

A methodological proposal to investigate the long term storage of pollutants in freshwater sediment biofilms and their response to environmental disturbances.

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A methodological proposal to investigate the long term storage of pollutants in freshwater sediment biofilms and their response to environmental disturbances.



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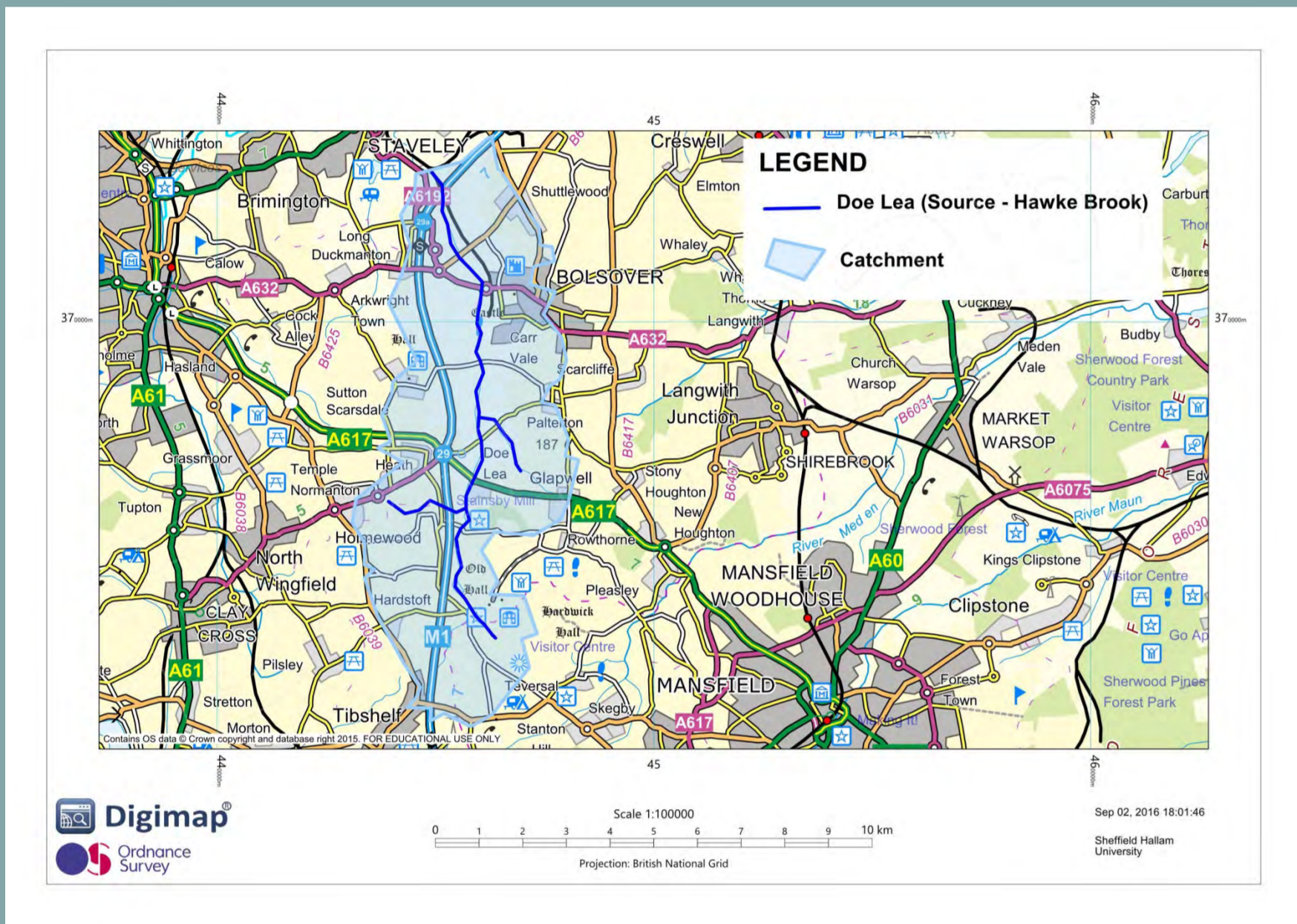
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The Problem: The proposed research will investigate novel methodologies for the ecological assessment of freshwater ecosystems and the use of sediment biofilms as bioindicators and bioreporters of pollution. Freshwater sediments are inhabited by attached microbial communities (biofilms) which are responsible for the majority of a river's metabolic activity (Tlili et al., 2007). Biofilms thus provide valuable information on the environmental quality of the river and its surrounding areas. Despite remediation of freshwater sediments, biofilms can still store large quantities of post industrial pollutants. Biofilms have the exceptional capacity to adjust to new conditions including natural (e.g., changes in hydraulics) and anthropogenic (e.g., urban developments) environmental disturbances. Gaining a more comprehensive understanding of biofilm behaviour is therefore fundamental to developing improved monitoring and management strategies.

The Objective: To propose a methodology for investigating the long term storage of pollutants in freshwater sediment biofilms and their response to environmental disturbances.



