



Historic (1940 to present) changes in Lillooet River planform (BC, Canada)

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We conducted a geomorphological study of changes in the planform of Lillooet River (Coast Mountain, British Columbia, Canada) over the past 75 years. The study involved identification and interpretations of channel changes in the reach of the river between Mount Meager (the source of the landslide) and Pemberton Meadows. Lillooet River flows about 95 km southeast from its headwaters at Lillooet Glacier to Lillooet Lake near Pemberton, the largest community in the valley. Between the mouth of Meager Creek and Pemberton Meadows, the river is unregulated and has a braided planform resulting from the very high delivery of sediment due to frequent landslides and debris flows sourced on the Mount Meager volcanic complex. Below Pemberton Meadows, the river occupies a single channel confined between dikes.

A rich archive of historical vertical aerial photographs exists for the study area, In addition, a high-resolution digital elevation model was produced from LiDAR data acquired in 2015. We processed each set of photos dating back to 1940 with the software Agisoft Photoscan to produce high resolution orthophotos. Analysis of these datasets, complemented with field investigation, showed that the river channel in the braided reach shifted laterally up to 550 m between 1981 and 2010; likely caused in part by five floods with peak discharges of more than 800 m³/s and four landslides on the flanks of Mount Meager massif with volumes up to 13 x 10⁶ m³. Channel avulsions were probably triggered by accumulation of in-channel rafts of coarse woody debris and are particularly evident in photos taken soon after floods. We conclude that significant changes in river morphology and sediment supply are episodic and related to large landslides and floods. This study is providing information that is relevant for managing flood hazards in the Lillooet River valley.