

**Appendix B. Relationships between thinning and breeding bird species abundance in conifer forests in the Northern Pacific Rainforest Bird Conservation Region (BCR 5).**

Species <sup>1</sup>	Significantly Higher Abundance In Thinned <sup>2</sup>	Similar (Non-Significant) Abundance Thinned and Unthinned <sup>3</sup>	Significantly Lower Abundance in Thinned <sup>2</sup>	Comments
<b>American Robin</b>	B, D, E, F, J <sup>4</sup>	G, H, K		Thinning usually results in higher abundance in the short-term (1–5 years), with no change in abundance in the mid- to long-term (5–15 years). Heavier intensity thinning appears more likely to result in increased abundance in the short-term (1–5 years) than lighter intensity thinning.
<b>Band-tailed Pigeon</b>		H		Limited data suggests thinning results in no change in abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Black-headed Grosbeak</b>		B, G, K		Limited data suggests thinning results in no change in abundance in the short-, mid-, or long-terms (1–15 years).
<b>Black-throated Gray Warbler</b>		B, C, G	D, K	Mixed results suggest thinning results in lower abundance or no change in abundance in the short- and mid- to long-term (1–15 years); thus local effects and/or thinning intensity may result in variability in response.
<b>Brown Creeper</b>	H, K	F, G, L	C, D	Mixed results suggest thinning usually results in lower abundance in the short-term (1–5 years) and no change in abundance in the mid- and long-term (5–20 years) or higher abundance in the mid- to long-term (5–15 years); thus local effects and/or thinning intensity may result in variability in response.
<b>Calliope Hummingbird</b>		G		Limited data suggests thinning results in no change in abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Cassin's Vireo</b>	G			Limited data suggests thinning results in higher abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Chestnut-backed Chickadee</b>	F, H	A, B, D, E, J, K, L	C	Mixed results suggest thinning usually results in no change in abundance in the short- and mid- to long-term (1–20 years), or higher abundance in the mid-term (5–10 years); thus local effects and/or thinning intensity may result in variability in response.
<b>Chipping Sparrow</b>	G			Limited data suggests thinning results in higher abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Dark-eyed Junco</b>	B, D, E, F, J, K	C, G	H	Thinning usually results in higher abundance in the short-term (1–5 years) and mid- to long-term (5–15 years); although local effects may result in no change or lower abundance in the short-term (1–5 years) or mid-term (5–10 years). Thinning intensity (light to heavy) does not appear to make much of a difference.
<b>Dusky Flycatcher</b>	G			Limited data suggests thinning results in higher abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Evening Grosbeak</b>	D, H, K	F, G		Mixed results suggest thinning results in higher abundance or no change in abundance in the short- and mid- to long-terms (1–15 years); thus local effects and/or thinning intensity may result in variability in response.
<b>Fox Sparrow</b>		E, G		Limited data suggests thinning results in no change in abundance in the short-term (1–5 years) or mid-term (5–10 years); long-term effects on abundance not reported.

