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A conflict between traditional flood measures and maintaining river ecosystems. A case study in river Lærdal, Norway

Ana Juárez¹, Knut Alfredsen¹, Morten Stickler^{2,3}, Ana Adeva-Bustos⁴, Sonia Seguí-García¹, Bendik Hansen⁴, and Rodrigo Suarez⁵

¹NTNU, Engineering, Civil and Environmental engineering, Trondheim, Norway (ana.juarez@ntnu.no)

²The Norwegian Water Resources and Energy Directorate NVE

³The University of South East Norway

⁴SINTEF

⁵Multiconsult

Floods are among the most damaging natural disasters which are likely to increase with the effects of climate change and changes in land use. Therefore, rivers have been the focus of engineering for establishing structural flood mitigation measures. Traditional flood infrastructure, such as levees and dredging have threatened floodplains and river ecosystems and during the last decade, sustainable reconciliation of freshwater ecosystems is increasing. However, we still find many areas where these traditional measures are proposed and it is challenging to find tools for evaluations of different measures and quantification of the possible impacts. We propose the use of hydraulic modelling and remote sensing data for evaluation of different flood strategies and quantification of changes in hydraulic parameters in an ecological scale. This is applied in Lærdal River, in Norway, a national salmon river specially recognized by its environment for Atlantic salmon, where the Norwegian Water Resources and Energy Directorate (NVE) has proposed flood measures that include confinement with walls and dredging in the riverbed. Results show that the constructing a higher wall could avoid dredging in the river bed resulting in a most cost-effective solution. Dredging could improve hydraulic conditions for juvenile salmon if applied as river restoration measure but channelization of the river would have big impacts in the river ecosystem.