

Sedimentation and invasive species in rivers: Investigation and trialling of mitigation options relevant to invasive non-native species related sediment inputs to rivers

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Project outline

Excessive sedimentation is known to be a key cause of ecological damage and deterioration to aquatic ecosystems. Each year, Yorkshire Water removes around 30,000 tons of sediment from rivers prior to treatment and subsequent supply of drinking water, costing an estimated £350,000 per year. Invasive Non Native Species (INNS) threaten aquatic ecosystems (Dudgeon et al., 2006), drinking water supplies and cost the water industry around £8m per year to remove (UKWIR, 2016). Furthermore, INNS such as Himalayan Balsam (Greenwood & Kuhn, 2014) and Signal Crayfish (Harvey et al., 2014) may drive increased sedimentation in rivers (Greenwood & Kuhn, 2014) resulting in increased operational costs and ecological deterioration under EU Water Framework Directive (WFD) status.

The rate of spread of INNS is increasing, and eradication of established invaders is highly unlikely (Simberloff et al., 2013). Therefore, measures which limit or mitigate sedimentation impacts are required. This research will investigate INNS related sedimentation in the Yorkshire Derwent catchment to identify methods and management options to reduce sediment levels and biodiversity loss whilst increasing the amenity value and broader environmental benefits such as ecological resilience, flood risk and water quality.



Objectives

The successful candidate will have the opportunity to carry out controlled field (before-after-control-impact) experiments to assess the impact of INNS on river sedimentation, including the trial of various river management and survey techniques including habitat restoration, riverbank stabilisation and laboratory experiments. Using this approach, the student will be able to address the following research questions; (1) what effect do INNS have on the

sediment load in the Derwent catchment?; (2) which management techniques offer the best solution to reducing sediment loads whilst increasing biodiversity and amenity value?; (3) how can these techniques be applied at a catchment scale?

Potential for research impact

The student will benefit from extensive training and work placements with Yorkshire Water and collaboration with river managers including the Environment Agency, Environmental NGOs and local farmers. The outcomes of the research will allow the identification of measures that can alleviate INNS related sedimentation and prevent deterioration of riparian banks and instream habitat which result in WFD failure to meet good ecological status or potential. Through existing collaborations across Catchment Partnerships and water industry networks, the results from this work will be applied across other catchments and by other water companies, and therefore has the opportunity to impact the future management of UK rivers.

Entry requirements

Applicants should have, or be on course to complete a good honours degree (2i or 1st) in related discipline. A Masters degree and experience in river habitat assessment, geomorphology, river and/ or plant ecology and crayfish handling would be advantageous.

Benefits and Training

The project offers the successful candidate an outstanding chance to make a meaningful contribution to river management, and an opportunity to work with regulators (The Environment Agency and Natural England), NGOs (The Yorkshire Wildlife Trust and regional Rivers Trusts) and industry (through the Water UK INNS Network, currently co-chaired by Yorkshire Water). The successful candidate will benefit from inter-disciplinary training in hydrology, geomorphology and land and flood risk management as part of the River Basin Processes and Management research cluster in the School of Geography, and the Ecology and Evolution research cluster in the School of Biology and as part of the wider water@leeds network. The nature of the project means that the student will be trained in project specific research methods including geomorphological methods (terrestrial laser scanning, structure-from-motion, sediment transport surveying), instream habitat surveying (River Habitat Surveys, geomorphological mapping, instream habitat surveys, crayfish handling), ecology and applied statistics for analysing data, both internally and at external workshops. Additional training in ecology (fish, macroinvertebrate and plant identification, electro fishing, river restoration) is likely from allied projects such as MSc dissertations and fellow PhD candidates. An additional important part of the training will be to attend academic, and industry national and international conferences to present results and gain feedback. **The student will be encouraged to submit high quality papers for publication during the project.**

Full details about postgraduate degrees at the University of Leeds, and instructions on how to apply, can be found at www.geog.leeds.ac.uk/study/phd

Informal enquiries should be directed to Megan Klaar

References

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Greenwood, P. & Kuhn, N.J. (2014). Does the invasive plant, *Impatiens glandulifera*, promote soil erosion along the riparian zone? An investigation on a small watercourse in northwest Switzerland. *Journal of Soils and Sediments* **14(3)**: 637-650.

Harvey, G.L. et al., (2014). Invasive crayfish as drivers of fine sediment dynamics in rivers: field and laboratory evidence. *Earth Surface Processes and Landforms* **39**: 259-271.

Simberloff D et al. (2013). Impacts of biological invasions: what's what and the way forward. *Trends in Ecology and Evolution* **28**: 58-66.

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