

A Process-based Approach for Proposing Ecological Flows for Geomorphic Purposes

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In gravel-bed streams, streamflows serve numerous ecological functions, including creating and sustaining pool and riffle habitat units. While models and approaches to establish ecological flows exist in literature, approaches to establish ecological flow regimes that target the restoration and maintenance of channel morphology and substrate structure are lacking. One of the key constraints that are generally cited is the complexity in articulating ecological functions and linking them to geomorphic metrics that are driven by a flow regime (i.e. hydro-geomorphic metrics). Structuring and articulating ecological functions and linking them to geomorphic functions at a watershed scale can provide Conservation Authorities and stream restoration specialists with protocols and tools to identify ranges of streamflows that need to be protected and maintained under flow regulation scenarios, including dam operations, future urban development and proposed water taking plans. A conceptual model is proposed for structuring and articulating ecological functions and assigning hydro-geomorphic metrics to habitat units that primarily depend on erosion and deposition processes spatially and temporally. The output of the conceptual model is a list of hypothesized ecological flows that are tested using a feedback loop. The feedback loop includes field investigations, hydrodynamic modeling, and management scenarios.