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Suspended sediment fluxes in the proglacial zone of a retreating glacier, Cariboo Mountains, British Columbia

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We examine seasonal sediment flux within the proglacial zone of the Castle Creek Glacier, an alpine glacier in the Cariboo Mountains of British Columbia. The glacier retreated 1.2 km in the past 50 years. Suspended sediment fluxes at three stations across the proglacial zone were monitored for 34 days in July and August, 2008 in order to determine sediment fluxes between the stations due to the exposure of recent glacial material in the proglacial zone. Automatic pumping samplers, a pressure transducer, and turbidity sensors were deployed, and 459 water samples were retrieved from three stations and analysed gravimetrically for their suspended sediment concentration (SSC). A stage-discharge (Q) rating relationship was established at the distal end of the proglacial zone and an hourly Q record was maintained from 9 July – 12 August 2008. The SSC v Q rating relationship varied with increasing distance from the glacier snout. The degree of scatter increased with distance from the glacier snout, and this increased scatter is believed to arise from entrainment of proglacial sediments between the glacier snout and distal monitoring station. Suspended sediment loads were estimated by using SSC and Q data integrated over 1 and 3-hr; sediment flux estimated by both sampling frequencies accord. Estimated sediment loads for the proximal, middle, and distal stations respectively averaged 2349 $\pm$ 259, 1796 $\pm$ 27, and 2758 $\pm$ 38 t. Castle Creek Glacier proglacial zone is capable of changing annual suspended sediment yields from 837 $\pm$ 91 t km-2 yr-1 near the glacier snout to 580 $\pm$ 9 t km-2 yr-1 just 660 m downstream in the middle of the proglacial zone, then raising them again to 800 $\pm$ 11 t km-2 yr-1 over 1.2 km from the glacier. These values highlight the importance of the glacier forefield in changing suspended sediment yields, and emphasise the potential impact of receding glaciers on sediment yields in both mountain streams and downstream lowland rivers.