

**Supplemental Material (Leclerc, Daniels and Carroll)**

We made the following adaptations to plot-level attributes when applying the western spruce budworm susceptibility index by Wulf and Carlson (1985).

1. *Coefficient of variation of DBH*

Originally, Wulf and Carlson (1985) calculated the coefficient of variation of tree heights (m). We used DBH (cm) since it was consistently measured for all trees and calculated the coefficient of variation ( $CV_{DBH}$ ) as follows:

$$CV_{DBH} = \frac{(SD_{DBH})}{(Mean_{DBH})} * 100$$

where,  $SD_{DBH}$  is the standard deviation and  $Mean_{DBH}$  is the mean of the DBH of measured trees. The calculated coefficient of variation was converted to the corresponding index value according to Wulf and Carlson (1985):

Coefficient of variation	Index value
0-10	0.9
11-20	1.1
21-30	1.3
31-40	1.5
41+	1.7

2. *Crown cover*

Wulf and Carlson (1985) used allometric equations to estimate crown cover from tree density (Bousfield *et al.* 1986). We directly measured total crown cover (%) using hemispheric photographs; total cover also represented host and late-successional host-tree cover since Douglas-fir comprised 95–100% of trees and all plots were in late-successional forests. Crown cover was converted to the corresponding index value according to Wulf and Carlson (1985):

Crown cover (%)	Index values		
	Total trees	Host trees	Late-successional host trees
0-10	0.8	0.1	0.6
11-20	0.8	0.3	1.0
21-30	1.1	0.5	1.3
31-40	1.1	0.8	1.6
41-50	1.3	1.0	1.8
51-60	1.3	1.3	2.0
61-70	1.4	1.6	2.1
71-80	1.4	1.8	2.2
81-90	1.5	2.1	2.3
91-100	1.5	2.4	2.4

### 3. *Maturity*

Maturity was calculated as the mean of the basal-area-weighted age of the host trees in each plot (Wulf and Carlson 1985). We calculated the basal-area-weighted age of individual trees using the following equation:

$$\text{Basal - area - weighted age}_{tree} = \text{age}_{tree} * \left[ \frac{BA_{tree}}{Total\ BA} \right] * 4.356$$

where,  $\text{age}_{tree}$  is the age in years from tree cores or estimated using regression;  $BA_{tree}$  is the basal area ( $\text{m}^2$ ) of each tree; Total BA for each plot is the sum of basal areas of all trees in the plot; and, 4.356 is the conversion from metric to imperial units to match Wulf and Carlson's (1985) original indices:

Mean basal-area-weighted age	Index value
1-25	0.3
26-50	1.0
51-75	1.1
76-150	1.2
150+	1.3

### 4. *Vigour*

Vigour is represented by plot-level basal area relative to average maximum basal areas determined from stocking-level assessments of forest inventory data for each sub-region and habitat-type group (Wulf and Carlson 1985). We calculated the maximum basal area from the fully-stocked control plots (Pers. Comm. K. Day, Manager, Alex Fraser Research Forest), then calculated relative basal area as:

$$\text{Relative basal area} = \left( \frac{Total\ BA}{Average\ maximum\ BA} \right) * 100$$

where, Total BA ( $\text{m}^2 \text{ha}^{-1}$ ) sum of the basal areas of trees in each plot and scaled to one hectare; average maximum BA ( $\text{m}^2 \text{ha}^{-1}$ ) was the mean plot-level basal area per hectare from the upper quartile of the control 2015 plots. The calculated relative basal area was converted to the corresponding index value according to Wulf and Carlson (1985):

Relative basal area	Index value
1-40	1.5
41-60	1.3
61-80	1.1
81+	0.9

**References**

- Bousfield, W. E., Wulf, N. W., and Carlson, C. E. (1986). *Rating Susceptibility of Stands to Western Spruce Budworm: Users Guide and Documentation to SBW Hazard*. Cooperative Forestry and Pest Management Report 86-7. Missoula, MT: USDA Forest Service, Northern Region, 22.
- Wulf, N. W., and Carlson, C. E. (1985). "Rating stand hazard to western spruce budworm," in *tech. coords. Managing Trees and Stands Susceptible to Western Spruce Budworm*. Technical Bulletin 1695, eds M. H. Brookes, J. J. Colbert, R. G. Mitchell, and R. W. Stark (Washington, DC: USDA Forest Service), 51–54.