

Identifying Ice-Jam Flooding Events through the Application of Dendrogeomorphological Methods

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Abstract

In this research, we explore whether a dendrogeomorphological assessment of tree scarring can accurately summarize past ice-jam flooding events occurring at a given reach of a river. A sample site was chosen with a history of ice-jam flooding located in close proximity to a river gauge station. Samples were collected along a 200-metre stretch of riverbank to capture the variation in elevations and possible different ice-jam flooding events. Disk samples were collected from trees with visual scarring evidence that indicated they had endured a past ice-jam event. Tree cores from an adjacent stand were collected to create a master chronology for each of the sampled species. Tree disks and cores were analyzed under a microscope using a Velmex stage system, then visually and statistically crossdated using the program COFECHA. Based on the last year of tree growth, years of individual injury events were established. The years of injury event dates were compared against the years of highest instantaneous maximum water elevations from gauged river data. The two data sets correlated, as years with highest recorded injury event dates were also the years of highest instantaneous water level elevations. The most common years of injury event dates were directly reflected in the top five years of highest river instantaneous water level elevations. In addition, the year of 2020 had the highest water elevations in the past 27 years, which was again reflected in the dendrogeomorphological data as the injury event year of 2020 was recorded on over 90% of the sampled tree disks. The correlation found between the gauged river data and the dendrogeomorphological data strongly suggests that past ice-jam flooding event dates can accurately be determined through the analysis of trees in riverbank stretches that have been impacted by ice-jams. The relationship of the gauged river data to the dendrogeomorphological data will therefore allow researchers to determine ice-jam site histories in remote areas where no gauged data exists. The site histories can provide information such as the years or heights that past ice-jam flooding occurred, which could then be used in ice-jam flooding hazard assessments.

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