

Williamson's Sapsucker Critical Habitat Phase 1: Random Plot Occupancy in the West and Okanagan-Boundary

by

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INTRODUCTION

Williamson's Sapsucker is a species of woodpecker that has been designated as Endangered by the Committee on the Status of Wildlife in Canada (COSEWIC 2005) primarily because of its low population numbers in Canada and the tendency to use old Western Larch stands as nesting habitat which are being altered by timber harvesting and private land clearing.

This was the first phase of a project in 2008 intended to define and identify Critical Habitat for Williamson's Sapsucker. Habitat data had been collected within a 225-m radius (16-ha) of Williamson's Sapsucker nest territories occupied in 2006 and/or 2007. Similar habitat data has not yet been collected at randomly selected unoccupied sites within the Williamson's Sapsucker area of occupancy to allow for a contrast of habitat data at occupied nest sites with the randomly selected unoccupied sites. This contrast will allow for a breeding habitat model to be developed, and for Critical Habitat to be defined. This phase of the project was to determine the occupancy of randomly selected sites within the area of occupancy.

METHODS

The Area of Occupancy (AO) had been previously determined based on the results of call playback surveys conducted from 1996-2007 (Gyug et al. 2007, Gyug 2007). The AO is the area where we may expect Williamson's Sapsucker to breed within suitable habitat. ArcView GIS was used to select random sites within the AO west of Okanagan Lake, and within the AO of the Okanagan-Boundary area (east of Okanagan Lake) (Figure 1). The target was to find an equivalent number of unoccupied sites to contrast with the known nest territories that were occupied in 2006 and/or 2007 (Table 1). I have used the term nest territories here because in some of the nest territories Williamson's Sapsucker switched from one nest tree in 2006 to another nest tree in 2007 (and sometimes switched again in 2008). Targets were to sample 30% more random points than the known number of nests so that, allowing for some occupied sites, there would still be enough random unoccupied sites to contrast with the known nest sites from 2006 and/or 2007. Additional "spare" random sample sites were designated in case we had to sample even more sites.

Randomly selected sites were selected so that their centres were at least 800-m apart, and at least 225-m from the edge of the AO. They were otherwise completely random within the AO with respect to land ownership and topography. A few points were deleted from the sample because the topography was too steep (canyons) to allow them to be sampled, and some points were deleted because permission was not granted to sample on private lands, or their were occupied dwellings within the plot. During sampling, I also realized that the AO of 2007 needed some modification with regard to upper elevation limits that had not been taken into account during the AO development. The AO had been based on Biogeoclimatic Ecosystem Classification (BEC) Variant boundaries, which are, necessarily, a generalization that tend to be based on broad-scale mapping and vegetation types. Several small areas of high elevation lodgepole pine or Engelmann Spruce forests had been included in BEC variants that were otherwise occupied by Williamson's Sapsucker only because they were too small to be mapped separately. Based on the results of the previous call playback sampling, and known nest and detection locations, any points above 1350 m in the West and above 1650 m in the Okanagan-Boundary were deleted from the random sample, and the boundaries of the AO were modified.

Table 1. Numbers of Williamson's Sapsucker nests known to be occupied in 2006 and/or 2007 in each local area, and the status of the collection of habitat data.

Area	Occupied Nest Territories	Territories for which:		
		Habitat data has been collected	Habitat data cannot be collected because it has changed due to timber harvesting	No habitat data has been collected
West (Princeton and Merritt only)	31	28	0	3
Okanagan	30	24	2	4
Boundary	40	38	0	2
East Kootenay	15	15	0	0
Totals	116	105	2	9

