

**Postgraduate research opportunities in Earth Surface Science
in the School of Geography at QMUL**

[Environmental Science by Research MSc](#) topics for 2018-19 entry

Spatial analysis of heavy metal contaminants in estuarine sediments

Estuaries and saltmarshes are known to act as reservoirs for the build-up of contaminants historically released into rivers through past industrial activity. These contaminants, often comprising highly toxic heavy metals, can be concentrated in sediments at levels which offer a significant threat to health for both humans, wildfowl and other components of these valuable habitats. Many saltmarsh sediments and estuaries have been extensively managed, through the draining of land for agricultural developments, and more recently through the de-embankment and restoration of former saltmarshes for coastal defence and habitat conservation purposes. The re-activation of restored saltmarshes through de-embankment opens up the potential for sediments that have historically locked up these heavy metal contaminants to become significant sources of future pollution.

This project makes use of 3D X-ray computed tomography to examine the concentrations and spatial distribution of heavy metal contaminants at a number of sites in the Thames Estuary. The primary aim of this project is to investigate and predict the potential mobility of contaminants in restored saltmarshes as they become hydraulically re-integrated with the broader estuarine system.

This project is jointly supervised by and [Professor Kate Spencer](#) and Dr Simon Carr (University of Cumbria)

- For further details, please contact [Professor Kate Spencer](#): k.spencer@qmul.ac.uk

Impacts of invasive species on river sediment dynamics

Invasive species are one of the most important drivers of global biodiversity loss and can generate significant economic damages. The biogeomorphic impacts of invasive species (through bioturbation, bioerosion, bioconstruction), however, have been largely overlooked despite the potential for significant management implications including reduced water quality, habitat degradation and sediment-related flood risk. This represents an important research gap: their extraordinary characteristics enable invasive species to achieve very high densities and represent a major geomorphological disturbance to which invaded systems may not be resilient. Numerous invasive plants and animals demonstrate potential for dramatic impacts on river morphology and sediment fluxes, but these impacts remain largely unquantified. This project will explore the influence of key invasive plants and animals on river sediment dynamics, combining analysis of secondary data and field research at impacted sites.

- For further details please contact [Dr Gemma Harvey](#): g.l.harvey@qmul.ac.uk

Semi-automated delineation of braided channel networks from multispectral satellite imagery

Braided rivers are complex networks of interconnected channels that are regularly restructured by fluxes of water and sediment. Attempts to quantify and understand their behaviour through

time have proved difficult due to a shortage of suitable data sets. Archives of multispectral satellite data (e.g. earthexplorer.usgs.gov) may provide a solution due to their rich temporal depth but new analytical tools are required to unlock their potential. Proposals for research into the development of semi-automated methods for the delineation of braided channel networks from Landsat TM data are welcomed. It is envisaged that the project would explore the utility of novel image analysis techniques (e.g. object-based approaches, support vector machines, etc.) and would suit graduates with an interest in fluvial geomorphology and experience in GIS and remote sensing.

- For further details, please contact [Dr Alex Henshaw: a.henshaw@qmul.ac.uk](mailto:a.henshaw@qmul.ac.uk)

Are rare species endangered endemics or hidden invaders?

How do you determine whether a rare species is an endangered endemic or a potentially harmful exotic invader? There is a risk that rare species in Britain may become the focus of inappropriate conservation efforts simply because they are rare and not known anywhere else in the world. The cataloguing of global biodiversity is far from complete, particularly with regard to small meiofaunal crustaceans such as ostracods. At least four rare ostracods have been reported in the western Yar Estuary on the Isle of Wight, including one known to have been introduced to SE England with imported American oysters during the 20th Century and a salt-marsh species of the genus *Terrestricythere* which could be an invader from the northwestern Pacific region, but little is known of their ecology and distribution. The project will involve a field survey of the intertidal ostracods of the Western Yar Estuary with particular attention to the rare species and may also seek to determine, through archives of their fossil shells obtained from sediment cores, how long they have been present.

- For further details, please contact [Professor Dave Horne: d.i.horne@qmul.ac.uk](mailto:d.i.horne@qmul.ac.uk)

Quantifying forest fire regimes in the Mediterranean

Forest fires are important ecological drivers in the Mediterranean but without quantifying their dynamics it is impossible to understand and make predictions about forest succession and carbon dynamics. This project will explore the dynamics of forest fires in Spain, using a combination of long-term inventory data and remote sensing fire products. The project will quantify the fire regime in different landscapes and compare information from these two data sources. There may also be opportunity to explore the climate dependency of fire regimes and input these results into a forest simulator to explore the impact of climate change on carbon dynamics in the area. This project would suit a numerate student with experience in GIS, remote sensing and/or coding, and who is keen to develop these skills further.

- For further details, please contact [Dr Emily Lines: e.lines@qmul.ac.uk](mailto:e.lines@qmul.ac.uk)

River restoration in urban areas

Restoring rivers in urban areas can deliver a wide range of benefits or Ecosystem Services and significant progress has been made in restoring many sections of London's rivers over the past decade. With many more sites planned it is increasingly important to evaluate the performance of completed schemes. Post project appraisals can also inform adaptive management practices at restoration sites to optimise future performance. A range of research projects are available at a number of river restoration sites in London with opportunities to undertake work in conjunction with organizations such as the Environment Agency, the UK River Restoration Centre, Thames21, and river trusts, including The South East Rivers Trust. Specific studies might

focus on, for example: evaluating the benefits of river rehabilitation on physical habitat diversity and biodiversity; assessing the performance of constructed wetlands and sediment traps in reducing point source pollutants such as road deposited sediments; and monitoring the ecological recovery of de-culverted or “daylighted” river reaches.

- For further details, please contact **Professor Geraldene Wharton**: g.wharton@qmul.ac.uk