

**Appendix 1.** Spatial and landcover characteristics of 150 survey points and those with and without owls and woodpeckers in the Boise National Forest, Idaho, USA during 2009–2010.

Table A1.1. Elevation and aspect of point-count locations (n = 150) within the Boise National Forest, Idaho, USA surveyed for owls and woodpeckers during 2009-2010. Data derived from a 30-m resolution digital elevation model (The National Map 2013).

	Mean	SD	Median	Min	Max
Elevation (m)	1489	289	1428	957	2376
Aspect (degrees) <sup>1</sup>	222	104	225	2	353

<sup>1</sup>Mean vector ( $u$ ), circular standard deviation, and median calculated using circular statistics. Min and Max are linear values.

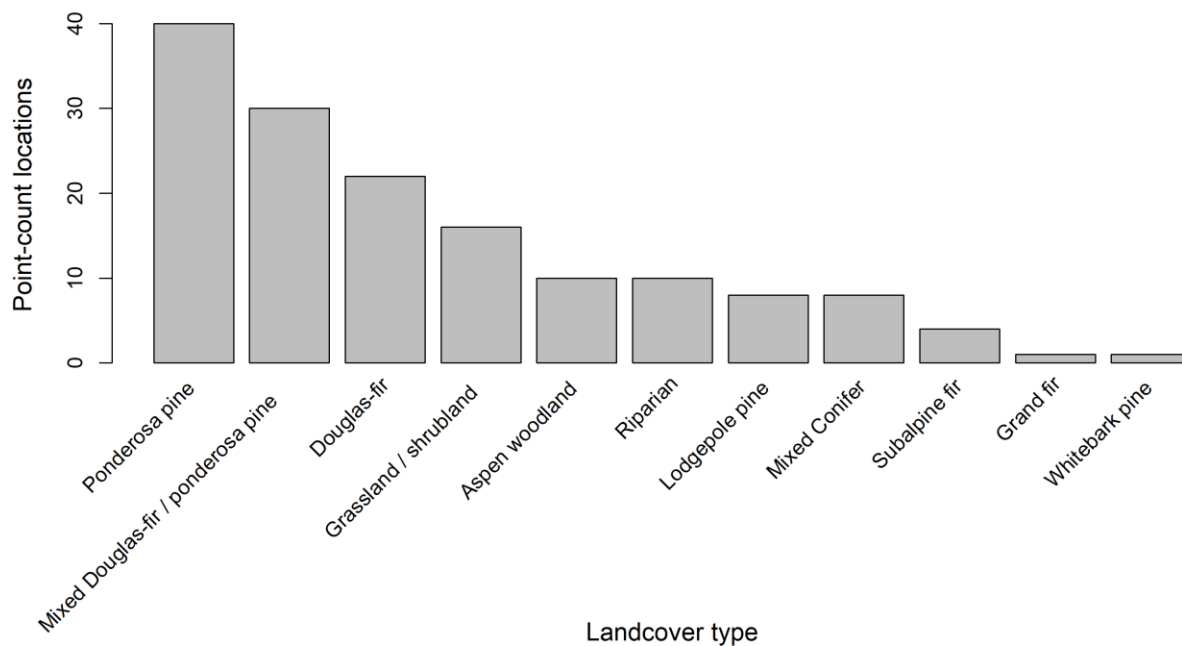


Figure A1.1. Landcover type at point-count locations (n = 150) within the Boise National Forest, Idaho, U.S.A. described using the southwest LANDFIRE (2013) database.

Table A1.2. Landcover and topographic variables ( $\bar{x} \pm SE$ ) within 0.4-, 1- and 3-km radius circular plots surrounding point-count locations (n = 150) where cavity nesting owls were present and where they were absent in the Boise National Forest, Idaho, USA during 2009-2010. Proportion of canopy cover, Douglas-fir, non-forest, and ponderosa as well as landcover diversity, which was calculated as the Shannon Diversity Index, were derived from the LANDFIRE (2013) dataset. The topographic variable aspect was transformed using a cosine transformation and TRI (terrain ruggedness index) was expressed as the average elevational difference between adjacent cells in a digital elevation model (The National Map 2013). Snag characteristics were only measured at the 0.4 km-scale using 10m-wide belt transects centered on the point-count location and totaling 1km in length.