River Doe Lea - Case Study

The initial focus of this research will be in the River Doe Lea in North East Derbyshire, UK.

The River Doe Lea extends 18km from the South at its source near Tibshelf, to the North at its discharge at the River Rother.

In the 1990s the river was famed for having the highest level of dioxins in the world, 27 times higher than the second most polluted (Schoon, 1994). The acute cause of this was a single pollutant event, however the river has also been subjected to long term anthropogenic pollution through industry, agriculture, transport (railways, M1) and wastewater pollution (treatment works, combined sewer overflows (CSOs)).

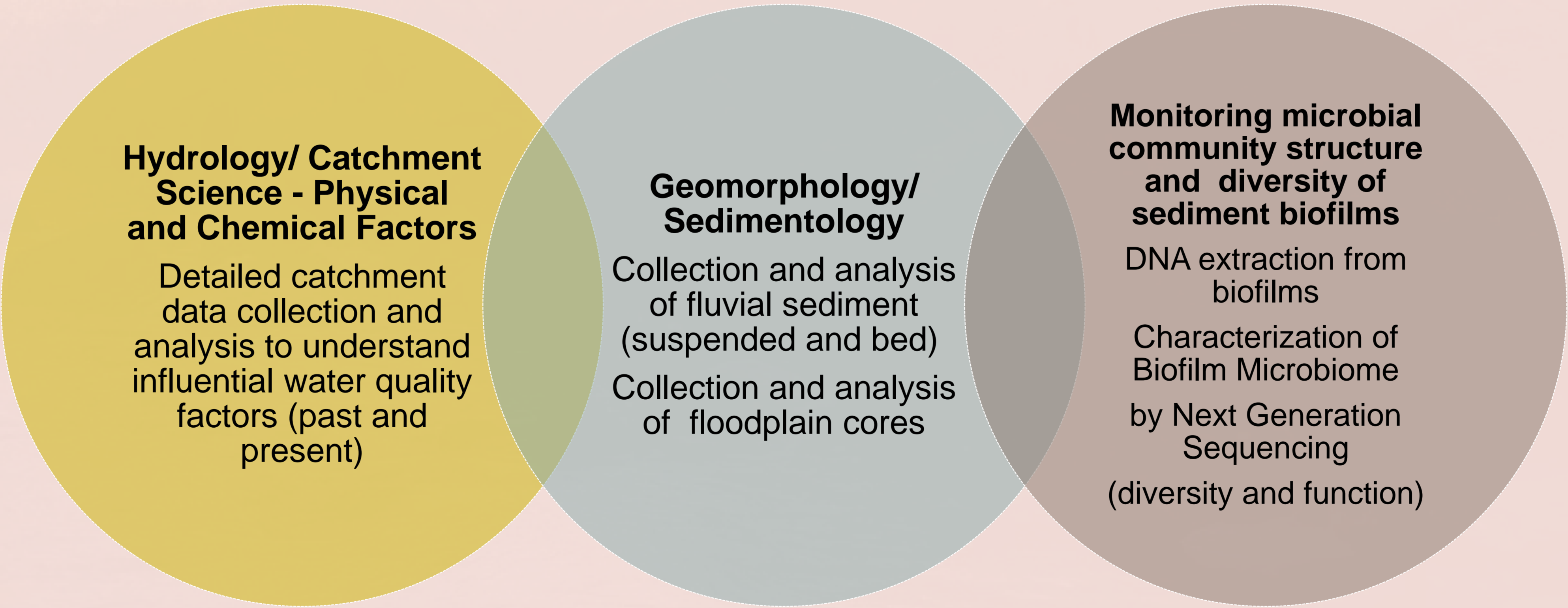


River Doe Lea

Proposed Methods

While previous studies have focused on the flow, chemical, biological and ecological quality of the river, little research has been conducted into the role and behaviour of sediment biofilms to environmental disturbances.

The proposed methodology will combine techniques from catchment and water science, geomorphology/sedimentology and microbiology.



Contact

This project is in the early stages of development. We currently have expertise in hydrology, water quality, geomorphology, sedimentology and microbiology but we would be interested in expanding our research team particularly in water chemistry. Please contact Dr Rebecca Sharpe for more information.

Proposed Research Questions

- How effective are sediment biofilms as bioindicators and bioreporters?
- How do biofilms behave under normal conditions – are they an important store of pollutants? - are biofilms influenced by environmental factors (temperature, hydraulics)?
- How do biofilms react under disturbed conditions (landuse, hydraulic and temperature changes)?
- What impact does this knowledge have on the Water Framework Directive, legislation and planning or on local communities? How do we manage present and future risks?

References

- Schoon, N. (1994) Pollution watchdog plans legal action: Record levels of dioxins in river near Coalite plant. Independent, 25th April. Available: <http://www.independent.co.uk/news/uk/pollution-watchdog-plans-legal-action-record-level-of-dioxins-in-river-near-coalite-plant-1372618.html> (Accessed 02/09/2016).
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