



## **Analysis of ice jam floodings from the study of riparian tree scars**

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Ice jam floodings create important damages by inducing water stages that are unlikely to occur by free water floodings. They occur in relation with distinct morphological features and hydrometeorological events. However, their occurrences and spatial extensions are still difficult to assess and there is a need for the use of field-based indicators to adequately document this fluvial risk. We used tree scars created by glacial abrasion during ice jam flooding to examine both the occurrence and spatial extension of ice jam flooding in rivers of Eastern Québec. Scars were located and described along two river reaches. On the Ouelle River, scar densities and relative heights above bankfull were documented along 21 km to identify river sections prone to ice jams floodings. On the Matane River, absolute heights of scars were mapped for a 4 km ice jam flood prone reach. Scar heights, along with survey information from landowners, allow to identify the magnitude of the ice jam floods along the river reach and to produce flood maps. Finally, on the Ouelle River, 177 trunk cross-sections were extracted from 40 trees and analysed to identify dates of scar formation and ice jam hydrological and climatic characteristics for the last 60 years. The records suggest various return periods for ice jams and highlight that hydrological and climatic conditions for ice jam instigation differ between the linear and the meandering reaches along the Ouelle River. This paper highlights the beneficial use of tree scars for the analysis of space-time dynamics of ice jam floodings.