EGU2020-18770
https://doi.org/10.5194/egusphere-egu2020-18770
EGU General Assembly 2020

Dynamic connectivity as a determinant of the resilience of stream habitat to geomorphic perturbation

Stuart Lane
Université de Lausanne, Lausanne, Switzerland (stuart.lane@unil.ch)

One of the primary challenges of understanding hydro-geomorphic connectivity is to move from static to dynamic representations of connection. This is particularly important when linkages are made between hydro-geomorphic connectivity and habitat. In response to external drivers, notably extreme events, the spatial locations of suitable habitat within an ecosystem may migrate spatially, potentially rapidly. A resilient ecosystem, in one sense, is one where organisms can either "weather-it-out" or migrate to newly suitable habitat to find temporary refuge from those extreme events. In this paper, I show that is it the spatio-temporal evolution of connectivity that determines the resilience of braided stream ecosystems to geomorphic perturbation. Using a validated model of the spatial distribution of instream macroinvertebrate habitat, that combines both known organism preferences with the risks of geomorphic perturbation, I show that during high flow events, suitable habitat shifts rapidly from the primary braid plain channels to secondary ones. The connectivity between primary and secondary channels determines the extent to which secondary channels can be used as refugia; but this connectivity varies continually during the flow event. This can be captured in connectivity metrics based upon notions of percolation. The work has important implications for stream management. First, it shows that the availability of habitat within an ecosystem at high flows is not a sufficient descriptor of the system resilience. The ability of organisms to access suitable habitat as flow rises, and to return to the low flow channel as it falls, is critical; connectivity is primordial. Second, it emphasises that a focus on connectivity as a static state or metric is not sufficient to describe the extent to which a system is resilient. The accessibility of habitat suitable zones at high flows depends upon the how connectivity evolves during the event, which controls accessibility. Thirdly, analyses of connectivity, and wider assessment of stream resilience, need to couple geomorphology and hydrology, and not just focus on environmental flows. The latter provide only a very partial representation of connectivity.