



Demonstration of the mediation by surface hydrological connectivity of the influence of landscape factors on instream ecology

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Amid concern over the decline of salmonid and other fish populations, the traditional basis of much stream restoration has been identification of degraded river sections and localised attempts to restore them. Research has demonstrated that fine sediment, solutes and organic matter also influence instream aquatic ecosystems and these may be influenced by upstream land use. However, the transfer of material from the watershed to the stream, primarily by running water, has not been explicitly considered. This is despite hydrological research which shows that this transfer is mediated by the hydrological connection of land parcels to the stream. Here we show that an index of delivery based upon hydrological connection discriminates both the presence/absence and the abundance of juvenile brown trout populations. The topographic control on watershed hydrological response exerts a fundamental filtering effect upon the spatial structure of brown trout fry. This is the first time that such an effect has been demonstrated. If topographic control mediates the watershed to stream linkage, land use impacts can only be understood with respect to their position in the landscape. The spatial organisation of landscape elements becomes crucial to understanding the ecological impacts of particular management activities, with hydrological flow paths providing the functional linkage. This is of practical importance as locations of high connectivity should be a primary objective in targeting watershed restoration measures to where they will deliver most instream benefits.