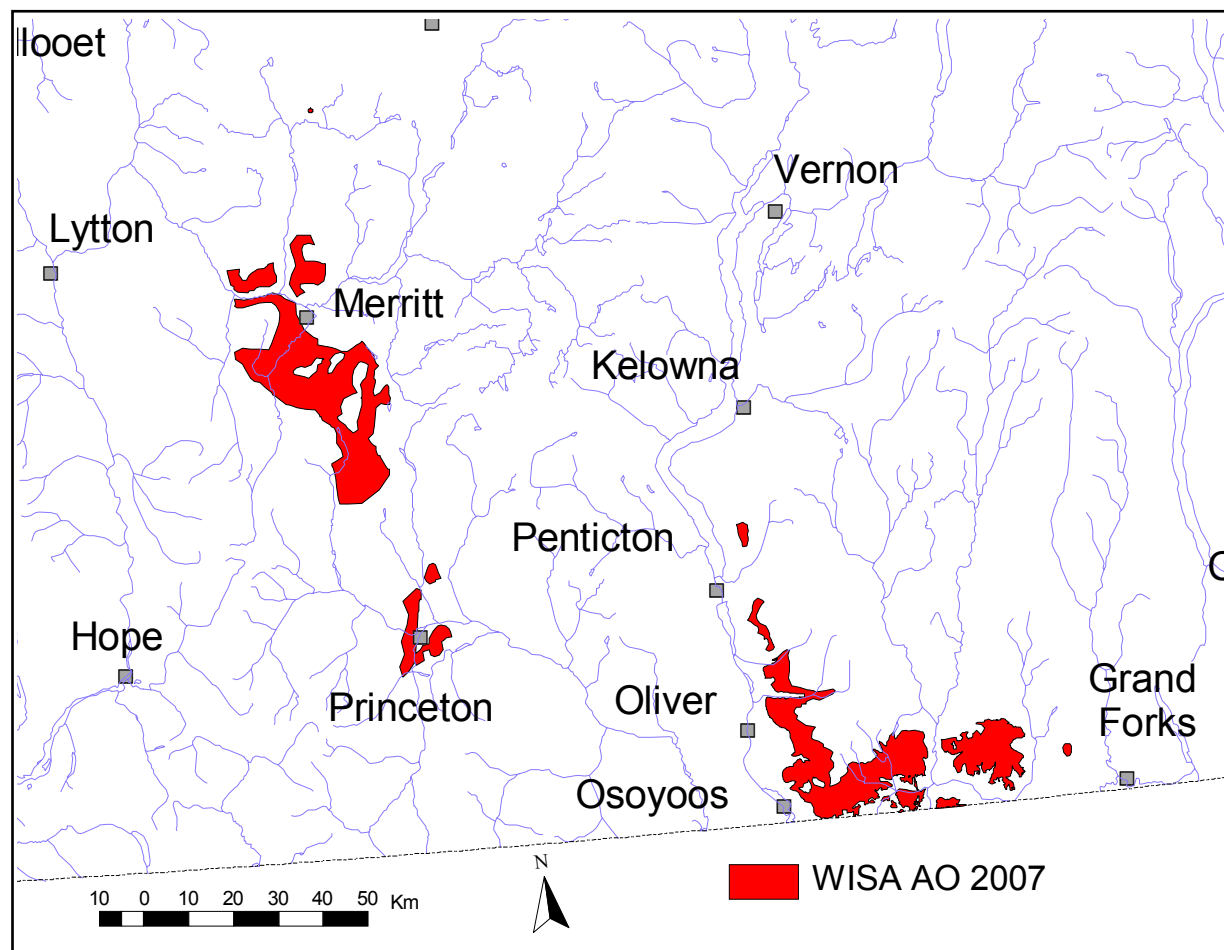


Figure 1. Williamson's Sapsucker Area of Occupancy in the area west of Okanagan Lake and the Okanagan-Boundary area where random points were selected for sampling for occupancy.

Call playback (CPB) surveys were conducted in May, 2008, to determine whether the randomly selected sites were occupied during the breeding season. About 45 minutes were spent searching within a 225-m radius (16-ha plot) of the randomly selected point. This search included at least five CPB survey points within the plot. Plots with very simple habitats (e.g., lack of trees) were sometimes completed in less than 45 minutes, but were always at least 25 minutes. Not all points could be completed in May, with a few done in June. All observations or detections of Williamson's Sapsucker were recorded on a GPS unit, or the distance and direction estimated from a marked GPS point so that the actual location could be estimated.

Returns were made to all randomly selected points in mid to late June to search for nests where Williamson's Sapsucker were detected in May. At least 1 hour was spent searching within the 225-m radius of these points, unless detections of Williamson's Sapsucker led the investigators outside the plots to search for nests. Locations of nests were marked on GPS units and recorded in UTM format. The nest tree species, the DBH, tree height, nest height and aspect, stage of development of young based on external nest observations were made at each nest. Counts of nestlings and the number of successfully fledged nestlings (i.e., at >22 days of age, or 80% of fledging age) were determined for any nest <15-m in height that could be reached with a nest camera on a pole. Returns were made to all other previously known nests that were also <15-m in height and determinations of the number of successfully fledged nestlings made.

