AGU Fall Meeting 2016 – possible sessions for abstract submission

EP031:

Restoring Biophysical Interactions in Altered River Ecosystems

Session ID#: 13565

Session Description:

In watersheds throughout the world, physical and biological processes that produce complex channel, riparian and floodplain habitats have been disrupted, resulting in altered riverine ecosystems. Emerging restoration practices focus on restoring key processes (e.g., large floods, floodplain connectivity, sediment transport continuity, wood recruitment, species reintroductions) to restore the form and function of rivers. This session explores the physical and biological processes that produce diverse river and floodplain ecosystems, how human activities have altered those processes, and how restoring them can improve ecosystem condition and function. We seek focused, process-based presentations highlighting both the mechanics of complex processes and examples of recreating biophysical interactions to restore river functionality across multiple spatial and temporal scales.

Primary Convener:

Timothy J Beechie, NOAA Seattle, Northwest Fisheries Science Center, Seattle, WA, United States

Conveners:

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Title

Spatio-Temporal Effects Of River Regulation On Habitat Suitability For Juvenile Atlantic Salmon: Implications For Ecosystem Functioning.

Abstract

Many upland rivers in the Northern Hemisphere contain important spawning and rearing habitat for Atlantic salmon (*S. salar*). Due to their high sensitivity to environmental change, they are often used as bio-indicators. In Scotland many upland rivers contain potentially suitable habitat for salmon, but are also regulated for hydropower. Regulated flow regimes can differ substantially between reaches and over time. Thus, active river management and restoration work is needed to maintain, restore, and protect their ecological functioning. This study investigated the effects of different types of river regulation (hydropeaking, compensation flow and near-natural) on the hydraulic characteristics of downstream river reaches and inferred the consequences for juvenile salmon using hydraulic habitat suitability models. The study focussed on the River Lyon, a tributary of the Tay, Scotland's largest river. 2D hydraulic models were constructed for three sites with contrasting flow regimes. Discharge time series were used to simulate hydraulic conditions for regulated and simulated natural flows (obtained from a calibrated hydrological model). Depth and velocity data were extracted from the hydraulic models and used to infer habitat suitability using published hydraulic habitat models for juvenile Atlantic salmon. Results show the effects of regulation can vary substantially between reaches (i.e., hydraulic conditions can be suitable in the re-naturalised reach but unsuitable in the regulated reaches and *vice versa*) due to spatial differences in flow regime. Comparison to natural flow regimes suggests that flow alteration has a variable influence on habitat quality depending on the type of regulation and life stage. Under simulated natural conditions habitat suitability was similar among sites. This work improves understanding of the effects of regulation on biophysical processes and may be useful in managing trade-offs between management, restoration, and societal benefits.