**Continued**

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<b>Golden-crowned Kinglet</b>		E, F, H, L	B, C, D, J, K	Mixed results suggest thinning usually results in lower abundance in the short-term (1–5 years) and mid- to long-term (5–15 years) or no change in abundance in the mid- and long-term (5–20 years). Heavier intensity thinning appears more likely to result in reduced abundance than lighter intensity thinning.
<b>Gray Jay</b>	B	D, H, K		Limited data suggests thinning usually results in no change or an increase in abundance in the short-term (1–5 years) and no change in abundance in the mid- to long-term (5–15 years).
<b>Hairy Woodpecker</b>	A, B, D, K, L	C, G, H		Mixed results suggest thinning usually results in higher abundance in the short-, mid-, and long-terms (1–20 years); although local effects and/or thinning intensity may result in no change in abundance in the short-term (1–5 years) or mid-term (5–10 years).
<b>Hammond's Flycatcher</b>	B, D, G, J, K, L	C		Consistent response that thinning usually results in higher abundance in the short-, mid-, and long-terms (1–20 years), although local effects and/or thinning intensity may result in no change in abundance in the short-term (1–5 years).
<b>Hermit Thrush</b>		G	B, C, E, J	Limited data suggests thinning results in lower abundance in the short- or mid-term (1–10 years), or no change in abundance in the mid-term (5–10 years); long-term effects on abundance not reported.
<b>Hermit Warbler</b>	G, J	C, F, H, K, L	B, D	Mixed results suggest thinning usually results in lower abundance in the short- to mid-term (1–10 years), with local effects resulting in no change in abundance or higher abundance in the mid- to long-term (5–20 years). Heavier intensity thinning appears more likely to result in reduced abundance than lighter intensity thinning in the short-term (1–5 years).
<b>Hutton's Vireo</b>	H	B, C, L	D, F, K	Mixed results suggest thinning results in lower abundance or no change in abundance in the short-, mid- and long-terms (1–20 years) or higher abundance in the mid-term (5–10 years); thus local effects and/or thinning intensity may result in variability in response.
<b>Lazuli Bunting</b>		G		Limited data suggests thinning results in no change in abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>MacGillivray's Warbler</b>	B, H, J	G		Limited data suggests thinning results in higher abundance in the short- and mid-term (1–10 years) or no change or higher abundance in the mid-term (5–10 years); long-term effects on abundance not reported.
<b>Mountain Chickadee</b>	G			Limited data suggests thinning results in higher abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Mountain Quail</b>		G		Limited data suggests thinning results in no change in abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Nashville Warbler</b>		G		Limited data suggests thinning results in no change in abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Northern Flicker</b>	G			Limited data suggests thinning results in higher abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Orange-crowned Warbler</b>	E			Limited data suggests no change in abundance in the short-term (1–5 years); mid- and long-term effects on abundance not reported.

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<b>Pacific-slope Flycatcher</b>		B, E, F	D, H, J, K, L	Mixed results suggest thinning results in no change in abundance in the short-term (1–5 years) or lower abundance in the short-, mid-, and long-term (1–20 years). Heavier intensity thinning appears more likely to result in reduced abundance than lighter intensity thinning.
<b>Pileated Woodpecker</b>		G		Limited data suggests thinning results in no change in abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Purple Finch</b>		B, G		Limited data suggests thinning results in no change in abundance in the short- and mid-term (1–10 years); long-term effects on abundance not reported.
<b>Red-breasted Nuthatch</b>	F, G, H, K, L	A, C, D, J		Thinning usually results in no change in abundance in the short- or mid-term (1–10 years), but higher abundance in the mid- and long-term (5–20 years).
<b>Red-breasted Sapsucker</b>	B	E, G		Limited data suggests thinning results in higher abundance in the short-term (1–5 years) with no change in abundance in the mid-term (5–10 years); long-term effects on abundance not reported.
<b>Rufous Hummingbird</b>	B, C			Limited data suggests thinning results in higher abundance in the short-term (1–5 years); mid- and long-term effects on abundance not reported.
<b>Song Sparrow</b>	H	E		Limited data suggests thinning results in no change in abundance in the short-term (1–5 years) and higher abundance in the mid-term (5–10 years); long-term effects on abundance not reported.
<b>Spotted Towhee</b>	H	G		Limited data suggests thinning results in higher abundance or no change in abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Steller's Jay</b>	C	E, G, H, J, L	D	Thinning usually results in no change in abundance in the short-, mid-, and long-term (1–20 years), although local effects and/or thinning intensity may result in lower or higher abundance in the short-term (1–5 years).
<b>Swainson's Thrush</b>	H, J, L	B, E, K	D	Mixed results suggest thinning most often results in no change in abundance in the short- and mid- to long-terms (1–15 years), although local effects may result in lower abundance in the short-term (1–5 years) and higher abundance in the mid- and long-term (5–20 years).
<b>Townsend's Solitaire</b>	B, D, G	C		Limited data suggests thinning usually results in higher abundance in the short- and mid-term (1–10 years), although local effects and/or thinning intensity may result in no change in abundance in the short-term (1–5 years); long-term effects on abundance not reported.
<b>Townsend's Warbler</b>		H	E	Limited data suggests thinning results in lower abundance in the short-term (1–5 years) and no change in abundance in the mid-term (5–10 years); long-term effects on abundance not reported.
<b>Varied Thrush</b>		E, F, L	B, D	Thinning usually results in lower abundance in the short-term (1–5 years) and no change in abundance in the mid-term (5–10 years) and long-term (10–20 years). Heavier intensity thinning appears more likely to result in reduced abundance than lighter intensity thinning.
<b>Warbling Vireo</b>	D, G, K	B		Mixed results suggest thinning results in higher abundance or no change in abundance in the short-term (1–5 years) with higher abundance in the mid- to long-term (5–15 years).