All Williamson's Sapsucker observations were entered into the Excel template of the B.C. Wildlife Species Inventory database for Williamson's Sapsucker developed in 2007. An additional Excel file with the summarized results of the random plots and nestling counts was also provided. These have also been included as appendices to this report.

RESULTS and DISCUSSION

CPB surveys were conducted at 175 random points in the western and Okanagan-Boundary areas in 2008 with Williamson's Sapsucker detected at, or near, 30% of these (Table 2). While it was only planned to sample between 120 and 130 random sites to achieve the target of 101 unoccupied sites in the sampling area, more random points had to be sampled than anticipated, and eventually 175 random points were sampled.

Eighty-three of the 175 random points could be accessed to within the 225-m plot radius by road, and 92 required walking (see Appendix 1). Thirty-six of these that required walking could be reached within 5 minutes, an additional 20 could be reached within 15 minutes, and an additional 26 could be reached within a 30 minute walk. In total, 165 of the 175 random points could be reached by road, or were within a 30-minute walk of a road. Of the final 10 sites, 8 could be reached within 1 hour, but 2 took considerably longer to reach (1.5 and 2 hours each way). These last two sites were in an unroaded area on the south side of Vaseux Creek within TFL 35.

Results from follow-up nest searches in June found active nests in five of the plots, and active nests near another 11 plots. Only one of the five nests found within the random plots was a nest that was already known to be active in 2006 and/or 2007, with the other four being newly discovered nests. The range of distances from plot centre of the 11 nests outside the plots was 285-560 m, or 60-335 m from the edge of the 225-m radius plots (see Appendix 1). The mean distance from the edge of the plots was 178 m, and the median was 185 m. Of the 11 nests found outside the plots, 4 of the 11 nesting territories were previously known to be active in 2006 and/or 2007 with the other 7 being newly discovered nesting territories.

Table 2. Summarized results of call playbacks (CPB) at randomly selected 16-ha plots within the Williamson's Sapsucker (WISA) Area of Occupancy west of Okanagan Lake, east of Okanagan Lake, and in the Boundary in 2008.

Area	Random Plots Sampled by CPB	WISA Detected within plot ¹	WISA Detected only outside plot ¹	No WISA detected
West (Princeton and Merritt only)	51	15	1	35
Okanagan	56	16	3	37
Boundary	68	13	5	50
Totals	175	44	9	122

¹WISA detections were considered within the plot if, at any time during the plot sampling, they entered the plot area, even if first detected outside the plot.

Table 3. Summarized results of nest searches in June at randomly selected 16-ha plots within the Williamson's Sapsucker (WISA) Area of Occupancy west of Okanagan Lake, east of Okanagan Lake, and in the Boundary in 2008 where WISA had been detected during CPBs.

Area	Random Plots Nest Searched	WISA nest within plot ¹	WISA nest found outside plot	WISA detected within plot but no nest found	WISA detected only outside plot but no nest found ²	No WISA detected
West	16	2	2	3	0	9
Okanagan	20	0	6	2	1	11
Boundary	17	3	3	1	2	8
Totals	53	5	11	6	3	28

¹Likely failed nests were not included within this table. This would have included at least one, and possibly two, nests within plots in the Okanagan.

²Nest searches where WISA were detected outside plot were not as complete as within plot searches, therefore these birds may have been nesting somewhere outside the plots.

At least one nest in one plot (RANK004) in the Okanagan probably failed based on the activity of the pair at the probable nest tree in early May, and the presence of three sapsucker-sized (22-24 mm length x 16-17 mm width) white eggshells on the ground at the base of the tree in June. We think that at least one other nest may have failed within a plot in the Okanagan. A pair were active near a nest tree known to be active in 2006 (WN305, RANK051), but no activity was found at the site when we returned in June for the nest search. Three other nests were discovered on the way to or from random plots that have not been included within Tables 1 or 2 since these birds were not detected anywhere near the random plots or from within the random plots.

Table 4. Number of Williamson's Sapsucker young fledged per successful nest, 2006-2008.

