

Estimating Natural Regeneration Following Mountain Pine Beetle Attacks in British Columbia Using Nearest Neighbour Analyses

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Abstract: Natural regeneration dynamics following mountain pine beetle attack differ from those following partial cutting. In infested stands, dead trees remain standing for several years, creating different light conditions for regenerating trees. However, since nearest neighbour imputation is multivariate and retains the variability of the reference data, nearest neighbour imputation previously used to predict regeneration after partial cutting was tested for imputing regeneration in mountain pine beetle (MPB) attacked stands. Data were gathered from MPB damaged stands in three different Biogeoclimatic Ecosystem Classification zones of British Columbia (Interior Douglas Fir (IDF), Sub-Boreal Pine Spruce and Montane Spruce (MS) zone). Measures of the overstory and regeneration were obtained in 1987, shortly after attack, and repeated in 2001, after much of the regeneration response was complete. Most similar neighbour (MSN) imputation based on a single nearest neighbour and the most similar neighbour distance metric was used to estimate 2001 regeneration stems per ha for three species groups and four size classes (12 variables) using 1987 overstory variables. Overstory variables included snag characteristics to reflect the changes due to MPB attack. Seventy-five percent of the data with 1987 overstory and 2001 regeneration data were used as the reference dataset and the remaining twenty-five percent were considered target data. Generally, larger regeneration size classes had smaller positive or negative values with lower RMSE values than smaller size classes. This was as expected, since the smallest class is more dynamic with recent establishment of seedlings and high mortality. The use of MSN for these stands is questioned, since the overstory structure is not static, and the use of MSN over time can produce logically inconsistent results. Other methods were also considered, particularly the use of a complex establishment model called SORTIE-ND, and the development of a system of equations as alternatives for estimating the 12 regeneration variables simultaneously.

Key Words: most similar neighbour (MSN), stand dynamics, variable-space nearest neighbour analysis

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