

MEMORIES OF MIXED-SEVERITY DISTURBANCE REGIMES FROM PONDEROSA PINE–DOUGLAS-FIR AGE STRUCTURES, SOUTHWESTERN BRITISH COLUMBIA

Carmen M. Wong

Senlin Consulting, 651 Commonage Road, Vernon, BC V1H 1G3, Canada

Kenneth P. Lertzman

School of Resource and Environmental Management, Simon Fraser University, Burnaby, BC V5A 1S6, Canada

Emily K. Heyerdahl

USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, P.O. Box 8089, Missoula, MT 59807

ABSTRACT

We used temporal and spatial patterns in establishment of ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) to infer the influential disturbance regime at both the stand level and across the study area over the last 200 years in the lower Stein Valley, southwestern British Columbia. The fine-scale topography and the lack of European disturbance in the study area allowed us to simultaneously examine the relative influence of disturbance severity, regional climate, and topography on forest structure. Stands on seven distinct, adjacent terraces (total 28 ha) were sampled, each bounded by the Stein River, steep slopes, streams, and/or rocky outcrops. We found evidence of a mixed-severity disturbance regime—approximately 24% of the sampled area was multi-aged (influenced by low-severity disturbances), 53% was structured by multiple cohorts (moderate-severity), and 23% by single cohorts (high-severity). The heterogeneity suggests the strong influence of topography in controlling disturbance regimes of all severity in the lower Stein Valley. Even though low-severity disturbances predominantly influenced only one-fourth of the area, strong empirical relationships between the historical mean fire interval and the presence of ponderosa pine, size of Douglas-fir, the degree of multi-agedness, and the volume of dead wood in the stands indicate the importance of such fires. At a larger scale of analysis, the study area-level, a moderate-severity disturbance regime was evident from the multiple cohorts in the combined age-class distribution and patterns of spatially autocorrelated establishment. The dependence of the interpretation of establishment patterns on the scale of analysis suggests a moderate-severity disturbance regime is simply a larger-scale expression of a mix of low- and higher-severity disturbances. Our observations suggest that fine-scale heterogeneity in disturbance severity is important at the northern extent of ponderosa pine where there is influential topography.

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