Area	Year	N Nests	Number of Young per nest	Std. Error
Okanagan-Boundary	2006	20	3.50	0.23
	2007	38	3.87	0.17
	2008	15	4.20	0.27
West	2006	15	2.87	0.27
	2007	20	3.45	0.23
	2008	26	3.62	0.20

Williamson's Sapsucker were not detected during CPB surveys on at least two random plots where nesting had previously been detected within or near the plot in the past. Follow-up surveys at these two points were conducted with no Williamson's Sapsuckers detected at one of the points (SPRK129), but Williamson's Sapsuckers were detected well outside the plot at the other (SPRK123), probably from a different known breeding territory. The results from these points have been included within Table 3. It was known from previous surveys that not every breeding territory will be occupied every year (72% reoccupancy from one year to the next; Gyug 2007), and this will contribute some level of noise to the analyses since some suitable breeding territories will not have been occupied in 2008. However, overall, this level of noise in the data is likely to be low, i.e., <30% of the random sites we found to be unoccupied in 2008 would be likely to be suitable but unoccupied in 2008. Therefore the best likely fit of data in any habitat model is likely to be in the 70% range, and this should form an acceptable level of model fitting when habitat models are developed.

Nest Productivity

Productivity data was collected at 16 nests in the Okanagan-Boundary, and 26 nests in the western project area in 2007 (Table 4). This included one nest on First Nations land as part of the Nicola Tribal Alliance project, and one nest near Logan Lake. Three of the nests included here were newly discovered in 2008 by the NTA project (Chris Gill, pers. comm., June 2008). A number of occupied nests could not be included within the productivity study in the Okanagan-Boundary because they were too high to be reached with the 15-m nest camera pole. Two nests in the Okanagan (WNK014, WNK018) were <15-m in height, but branching characteristics of these particular trees did not permit a ground-based nest camera to be used. Only one nest that was being followed for fledgling counts (WNB021) failed completely when the young were about 10-days old. Not all nests could be followed past the 22 day stage, but the effects of not doing so we consider to be minor, and with any differences equally spread across all areas.

The number of young fledged (Table 4) differed significantly by year ($F_{2,128} = 4.562$, $p = 0.013$) and by area ($F_{1,128} = 8.418$, $p = 0.004$) using two-way ANOVA analyses. There was no significant interaction effect between year and area ($F_{2,128} = 0.133$, $p = 0.88$). Only successful nests were used for this comparison because unsuccessful nests that failed early in the nesting period did not have an equal chance of being discovered given our discovery method of searching for adults feeding young, or listening for the vocalizations of young in the nest.

LITERATURE CITED

- COSEWIC 2005. COSEWIC Status Report on Williamson's Sapsucker *Sphyrapicus thyroideus*. Prepared for the Committee on the Status of Endangered Wildlife in Canada.
- Gyug, L.W. 2007. Williamson's Sapsucker, Western Region 2007. B.C. Conservation Foundation, Surrey, B.C. and Ministry of Environment, Ecosystems Branch, Victoria, B.C.
- Gyug, L.W., I.P. Ohanjanian, C. Steeger, I.A. Manley, and P.W. Davidson. 2007. Distribution and Density of Williamson's Sapsucker (*Sphyrapicus thyroideus*) in British Columbia, Canada. British Columbia Birds 16: 2-15.

Appendix 1. Results from random points within the West and Okanagan-Boundary WISA AO, 2008

