISA in the recent set of inventories (2006-2010). Secondly, sites with short-term capability, i.e. suitability after timber harvesting should be managed with the same guidelines. I recommend that these be identified from ground calls during timber reconnaissance.

A key to determine what constitutes a suitable WISA nest tree was developed for the Okanagan-Boundary, and is attached as an appendix with modifications for the East Kootenay. Wherever very large (>57 cm dbh) veteran Lw exist, they should be reserved from harvest. If the density of suitable nest trees is >0.25/ha (the density near known nests) in a portion of the stand, then the entire stand of 16-50 ha should be managed for WISA. Expected densities of suitable nest trees in other areas that would not be managed for WISA average 0.15/ha or fewer (Gyug 2009b).

The overall amount of area within the Area of Occupancy to be managed with WISA timber harvest guidelines would still have to be determined. No population goal has been set by the Recovery Plan which is based on habitat maintenance. If the goal was to manage enough habitat for 100 nesting pairs (probably about twice the current number), and given breeding territories of about 50 ha per pair in low tree density habitat, and then doubling that number (because only about half of all available territories are occupied in a given year), yields about 10,000 ha. This is about 12% of the 85,000 ha Area of Occupancy in the East Kootenay.

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Appendix 1. Key to identify habitat with short-term capability or post-harvest suitability for Williamson's Sapsucker in the East Kootenay.

**Williamson's Sapsucker
Habitat Capability Field Key 2011
EAST KOOTENAY**

Key to Short-term Habitat Capability, which is equivalent to Post-harvest Suitability:

Is the site currently suitable?

Direct Observations or Sign is the most reliable method to confirm suitability—all other methods are indirect estimates. If the site is suitable and occupied by Williamson's Sapsucker before harvesting, then the prescription must be written to that it remain so after harvesting.

April-June: Are Williamson's Sapsucker (B-WISA) present? Must use Call Playbacks for >30 minutes per site before absence can be confirmed. However, not every site is occupied every year, so this is not definitive.

Does the site have the capability to be suitable post-harvest?

Williamson's Sapsucker is a cavity-nesting woodpecker requiring trees or snags with heart rots or otherwise decayed. Capability is defined by a density of suitable nest trees **>0.25/ha**

Of known B-WISA nest trees in the East Kootenay:

35% are large to very large (>57 cm dbh) Lw with obvious defects (e.g. broken top, dead top, deep scars) or large dead Lw with obvious heart rots

35% are moderate (30-57 cm dbh) Lw with heart rots.

15% are large (>28 cm dbh) At, usually with multiple cavities

15% are other large to very large (>57 cm dbh) conifers (Py or Fd, and usually dead)

Method: Long strip plots are most effective at tallying suitable nest trees because densities expected are low.

Count as suitable nest trees only if they have nest cavities 3-5 cm diameter or larger and are :

1. Lw >30 cm dbh with obvious defects (e.g. broken top, dead top, fire scars) or heart rots.
2. At >28 cm dbh with multiple cavities and obvious defects such as heart rots
3. Other dead conifers >35 cm dbh with obvious heart rots or dead tops, and with nest cavities
4. Any trees with large and oblong nest/roost cavity entrances made by Pileated Woodpeckers

Do not count trees as potential B-WISA nesting trees that:

- Only have old nest cavities and are too rotten to be suitable for new cavity excavation (e.g. old Fd stubs),
- Decay class 8 snags of any species (very decayed and soft, usually <6-m tall),
- Only have small (<3-cm diameter) cavities,
- Only have Pileated Woodpecker feeding sign - oblong or elongated excavations to get at carpenter ants, but not nest cavities,
- fire-killed Lw or other trees that have remained solid, i.e. did not have any heart rots before they were fire-killed.