

The importance of temporal changes in gravel-stored fine sediment on habitat conditions in a salmon spawning stream.

ELLEN L. PETTICREW* & JOHN F. REX

Geography Program, University of Northern British Columbia, 3333 University Way, Prince George, British Columbia V2N 4Z9, Canada
ellen@unbc.ca; ellen.petticrew@plymouth.ac.uk

Abstract Sediment (<2 mm and <75 μm) was collected in a productive sockeye spawning stream in northern British Columbia, Canada, using infiltration gravel bags from the pre-spawn through to the post-spawning period of 2002. As much of the gravel-stored fine sediment (<75 μm) exists as larger,

implication of these results is that both the quantity and quality of the organic matter present in a stream play a significant role in the generation, transfer and storage of aggregated sediment in stream systems. While the total mass of gravel-stored organic material may be small relative to the <2-mm inorganic fraction, it has the potential to decrease the quality of the inter-gravel habitat as these organic-laden sediments are mineralized by aerobic bacteria which use oxygen required for the incubating fish eggs. The objective of this work was to evaluate the temporal changes in the gravel-stored fine sediment in the context of: (a) fish activity (spawning and die-off) and (b) inter-gravel oxygen concentrations which reflect the habitat quality.

METHODS

Study site

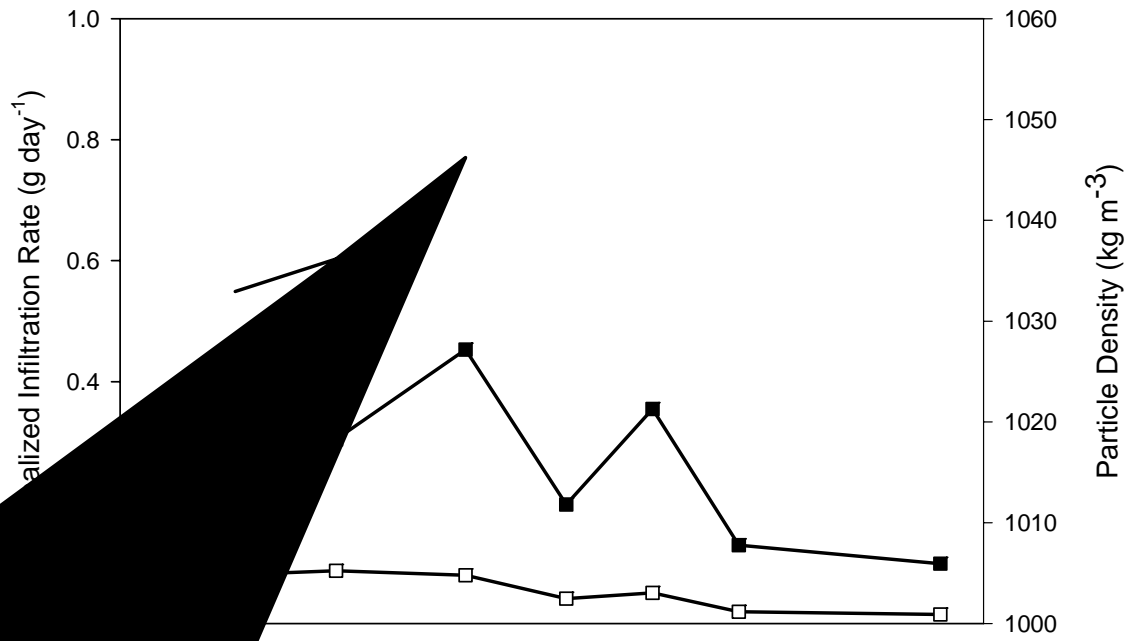
O'Ne-eil Creek is located in the Hogem Range of the Omenica Mountains in the

030..0007 T-c0.06 Central Interior) 30m from the British Columbia, Canada (1.0032 and 007 (T) 1163642131172110009 Ta

Gravel-stored aggregated sediment

Each sample bucket containing <2 mm sediment was gently resuspended and, after 10 s, two 250-ml sub-samples representing material which settled slower than sands were collected from the top 5 cm. These were later analysed for sediment concentration, organic matter content, effective particle size distribution (EPSD) and settling velocity. This sub-sampling technique allows the incorporation of larger flocculated particles or aggregates of mineral and organic matter which may be larger but less dense than sand grains >63 μm . Particle size analysis of the constituent inorganics comprising sub-samples collected in this manner indicate no particles >75 μm are left in suspension; therefore, all observed particles exceeding this size are aggregates or organic debris (Petticrew *et al.*

Sediment < 2 mm Infiltration Rate (g day^{-1})
Discharge ($\text{m}^3 \text{s}^{-1}$)



short distances downstream. During the week of 2–9 August, when the greatest intensity of gravel cleaning occurred, the <2 mm sediments would have been very mobile, as reflected by the increased mass in the infiltration bags. Low infiltration rates during the less active periods of late-spawn and die-off are associated with low flows of $\sim 2.00 \text{ m}^3 \text{ s}^{-1}$. The small increase in the infiltration rate of 5 September, when fish are no longer present in the stream, indicated the significance of local rain events in moving material of this size.

Gravel-stored fine sediment and habitat conditions

While infiltration rates of <2 mm sediments were high at the peak of spawn, the incorporation of <75 μm material was low. The fining of the gravel-stored population at peak-spawn indicates larger aggregates are broken apart by the digging action, reducing their size and density (Table 1). At these low flows the resuspended sands settle quickly in a short distance while the smaller aggregates, being less dense, are moved downstream resulting in increased lo

products had entered the stream to be transported away, taken up by primary producers or stored in the gravels.