CPB Date	PointID	UTM Zone	UTM_E	Utm_N	Access	Time to walk	CPB Result	Nest Search Date	Nest Search Result	Nest Number-Distance from Plot Centre and Comments
Boundary										
2-Jun	RANB001	11	357741	5443237	Walk	1	NULL			
22-May	RANBP002	11	351765	5438645	Walk	20	NULL			
23-May	RANB006	11	351191	5437954	Road		NULL			
26-May	RANB007	11	373007	5437276	Road		NULL			
18-May	RANBP009	11	348044	5432664	Walk	2	NULL			
										Nests WNB004/018 400 m N of plot centre not occupied this year, but male came into plot on 19-May, and still present >500 m from plot centre on 15-Jun
19-May	RANB010	11	347384	5444301	Walk	1	B-WISA	15-Jun	B-WISAout	
26-May	RANB014	11	372259	5443008	Walk	30	NULL			
23-May	RANB018	11	357542	5442388	Road		NULL			
26-May	RANB020	11	369455	5440615	Road		NULL			
18-May	RANB021	11	335475	5439723	Road		NULL			
2-Jun	RANB025	11	369295	5442917	Walk	18	NULL			
26-May	RANB026	11	371735	5444606	Road		NULL			
22-May	RANB028	11	349710	5440217	Road		B-WISA	16-Jun	NULL	
26-May	RANB029	11	363171	5439712	Road		B-WISAout	15-Jun	NULL	
19-May	RANB033	11	348999	5439098	Road		B-WISA	27-Jun	NULL	
26-May	RANB035	11	370900	5445630	Road		NULL			
26-May	RANB038	11	367665	5443800	Road		NULL			
19-May	RANB039	11	348943	5439929	Road		B-WISA	15-Jun	Nest IN	WNB025- 108 m
19-May	RANB041	11	347901	5442600	Walk	15	B-WISA	17-Jun	NULL	
13-May	RANB043	11	341914	5441316	Road		B-WISA	23-Jun	NULL	
22-May	RANB045	11	350441	5443626	Walk	2	NULL			
26-May	RANB046	11	367003	5434804	Walk	5	NULL			
27-May	RANB048	11	364270	5439606	Road		B-WISAout	15-Jun	B-WISA	Male only
14-May	RANB049	11	343421	5439389	Road		NULL			
22-May	RANB050	11	351181	5441345	Walk	9	NULL			
13-May	RANB057	11	342310	5440211	Walk	5	B-WISA	24-Jun	Nest OUT	WNB038- 312 m
13-May	RANB058	11	344949	5445337	Road		B-WISAout	24-Jun	NULL	
31-May	RANB059	11	338126	5436553	Walk	30	B-WISAout	25-Jun	NULL	
14-May	RANB060	11	340576	5437011	Road		NULL			
27-May	RANB061	11	359488	5437834	Walk	35	NULL			
22-May	RANB064	11	350522	5444671	Road		NULL			
18-May	RANBP068	11	336146	5434642	Walk	2	B-WISA	22-Jun	Nest OUT	WN047 – 414 m
19-May	RANB069	11	345517	5438415	Walk	6	NULL			
27-May	RANBP071	11	370873	5432820	Walk	5	NULL			

26-May	RANB072	11	371193	5443461	Walk	5	NULL			
27-May	RANB073	11	362015	5440274	Walk	20	NULL			
27-May	RANB074	11	363821	5436831	Walk	22	NULL			
19-May	RANB075	11	346960	5442607	Road		NULL			
19-May	RANB076	11	357065	5430707	Walk	2	NULL			
13-May	RANB078	11	343596	5444874	Road		NULL			
26-May	RANB079	11	370563	5441102	Road		NULL			
27-May	RANB081	11	365396	5437800	Road		NULL			
19-May	RANB082	11	345422	5442153	Road		NULL			
26-May	RANB085	11	370855	5442546	Road		NULL			
2-Jun	RANBP088	11	341121	5435900	Walk	15	B-WISA	22-Jun	Nest IN	WNB037 -190 m
18-May	RANB089	11	332075	5436564	Walk	2	NULL			
25-May	RANB090	11	332075	5436564	Walk	1	B-WISAout	14-Jun	Nest OUT	WNB034 -462 m
2-Jun	RANBP093	11	372679	5435968	Walk	18	NULL			
27-May	RANB094	11	361392	5439641	Road		NULL			
26-May	RANB095	11	365422	5444045	Walk	21	NULL			
27-May	RANB096	11	361074	5442366	Walk	2	NULL			
22-May	RANB098	11	349408	5442275	Road		NULL			
27-May	RANB100	11	360216	5438422	Walk	5	NULL			
23-May	RANB104	11	342824	5442085	Road		NULL			
27-May	RANBP105	11	365298	5436809	Walk	6	NULL			
18-May	RANB108	11	333120	5436934	Walk	11	NULL			
25-May	RANB109	11	333120	5436934	Walk	30	NULL			
19-May	RANB110	11	348481	5441879	Road		NULL			
26-May	RANB112	11	371623	5439286	Road		B-WISA	14-Jun	NULL	
19-May	RANBP114	11	354740	5429931	Walk	19	NULL			
2-Jun	SPRB116	11	359123	5443769	Walk	52	NULL			
27-May	RANBP120	11	370717	5435225	Road		NULL			
26-May	SPRB121	11	362616	5440972	Walk	20	NULL			
23-May	SPRB124	11	339453	5434519	Walk	30	B-WISA	28-Jun	B-WISAout	Male only
15-Jun	SPRB125	11	364513	5444256	Road		NULL			
15-Jun	SPRB128	11	346242	5440703	Road		NULL			
28-Jun	SPRB134	11	339149	5436453	Walk	21	B-WISA			
30-May	SPRB135	11	337256	5436445	Walk	45	B-WISA	25-Jun	Nest IN	WNB039 – 76 m
17-May	RANK003	11	319663	5479046	Walk	34	NULL			
Okanagan										
12-May	RANK004	11	330102	5437441	Walk	30	B-WISA	16-Jun	NULL	WK090 – 135 m-Probable failed nest
22-May	RANK005	11	330447	5457295	Road		NULL			
17-May	RANK008	11	318005	5496406	Road		B-WISA	12-Jun	Nest OUT	WNK018 -324 m
14-May	RANK011	11	328775	5440923	Road		NULL			
20-May	RANK012	11	324620	5440714	Walk	4	B-WISA	26-Jun	NULL	
20-May	RANK013	11	321731	5442067	Walk	3	NULL			
13-May	RANK015	11	328243	5436812	Walk	5	NULL			
14-May	RANK016	11	325173	5447460	Road		NULL			

