



Euro-FLOW: a European training and research network for environmental FLOW management in river basins. A MARIE SKŁODOWSKA-CURIE ACTIONS Innovative Training Network (ITN) funded under H2020-MSCA-ITN-2017

ESR 6: River food web responses to reservoir outflow manipulation

3 year fixed- term PhD position.

Host institute: University of Leeds, UK

Supervisors: Dr Lee Brown (University of Leeds) and Dr Nikolai Friberg (NIVA, Norway)

Project Description:

River flows play a central role influencing ecosystem diversity by redistributing energy, nutrients, sediment and biota (1,2), but the frequency, magnitude and timing characteristic of extreme events is heavily modified in regulated rivers. In many regions of the world, artificial flows are being modified by managing reservoir releases in attempts to restore river ecosystems, but most ecological studies have focused on the responses of single groups of organisms (3). There is a major need to understand the alteration and re-assembly of aquatic food webs following outflow manipulation events (typically flow peaks) to understand the importance of linkages and feedbacks between different trophic groups influencing biological community responses (4). Some understanding of food web responses to large floods has been generated in response to flushing flows as part of restoration measures in heavily regulated rivers of the USA (e.g. 5) but the transferability to other regions remains to be studied. This PhD will develop new empirical evidence for food web responses to reservoir flow manipulation.

1. Poff 1997 *Journal of the North American Benthological Society* 16 p391
2. Lake 2000 *Journal of the North American Benthological Society* 19 p573
3. Gillespie et al. 2015 *Freshwater Biology* 60 p410
4. Woodward et al. 2016 *Philosophical Transactions of the Royal Society B* 374 p694
5. Cross et al. 2011 *Ecological Applications* 21 p2016.

Objectives:

- (1) Quantify the distribution of biomass across trophic levels in rivers in relation to flow regimes and designed experimental flows using BACI approaches;
- (2) Assess the ways in which flow management alters feeding links between basal resources (detritus, algae), invertebrate consumers and predators (invertebrates, fish, amphibians);
- (3) Quantify flows of energy and matter between species based on estimates of primary and secondary production, and evaluate the use of metabolic theory to predict food web responses to flow manipulation.

Expected outcomes:

- (1) Creation of new, replicated food web datasets with quantified linkages;

(2) Database of information to determine relationships between food web structural/functional properties and hydrological variability;

(3) Food web data at scales ranging from river reach to whole river to catchment

Secondments:

University of Cantabria- Environmental Hydraulics Institute (UC-IHC, Spain, host Jose Barquin) for 3 months in year 2 with the purpose of the collection of food web data and species identification

MWH Global (UK) for 1-2 months in year 3 to understand the business environment and global-scale river regulation developments