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<b>Western Tanager</b>	B, C, D, H, J, K	G, L		Thinning usually results in higher abundance in the short-term (1–5 years) and higher abundance or no change in abundance in the mid- to long-term (5–15 years).
<b>White-headed Woodpecker</b>	G			Limited data suggests thinning results in higher abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Wilson's Warbler</b>	H, L	B, D, K	E	Mixed results suggest thinning most often results in no change in abundance in the short- and mid- to long-term (1–15 years); although local effects and/or thinning intensity may result in lower abundance in the short-term (1–5 years) and higher abundance in the mid- and long-term (5–20 years).
<b>Winter Wren</b>	F, K	D, L	B, H, J	Mixed results suggest highly variable response; thinning can result in lower abundance in the short- and mid-term (1–10 years) or no change in abundance in the short-term (1–5 years) or long-term (10–20 years) and higher abundance in the mid- to long-term (5–15 years); thus local effects and/or thinning intensity may result in variability in response.
<b>Western Wood-pewee</b>		G		Limited data suggests thinning results in no change in abundance in the mid-term (5–10 years); short- and long-term effects on abundance not reported.
<b>Yellow-rumped Warbler</b>	C, G			Limited data suggests thinning results in higher abundance in the short-term (1–5 years) and mid-term (5–10 years); long-term effects on abundance not reported.

<sup>1</sup> Species listed here are those cited in the studies below that are considered to be associated with young conifer forests in the Guide.

<sup>2</sup> Higher and lower abundances in thinned stands reflect statistically significant differences as reported in the studies.

<sup>3</sup> Similar abundance between thinned and unthinned indicates there was no significant difference reported in the studies.

<sup>4</sup> Letters correspond to studies listed in the table below (ordered by years post-thin).

Reference	Study Type <sup>5</sup>	Years Post-Thin	Level of thinning <sup>6</sup>	Location
A Weikel (1997)	experimental	1–2	Moderate to Heavy	Northern Coast Range, OR
B Hagar et al. (2004)	experimental	1–4	Moderate to Heavy	West-central Cascades, OR
C Dillingham et al. (2007)	experimental	2–3	Moderate to Heavy	Southern Coast Range, OR
D Hayes et al. (2003)	experimental	1–6	Moderate to Heavy	Northern Coast Range, OR
E Dellasalla et al. (1996)	observational	3–5	Light to Moderate	Southeast AK (Prince of Wales Island)
F Artman (1990)	observational	4–6	Moderate to Heavy	West-central Cascades, WA
G Siegel and DeSante (2003)	observational	5–11	Light to Moderate	Northwestern Sierra Nevada, CA
H Manuwal and Palazotto (2004)	observational	8–11	Light and Heavy	Puget Lowlands, WA
J Hagar and Friesen (2009)	experimental	10–12	Light to Heavy	West-central Cascades, OR
K Hagar et al. (1996)	observational	5–15	Light to Moderate	Central and Northern Coast Range, OR
L Muir et al. (2002)	observational	10–24	Light to Moderate	Central Coast Range, OR

<sup>5</sup> The summary includes both experimental studies (pre- and post-thinning in the same stand) and observational studies (comparing thinned and unthinned stands in two different places).

<sup>6</sup> The description of the level of thinning was taken from the study or modified slightly to be relative to the other studies. It is based generally on the volume removed and remaining tree densities, although data presented in the studies were not always sufficient to apply consistent standards of light, moderate, and heavy thinning.