12-May	RANK019	11	329384	5436204	Walk	20	NULL			
13-May	RANK023	11	327252	5437403	Walk	12	NULL			
9-May	RANK024	11	322734	5464375	Road		NULL			
14-May	RANK030	11	328951	5447085	Road		B-WISA	13-Jun	Nest OUT	WNK023 -560 m
12-May	RANKP031	11	329471	5431037	Road		B-WISA	16-Jun	NULL	WNK020 – 153 m (Nest not active in June)
14-May	RANK032	11	324647	5449345	Road		B-WISA	23-Jun	NULL	
20-May	RANK034	11	327656	5440023	Road		NULL			
14-May	RANK036	11	327368	5444301	Road		B-WISA	11-Jun	NULL	
9-May	RANK037	11	322016	5469774	Walk	2	B-WISA	13-Jun	Nest OUT	WNK019 -286 m
9-May	RANK044	11	324091	5463937	Walk	5	B-WISAout	13-Jun	NULL	
14-May	RANK047	11	326111	5448438	Walk	2	B-WISAout	21-Jun	Nest OUT	WNK014 -490 m
21-May	RANK051	11	327265	5450937	Walk	10	B-WISA	23-Jun	NULL	WN305 -167 m (Nest not active in June)
3-Jun	RANK052	11	325740	5456940	Walk	90	NULL			
14-May	RANK053	11	327528	5447431	Road		B-WISA	13-Jun	B-WISA	
12-May	RANK055	11	330545	5435960	Walk	20	NULL			
12-May	RANKP056	11	331694	5434680	Walk	4	NULL			
14-May	RANK062	11	326996	5446549	Road		B-WISA	13-Jun	NULL	
3-Jun	RANK065	11	323959	5457132	Walk	40	NULL			
20-May	RANK066	11	327026	5438405	Walk	1	NULL			
12-May	RANKP067	11	329736	5433151	Walk	20	B-WISA	16-Jun	NULL	
9-May	RANK070	11	324958	5467128	Walk	2	NULL			
12-May	RANK077	11	328925	5434994	Walk	20	B-WISA	16-Jun	Nest OUT	WNK022 -285 m
9-May	RANK080	11	324320	5465595	Road		B-WISA	24-Jun	B-WISA	Male only
9-May	RANK083	11	322421	5461133	Walk	10	NULL			
3-Jun	RANK084	11	321853	5457095	Walk	90	NULL			
9-May	RANK086	11	321851	5464793	Walk	6	NULL			
14-May	RANK087	11	327953	5443128	Road		NULL			
12-May	RANKP091	11	327021	5431136	Road		NULL			
14-May	RANK092	11	325853	5449397	Road		B-WISAout			Not sampled by nest search because WISA >300 m out of plot
12-May	RANKP097	11	330845	5433971	Road		NULL			
21-May	RANK099	11	326818	5451734	Walk	5	NULL			
20-May	RANK101	11	324324	5439798	Walk	5	NULL			
21-May	RANK102	11	321902	5454888	Walk	17	NULL			
17-May	RANK103	11	318483	5493443	Walk	25	NULL			
12-May	SPRK106	11	329715	5435141	Walk	20	NULL			
9-May	SPRK107	11	323793	5462901	Road		B-WISA	13-Jun	NULL	
14-May	SPRK111	11	326855	5442864	Road		NULL			
14-May	SPRK113	11	328355	5444209	Road		B-WISA	13-Jun	Nest OUT	WN229 -410 m- however, birds in plot may be different territory
13-May	SPRK115	11	327951	5435961	Road		NULL			
21-May	SPRK117	11	322594	5453028	Walk	15	NULL			
3-Jun	SPRK119	11	320965	5457820	Walk	120	NULL			
22-May	SPRK122	11	322730	5440914	Road		NULL			
22-May	SPRK123	11	323045	5463541	Road		NULL	24-Jun	B-WISAout	Former nests (2003-2005) were within plots.
18-May	RANKP126	11	334188	5431259	Road		NULL			