Variable	Flammulated Owl		Northern Saw-whet Owl	
	Present (27)	Absent (123)	Present (45)	Absent (105)
Aspect <sub>0.4km</sub>	0.03±0.01	0.04±0.01	0.03±0.01	0.05±0.01
Canopy <sub>0.4km</sub>	0.42±0.17	0.36±0.15	0.35±0.16	0.38±0.15
Diversity <sub>0.4km</sub>	1.15±0.31	1.35±0.29	1.27±0.31	1.34±0.3
Douglas-fir <sub>0.4km</sub>	0.23±0.22	0.13±0.14	0.18±0.21	0.14±0.13
Non-forest <sub>0.4km</sub>	0.11±0.14	0.16±0.15	0.16±0.15	0.15±0.15
Ponderosa <sub>0.4km</sub>	0.28±0.24	0.27±0.2	0.29±0.21	0.26±0.21
TRI <sub>0.4km</sub>	8.07±2.37	8.34±2.9	7.36±2.83	8.69±2.72
Aspect <sub>1km</sub>	0.03±0	0.05±0.03	0.02±0.03	0.06±0.03
Canopy <sub>1km</sub>	0.4±0.08	0.37±0.08	0.35±0.07	0.38±0.09
Diversity <sub>1km</sub>	1.38±0.18	1.57±0.2	1.51±0.2	1.55±0.2
Douglas-fir <sub>1km</sub>	0.19±0.11	0.13±0.08	0.13±0.09	0.14±0.09
Non-forest <sub>1km</sub>	0.13±0.12	0.17±0.1	0.2±0.1	0.15±0.11
Ponderosa <sub>1km</sub>	0.3±0.21	0.26±0.16	0.29±0.18	0.26±0.17
TRI <sub>1km</sub>	8.47±2.09	8.87±2.3	8.54±2.35	8.91±2.23
Aspect <sub>3km</sub>	0.03±0	0.1±0.03	0.09±0.03	0.09±0.03
Canopy <sub>3km</sub>	0.38±0.08	0.38±0.08	0.37±0.07	0.38±0.09
Diversity <sub>3km</sub>	1.03±0.18	1.15±0.2	1.08±0.20	1.15±0.20
Douglas-fir <sub>3km</sub>	0.17±0.11	0.14±0.08	0.14±0.09	0.15±0.09
Non-forest <sub>3km</sub>	0.20±0.12	0.18±0.1	0.21±0.10	0.18±0.11
Ponderosa <sub>3km</sub>	0.29±0.21	0.23±0.16	0.27±0.18	0.23±0.17
TRI <sub>3km</sub>	8.69±2.09	9.11±2.3	9.25±2.35	8.95±2.23
# of Snags	11.4±8.03	12.7±26.00	8.6±7.14	14.1±27.90
Avg. DBH Snags	36.3±8.40	34.9±12.05	37.9±11.49	34.0±11.31

Table A1.3. Landcover and topographic variables ( $\bar{x} \pm SE$ ) within 0.4-, 1- and 3-km radius circular plots surrounding point-count locations where woodpeckers were present versus absent in the Boise National Forest, Idaho, USA during 2009-2010. Proportion of canopy cover, Douglas-fir, non-forest, and ponderosa as well as landcover diversity, which was calculated as the Shannon Diversity Index, were derived from the LANDFIRE (2013) dataset. The topographic variable aspect was transformed using a cosine transformation and TRI (terrain ruggedness index) was expressed as the average elevational difference between adjacent cells in a digital elevation model (The National Map 2013). Snag characteristics were only measured at the 0.4 km-scale using 10m-wide belt transects centered on the point-count location and totaling 1km in length.

