

Theme: Water allocation among competing uses and users

Sub-theme: Environmental needs and flows

Identifying potential impacts of hydropower regulation on salmonid habitats in Scottish rivers using connectivity metrics

Authors: Bas Buddendorf¹, Josie Geris¹, Iain Malcolm², Mark Wilkinson³, Chris Soulsby¹

Affiliations: ¹Northern Rivers Institute, School of Geosciences, University of Aberdeen; ²Marine Scotland, Pitlochry; ³James Hutton Institute, Environmental and Biochemical Sciences, Aberdeen

Contact: bas.buddendorf@abdn.ac.uk

Abstract:

Hydropower generation is a key component of Scotland's strategy of meeting all electricity demands from renewable sources by 2020. However, there is a conflict between energy demands from hydropower schemes and ecological flow requirements in many regulated rivers as set forth by the Water Framework Directive. Scottish rivers support significant populations of Atlantic salmon (*Salmo salar* L.). The flow requirements for Atlantic salmon are different for different life stages and consequently the impacts of hydroschemes can be different too. An important element in maintaining a good ecological status or potential of riverine systems is the connectivity in river networks and fish access to different habitats. The impact of hydroschemes on the spatial and temporal connectivity is not well understood and currently there is no clear overview of where possible issues of connectivity might occur and adversely affect salmonid habitats. We aim to provide an overview of where possible issues of connectivity might occur by mapping the connectivity in Scottish river networks. Such an overview could be a helpful tool in informing sustainable management of salmon rivers for the involved stakeholders. Using GIS we have created river networks for a number of regulated and unregulated catchments at multiple scales within the larger Tay catchment system. We have used a set of simple connectivity measures to study how changes in the river network affect the connectivity of the catchment at different spatial scales. Our study produced an overview of areas where connectivity issues occur or may occur in the event of alterations to the natural river network. Hence, this work has provided an explicit context for focused field data collection in sensitive areas. These results can only be considered as preliminary as currently no hydrologic, hydraulic and biological data have been taken into account; this work merely shows the connectivity of river networks based on landscape structure alone (i.e., using information on elevation, slope, location of rivers based on Ordnance Survey maps and HECs). In conclusion, an overview of areas where connectivity issues in Scottish salmon rivers occur or are likely to occur in the event of alterations to the river network has been established. Data collection can be performed in a more explicit context, which is key to developing a better understanding of the environmental flow requirements of Atlantic salmon and the impact of hydroschemes on the ecological status of Scottish rivers.