12-May	RANKP127	11	331506	5432928	Road		NULL			
22-May	SPRK129	11	323765	5466446	Road		NULL	13-Jun	NULL	
14-May	SPRK132	11	325846	5446962	Road		NULL			

West

7-May	RANW01	10	682789	5491615	Road		NULL			
6-May	RANW02	10	649377	5560567	Walk	7	B-WISA	18-Jun	NULL	
23-May	RANW03	10	660754	5540668	Walk	16	NULL			
2-May	RANW04	10	664133	5520794	Road		B-WISA	19-Jun	Nest IN	WNM036 -90 m
5-May	RANW05	10	654316	5542002	Walk	25	NULL			
5-May	RANW07	10	665750	5536305	Walk	47	NULL			
5-May	RANW08	10	662768	5529265	Road		B-WISA	19-Jun	NULL	
7-May	RANW09	10	681853	5492327	Walk	14	B-WISA	20-Jun	NULL	
2-May	RANW10	10	668222	5514542	Road		NULL			
6-May	RANW11	10	643967	5557508	Road		B-WISA	18-Jun	B-WISA	
5-May	RANW12	10	667789	5541987	Road		B-WISA	19-Jun	NULL	
5-May	RANW13	10	642722	5543393	Walk	3	NULL			
6-May	RANW15	10	649394	5561534	Road		B-WISA	18-Jun	Nest IN	WNM032 -190 m
5-May	RANW16	10	660410	5530342	Road		NULL			
2-May	RANW17	10	669762	5512605	Road		NULL			
7-May	RANW19	10	684223	5479096	Walk	1	B-WISA	20-Jun	NULL	
6-May	RANW20	10	651416	5537523	Walk	22	NULL			
2-May	RANW/P21	10	670221	5531335	Walk	1	NULL			
5-May	RANW/P22	10	664922	5533733	Road		B-WISA	19-Jun	Nest OUT	WNM035 - 515 m
2-May	RANW23	10	668777	5525421	Walk	2	NULL			
7-May	RANW/P25	10	677679	5484063	Walk	1	NULL			
6-May	RANW26	10	665941	5534468	Road		NULL			
7-May	RANW/P27	10	676461	5476407	Road		NULL			
2-May	RANW/P28	10	665701	5521663	Road		B-WISA	19-Jun	NULL	
23-May	RANW29	10	662543	5542656	Walk	5	NULL			
2-May	RANW30	10	667347	5521935	Walk	10	NULL			
5-May	RANW31	10	653402	5542280	Road		NULL			
5-May	RANW32	10	659886	5535645	Walk	40	NULL			
5-May	RANW33	10	649044	5540148	Road		NULL			
2-May	RANW/P34	10	665557	5520516	Walk	5	B-WISA	19-Jun	NULL	
6-May	RANW35	10	653769	5552784	Walk	10	B-WISA	18-Jun	B-WISA	
7-May	RANW36	10	650985	5554928	Walk	24	NULL			
5-May	RANW/P38	10	662182	5530912	Road		B-WISA	19-Jun	NULL	
2-May	RANW/P40	10	670743	5528245	Road		NULL			
7-May	RANW41	10	683424	5493852	Road		NULL			
6-May	RANW42	10	656159	5559165	Walk	15	B-WISA	18-Jun	Nest OUT	WNM045 380 m
2-May	RANW43	10	669700	5511112	Walk	5	NULL			
5-May	SPRW44	10	646787	5537208	Road		NULL			
2-May	RANW/P45	10	673899	5534351	Walk	3	NULL			
5-May	SPRW46	10	648856	5543092	Road		NULL			