Variable	Hairy Woodpecker		Northern Flicker		Pileated Woodpecker		Red-naped Sapsucker	
	Present (29)	Absent (121)	Present (42)	Absent (108)	Present (14)	Absent (136)	Present (27)	Absent (123)
Aspect <sub>0.4km</sub>	0.02±0.01	0.03±0.01	0.02±0.01	0.05±0.01	0.02±0.01	0.04±0.01	0.05±0.01	0.04±0.01
Canopy <sub>0.4km</sub>	0.36±0.15	0.42±0.16	0.33±0.15	0.39±0.15	0.43±0.15	0.36±0.15	0.37±0.17	0.37±0.15
Diversity <sub>0.4km</sub>	1.22±0.39	1.15±0.27	1.22±0.38	1.35±0.26	1.32±0.19	1.31±0.31	1.2±0.33	1.34±0.29
Douglas-fir <sub>0.4km</sub>	0.21±0.23	0.23±0.13	0.16±0.19	0.15±0.15	0.13±0.14	0.15±0.16	0.2±0.2	0.14±0.15
Non-forest <sub>0.4km</sub>	0.12±0.13	0.11±0.15	0.16±0.18	0.15±0.13	0.09±0.13	0.16±0.15	0.15±0.17	0.15±0.14
Ponderosa <sub>0.4km</sub>	0.31±0.25	0.28±0.19	0.35±0.26	0.24±0.18	0.18±0.12	0.28±0.21	0.32±0.28	0.26±0.19
TRI <sub>0.4km</sub>	7.21±2.56	8.07±2.81	7.22±2.76	8.7±2.74	8.66±2.45	8.25±2.85	7.12±2.48	8.55±2.82
Aspect <sub>1km</sub>	0.04±0.01	0.05±0.03	0.07±0.04	0.04±0.02	0.07±0.05	0.05±0.02	0.05±0.04	0.05±0.02
Canopy <sub>1km</sub>	0.36±0.07	0.38±0.08	0.35±0.08	0.39±0.08	0.41±0.08	0.37±0.08	0.37±0.1	0.37±0.08
Diversity <sub>1km</sub>	1.45±0.22	1.56±0.19	1.44±0.22	1.58±0.18	1.57±0.14	1.54±0.2	1.5±0.21	1.55±0.19
Douglas-fir <sub>1km</sub>	0.16±0.08	0.13±0.09	0.13±0.08	0.14±0.09	0.11±0.06	0.14±0.09	0.18±0.1	0.13±0.09
Non-forest <sub>1km</sub>	0.14±0.11	0.17±0.11	0.16±0.1	0.17±0.11	0.2±0.13	0.16±0.1	0.15±0.1	0.17±0.11
Ponderosa <sub>1km</sub>	0.34±0.22	0.25±0.16	0.34±0.22	0.24±0.14	0.18±0.08	0.28±0.18	0.3±0.21	0.26±0.16
TRI <sub>1km</sub>	7.92±2.47	9.01±2.2	7.84±2.62	9.17±2.01	8.87±2.38	8.79±2.26	7.48±2.18	9.09±2.25
Aspect <sub>3km</sub>	0.07±0.01	0.1±0.03	0.15±0.04	0.06±0.02	0.22±0.05	0.08±0.02	0.15±0.04	0.08±0.02
Canopy <sub>3km</sub>	0.35±0.07	0.38±0.08	0.35±0.08	0.39±0.08	0.38±0.08	0.38±0.08	0.39±0.1	0.37±0.08
Diversity <sub>3km</sub>	1.03±0.22	1.15±0.19	1.03±0.22	1.16±0.18	1.14±0.14	1.12±0.2	1.04±0.21	1.14±0.19
Douglas-fir <sub>3km</sub>	0.14±0.08	0.14±0.09	0.11±0.08	0.16±0.09	0.12±0.06	0.15±0.09	0.17±0.1	0.14±0.09

Non-forest <sub>3km</sub>	0.18±0.11	0.19±0.11	0.17±0.1	0.19±0.11	0.23±0.13	0.18±0.1	0.17±0.1	0.19±0.11
Ponderosa <sub>3km</sub>	0.31±0.22	0.22±0.16	0.32±0.22	0.21±0.14	0.17±0.08	0.25±0.18	0.27±0.21	0.23±0.16
TRI <sub>3km</sub>	8.46±2.47	9.18±2.2	8.21±2.62	9.39±2.01	0.02±0.01	9.04±2.26	8.25±2.18	9.21±2.25
# of Snags	19.4±48.48	10.8±11.78	17.6±42.07	10.6±10.55	15.9±18.82	12.1±24.25	10.3±8.4	12.9±25.96
Avg. DBH Snags	32.6±10.79	35.8±11.59	34.7±10.81	35.2±11.67	34.7±12.92	35.2±11.36	39.2±12.44	34.3±11.11

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