



## **Numerical modelling of colmation and decolmation processes for gravel-bed river restoration schemes**

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It is well established that man has greatly influenced river sediment loading, which has had a detrimental effect on the aquatic ecosystem, in particular on salmonid spawning in gravel-bed rivers. Successful spawning relies upon a balance between colmation and decolmation processes. Excessive colmation results in juvenile fish being injured through abrasion and adhesion. Without decolmation, juvenile fish trying to emerge from the riverbed, following their incubation period, become trapped. Sediment oxygen demand and intragravel flows can also be influenced by colmation and decolmation resulting in changes in dissolved oxygen levels in the riverbed. Therefore, river restoration schemes often aim to emulate the balance between these processes. However, though conceptually well understood, the physical processes of colmation and decolmation are at best poorly described. This makes the design of restoration schemes challenging and as a result many have had little effect on salmonid spawning whilst some have even been detrimental. It is only with recent advances in technology that it has been possible to understand the complexities of the processes, in particular the influence of microscopic turbulent flows within the near-bed region and within a riverbed's pore matrix. This research aims to further understanding of colmation and decolmation by focusing on the quantification of turbulence close to and within the riverbed facilitating the modelling of these processes. By enhancing the capability of the 2D numerical hydraulic modelling package DI-VAST (Depth Integrated Velocities And Solute Transport), this research ultimately aims to improve the design and assessment of gravel-bed river restoration schemes.