Geophysical Research Abstracts
Vol. 19, EGU2017-17728, 2017
EGU General Assembly 2017

Investigating the impacts of anthropogenic hydromorphological pressures on waterbody ecological status and the specification and appraisal of effective mitigation options

Daniel Newton (1), Irantzu Lexartza-Artza (2), and Sally German (3)

(1) Arup, Leeds, United Kingdom (daniel.newton@arup.com), (2) Arup, Leeds, United Kingdom (irantzu.lexartza-artza@arup.com), (3) Arup, Leeds, United Kingdom (sally.german@arup.com)

Hydromorphological regimes of rivers are fundamental in supporting aquatic biota. This includes fluvial geomorphological processes, particularly those controlling the sediment regime, which act to naturally form and maintain key features along river corridors. These features – such as riffles, pools, eroding banks, bars and marginal deposits – in turn provide important micro and macro-scale habitat units for riverine flora and fauna, including different life-cycle stages of key species. The availability, diversity, and connectivity of these aquatic habitat units thus influences overall 'health' of the river ecosystem.
Water bodies downstream of reservoirs are subject to modified hydromorphological regimes due to artificial storage and release programmes used to manage water supplies. This situation commonly results in reduced average flows, passing through channels inherited from previous hydromorphological regimes; which in turn can result in reduced habitat functionality. Concurrently, sediment supply from upstream is typically severely disrupted, restricting self-maintenance of habitat features. Upstream of reservoirs, headwaters can be ecologically isolated, owning to the presence of barriers to fish passage between the reservoirs and feeder streams in the form of historical weirs and other in-channel structures. Moreover, river systems subject to impoundment/flow abstraction for water supply may be particularly vulnerable to effects of long-term drought conditions. This may include further reduction in geomorphological and ecological functionality, with regards to the refresh and hydrodynamic parameters of aquatic habitats. Prolonged low-flow conditions may also amplify impacts of other in-channel assets (e.g. culverts, weirs) on flow and sediment continuity, ecological connectivity, and physicochemical water quality. Resulting impacts on biological quality elements key to riverine ecosystem structure and function (including target/protected species such as Atlantic salmon and lamprey), may have significant economic and conservation implications at local, regional and international scales.
This poster will outline work undertaken by Arup to support UK water industry partners (including national environmental agencies and water companies) in investigating asset-related impacts on waterbody hydromorphological and ecological status and implementing and appraising appropriate mitigation solutions. This includes:

(1) An investigation providing a framework for specification, assessment and optimisation of options for addressing WFD measures required to reduce the impacts of impoundment assets across the Yorkshire region. This includes trial of reservoir flow release modifications, downstream river restoration techniques, and fish passage easement works. Trials are based around intensive baseline and post-implementation monitoring programmes (tailored around WFD quality elements); designed to help substantiate the evidence base of the ecological benefits of different mitigaiton options.

(2) A baseline ecological and geomorphological monitoring programme establishing river ecosystem condition, to inform drought management planning /mitigaiton optioneering in relation to the impacts of reservoir assets and flow abstraction operations. Baseline monitoring is helping to delveop understanding of hydromorpholoical and habitat continuity along affected reahes, as well as hydrological linkages with adjacent SSSIs.

(3) An extensive morphological impact assessment survey programme assessing the reference typology and baseline condition of over 5,000km of heavily modified watercourses across Scotland; identifying multiple anthropogenic pressures, related hydromorpholgoial impacts, and opportunties for restoration/rehabilitation mitigation actions to support improvement in ecological potential.