6-May	SPRW47	10	651654	5532565	Walk	6	NULL			
7-May	SPRW48	10	678595	5473368	Walk	1	NULL			
6-May	SPRW49	10	642408	5541906	Walk	1	NULL			
6-May	SPRW50	10	647031	5542243	Road		NULL			
7-May	RANW/P51	10	676029	5478100	Walk	9	NULL			
7-May	SPRW52	10	681467	5476242	Walk	11	NULL			
23-Jun	RANW/P53	10	641102	5560423	Road		NULL			
23-May	RANW/P55	10	670533	5525807	Walk	18	NULL			
20-Jun	SPRW56	10	678741	5485443	Road		B-WISA	20-Jun	B-WISA	
23-May	RANW/P57	10	664772	5537011	Road		NULL			
23-May	SPRW58	10	659253	5537216	Walk	14	B-WISAout	24-Jun	NULL	

Appendix 2. Results from nest camera checks within the West and Okanagan-Boundary, 2008

Date of Last Nest Check	Nest ID	N Nest Checks	M	F	Total	Est'd Age (days) at last nest check
Okanagan-Boundary						
27-Jun-2008	WN047	3	3	1	4	24
27-Jun-2008	WN210	3	2	2	4	24
27-Jun-2008	WN213	2	2	2	4	24
26-Jun-2008	WN229	2	2	3	5	24
26-Jun-2008	WN309	2	2	3	5	24
2-Jul-2008	WN314	3	2	2	4	24
22-Jun-2008	WNB021	1	1	0	0	Failed at ~10 days
2-Jul-2008	WNB029	3	3	0	3	18
2-Jul-2008	WNB036	2	2	2	4	17
2-Jul-2008	WNB037	2	3	2	5	20
21-Jun-2008	WNK013	1	2	2	4	18
28-Jun-2008	WNK017	4	2	2	4	24
2-Jul-2008	WNK019	3	3	1	4	24
27-Jun-2008	WNK021	3	3	1	4	24
2-Jul-2008	WNK023	2	5	0	5	24
2-Jul-2008	WNK024	3	1	3	4	20
West						
30-Jun-2008	WNL001	2	3	0	3	17
29-Jun-2008	WNM006	3	1	3	4	20
29-Jun-2008	WNM007	3	1	3	4	20
30-Jun-2008	WNM011	3	2	2	4	20
25-Jun-2008	WNM018	2	1	1	2	22
25-Jun-2008	WNM021	2	4	1	5	22
30-Jun-2008	WNM028	2	1	2	3	24
25-Jun-2008	WNM029	3	1	3	4	24
23-Jun-2008	WNM030	2	1	3	4	20
29-Jun-2008	WNM031	3	3	0	3	20
18-Jun-2008	WNM032	1	1	0	1	18
30-Jun-2008	WNM033	2	3	0	3	15
30-Jun-2008	WNM034	3	3	1	4	20
30-Jun-2008	WNM035	2	2	3	5	22
30-Jun-2008	WNM036	2	2	3	5	17
29-Jun-2008	WNM037	2	3	1	4	20
30-Jun-2008	WNM038	3	1	3	4	20
30-Jun-2008	WNM039	2	1	0	1	18
30-Jun-2008	WNM040	1	3	1	4	20
29-Jun-2008	WNM041	2	1	3	4	24
29-Jun-2008	WNM042	2	2	3	5	20
30-Jun-2008	WNM043	2	2	2	4	20
30-Jun-2008	WNM044	2	3	1	4	20
23-Jun-2008	WNM047	2	4	0	4	20
20-Jun-2008	WNP006	1	1	1	2	17
26-Jun-2008	WNP007	2	4	0	4	20