Appendix 10. Determining wildlife tree dbh recommendations for cavity-nesters

Resource managers often apply minimum size recommendations (e.g., wildlife tree dbh) to achieve wildlife conservation objectives. The use of minimum dbh sizes for retention of wildlife trees may not be the best management practice for cavity-nesters. Larger diameter wildlife trees provide important features including larger diameter cavities and thicker insulation around the nest cavity. An alternative approach to minimum sizes is to use the mean plus one standard deviation. Since information is not always available for a specific species of cavity-nester, it may be possible to use information from a primary cavity-nester to approximate the characteristics of the trees that will be selected by the secondary cavity-nester. Both the Pileated Woodpecker (*Dryocopus pileatus*) and Northern Flicker (*Colaptes auratus*) are primary cavity nesters and provide nesting and roosting cavities for many secondary cavity users. A summary of the nesting requirements of these two species is provided in Tables 10-1 and 10-2.

Table 10-1. Characteristics (mean ± SD) (cm) of Pileated Woodpecker nest trees in coastal and interior ecosystems

Location	Forest type	N	Tree dbh (cm)	Tree height (m)	Nest height (m)	Citation
Coastal ecosystems						
Western Washington	Western hemlock, Pacific silver fir	27	100.5	39.7	35.2	Aubrey and Raley (1996)
Oregon Coast Ranges	Western hemlock	15	68.9 ± 25	26.5 ± 16	19.9 ± 11	Mellen (1987)
Oregon Coast Ranges	Western hemlock	6	67.0 ± 20.3	26.5 ± 14.7	16.7 ± 5.4	Nelson (1988)
South Cascades	Mixed conifer to Douglas-fir	2	88.0 ± 19.8	40.0 ± 4.2	19.0 ± 4.2	Lundquist (1988)
Southeast Vancouver Island	CWHxm, CDF	7	82 ± 42	22 ± 13.8	17.4 ± 9.3	Hartwig (1999)
North Vancouver Island	CWHxm, CWHvm, MHmm	2	84.2 ± 17.5	36.7 ± 9.1	16.1 ± 3.4	Deal and Setterington (2000)
Interior ecosystems						
Blue Mountains, Oregon	Coniferous	105	84	28	15	Bull (1987)
Okanogan National Forest	Coniferous	6	84.2 ± 17.5	36.7 ± 9.1	16.1 ± 3.4	Madsen (1985)
Northern Montana	Coniferous	89	73.4 ± 1.9	29.0 ± 1.0	15.9 ± 0.6	McClelland and McClelland (1999)
South-central B.C.	Deciduous (IDF)	20	40.5 ± 7.1	19.2 ± 6.3	9.2 ± 1.8	Harestad and Keisker (1989)
West-central Alberta and northern B.C.	Deciduous	98	44.0			Bonar (1997)

Table 10-2. Characteristics (mean ± SD) of Northern Flicker nest trees in coastal and interior ecosystems

Location	Forest type	N	Tree dbh (cm)	Tree height (m)	Nest height (m)	Citation
Coastal ecosystems						
Northern Vancouver Island	CWHxm, CWHvm, MHmm	85	73.1 ± 3.4	22.6 ± 1.1		Deal and Setterington (2000)
Oregon Coast Ranges	Western hemlock	9	95.8 ± 30.0	38.6 ± 9.6	35.6 ± 10.8	Nelson (1988)
South Cascades	Mixed conifer to Douglas-fir	3	127.7 ± 38.5	46.3 ± 15.0	38.7 ± 20.6	Lundquist (1988)
Interior ecosystems						
Okanogan National Forest	Coniferous	16	70.4 ± 27.2	20.8 ± 11.9	14.3 ± 9.7	Madsen (1985)
South-central B.C.	Deciduous	17	31.9 ± 9.9	14.7 ± 7.8	5.7 ± 3.7	Harestad and Keisker (1989)
Riske Creek, B.C.	Deciduous	159	33.87 ± 10.34		3.32 ± 2.82	Wiebe (2001)

Many secondary cavity-nesters depend on more than one primary cavity-excavator for suitable cavities. Thus several data sets can be combined by using a weighted mean, which will give proportional weight to studies according to their sample sizes. This method may be used to calculate an optimum recommended dbh tree size for retention in coastal and interior ecosystems (see Table 10-3 for examples or the Pileated Woodpecker and Northern Flicker).

1. Derive recommended mean from mean values from studies on appropriate species of cavity-nesters.
2. Standardize data from studies by converting standard errors to standard deviation. Standard deviation = standard error * $\sqrt{n}$ (Zar 1996).
3. Include data from generally similar ecosystems (i.e., northwestern U.S. and southwestern Canada and separate interior from coastal studies when appropriate).
4. Give more weight to studies that have larger sample sizes by using a weighted mean. The recommended mean is a weighted mean that is being used here to combine the means from two or more studies while adjusting for differences between subgroup frequencies (weighted mean = $\sum x_i * n_i / \sum n_i$). A pooled standard deviation can be calculated from the studies. Pooled SD = $\sqrt{[\sum [SD_i^2 (n_i - 1)] / [\sum n_i - G]}$ where G is the number of groups or studies (R. Davidson, statistics professor, Univ. Victoria, BC, retired).

Table 10-3. Recommendations for optimum size dbh (mean + 1SD) (cm) for Northern Flicker and Pileated Woodpecker in British Columbia based on weighted mean and pooled standard deviation

	Northern Flicker		Pileated Woodpecker	
Location	**Coniferous**	**Deciduous**	**Coniferous**	**Deciduous**
Interior ecosystems	70–98[a] or larger	34–44 or larger	74–80 or larger	41–48 or larger
Coastal ecosystems	77–88 or larger		74–102 or larger	

a After Madsen (1985) only.

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