

## Dr Megan Klaar PhD

Research Fellow

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### About

Megan's research focuses on the linkages between geomorphology, hydrology and ecology. Currently, she is working on a NERC-funded project to determine the efficiency of alternative (permanent and transient) instream wood restoration designs for the management of biogeochemical cycling and nutrient uptake in the hyporheic zone of lowland rivers. The outcomes of this project will directly impact river restoration management and policy and decide whether, and to what degree, instream wood restoration can be deployed in lowland streams to reduce critically high nitrogen loads.

### Qualifications

- PhD, University of Birmingham, 2010
- Chartered Environmentalist (CEnv), Society for the Environment, 2006
- MSc Biology of Water Resource Management, Napier University, Edinburgh, 2001
- BSc (Hons) Ecology and Conservation, University of Sussex, 1999

### Biography

Previous to beginning her academic career, Megan had worked within the Government and Industrial sectors for a number of years, including positions with the Environment Agency (Fisheries Scientist), Lochaber Fisheries Trust (Biologist) and South East Water (Ecologist). Her previous research extended into such diverse areas as the ecological impacts of the UK's first trial desalination plant, assessment of sea lice infestation on farmed salmon and the formation of policy and best practice guidelines for the control of invasive aquatic species.

On returning to academia, Megan's research has focused on eco-hydromorphology; the interactions between ecology, hydrology and morphology. Previous research as part of her PhD and post doctoral research focused on the role of instream wood in the development of hydrogeomorphic complexity within recently deglaciated streams, and the influence of such development on colonizing Pacific salmon. Megan has also worked with the Environment Agency and Centre for Ecology and Hydrology (CEH) in developing new ways to monitor river and groundwater abstraction impacts on instream habitats and species.

Megan is particularly interested in conducting applied research to help develop evidence-based environmental policies.

### Research

#### Recent Research:

##### **'Rapid Assessment of Physical Habitat Sensitivity to Abstraction'**

An Environment Agency/ University of Worcester funded position which sought to develop and improve the operational capacity of the Environment Agency (EA) to measure and monitor the sensitivity of rivers to river and groundwater abstractions. A major outcome of the project was the further development and refinement of the RAPHSA (Rapid Assessment of Physical Habitat Sensitivity to Abstractions) tool which allows the EA to determine which rivers are more or less sensitive to water abstractions, and thus provide a secure foundation for the future licensing of river and groundwater abstractions within England.

Collaborators: Environment Agency, University of Worcester, Centre for Ecology and Hydrology

##### **NERC Policy Placement Fellow 'Understanding the impacts of water abstraction and river flows on aquatic ecology'**

In conjunction with the Environment Agency. This research aimed to enhance the hydroecological evidence base used by the EA to assess and regulate abstraction pressures throughout England and Wales. Key activities included development and verification of the current method used by the EA to assess ecological consequences of abstraction pressure and the analysis of novel techniques and tools which may be used to support operational decisions.

Collaborators: Natural Environment Research Council, Environment Agency, University of Birmingham

##### **'Evolution of NITrogen BUFFERing capacity of land water interfaces along hydrosystems of different age (NITBUFFER)**

This NERC funded project sought to analyse the relationship between landscape formation and nitrogen cycling processes in order to provide quantitative data on the consequences of climate change and associated deglaciation on nitrogen fluxes. By using data obtained from remote sensing using LiDAR and satellite (Landsat) data, twinned with the measurement of rate processes involved in nitrogen cycling within different land- water interfaces, this research provided the first insights into the natural timeframe of land- water interface formation and development, and their consequences on nitrogen regulation in stream channels.

Collaborators: Prof. A. Milner & Dr R. Bartlett (Birmingham), Prof. G. Pinay (University of Rennes) and Dr C. Kidd (NASA/ University of Maryland)

##### **'The development of geomorphic and hydraulic complexity and its influence on fish communities following glacial recession in Glacier Bay, Alaska'**

Rapid glacial recession within Glacier Bay National Park, Alaska, has resulted in the unique opportunity to study the formation and development of stream communities within watershed of different ages in a relatively small spatial scale. Utilising this opportunity, it is possible to monitor geomorphological development and associated ecological responses over time. The project aim was to assess the characteristics of bed morphology and hydraulics, and the influence of instream wood in determining the availability of instream habitat for Pacific salmon as they continue to colonise the developing habitats.

Collaborators: Prof. A. Milner, Dr I. Maddock (University of Worcester)

##### **'Sustainable bank protection strategies: A best practice guide'**

ESPRC KTA program focusing the production of best practice guidelines for the sustainable management of bank erosion in large tropical river systems. Outputs of this work, including a critical review of bank protection methods, have the potential to be employed to stabilise eroding sites along the banks of large monsoonal rivers in developing nations such as Vietnam, Cambodia, Laos and Bangladesh.

Collaborators: Prof. S. Darby and Prof. P. Carling (Southampton University)

## Research Grants, Awards and Prizes:

*Large woody debris- a river restoration panacea for streambed nitrate attenuation?* Co-Investigator (Researcher), NERC, 2014-2016, **£977k**

*Smarter EFIs- alternative environmental flow options for use in UK abstraction reform*, Principal Investigator, Environment Agency, 2013, **£8.5k**

*Assessing the influence of river flows on aquatic macroinvertebrates: statistical analysis using historical Environment Agency data*, Principal Investigator, University of Worcester, 2013, **£3.5k**

*Rapid assessment of physical habitat sensitivity to river abstraction- Expanding coverage for use in the Environment Agency*, Principal Investigator, Environment Agency & University of Worcester, 2012/2013. **£77k**

*Understanding the impacts of water abstraction and river flows on aquatic ecology*, Principal Investigator, NERC & Environment Agency, 2011/2012, **£63k**

Head of School Teaching Award (with Prof A. Milner) University of Birmingham, 2010

## Publications

**Klaar, M.J.**, Malone, E., Kidd, C., Bartlett, R., Pinay, G. Chapin III, F.S. and Milner, A.M. (2014). Spatial and temporal dynamics of landscape development within watersheds of different ages. *Earth Surface Processes and Landforms* (in review)

Krause, S., **Klaar, M.J.**, Hannah, D.M., Mant, J., Bridgeman, J., Trimmer, M. and Manning-Jones, S. (2014). The potential of large woody debris to alter biogeochemical processes and ecosystem services in lowland rivers. *WIREs Water*, in press.

**Klaar, M.J.**, Dunbar, M.J., Warren, M. and Soley, R. (2014). Developing hydroecological models to inform environmental flow standards: a case study from England. *WIREs Water* 1(2): 207-217.

Contributing author to British Ecological Society *Ecological Issues* Report: The impact of extreme events on freshwater ecosystems. Available at: [http://www.britishecologicalsociety.org/wp-content/uploads/small\\_single-pages.pdf](http://www.britishecologicalsociety.org/wp-content/uploads/small_single-pages.pdf)

Milner, A.M., Robertson, A.L., McDermott, M.J., **Klaar, M.J.** and Brown, L.E. (2013). Major flood disturbance alters river ecosystem evolution. *Nature Climate Change* 3: 137-141.

**Klaar, M.J.**, Hill, D.F., Maddock, I. and Milner, A.M. (2011). Interactions between instream wood and hydrogeomorphic development within recently deglaciated streams in Glacier Bay National Park, Alaska. *Geomorphology* 130: 208-220.

**Klaar, M.J.**, Maddock, I., and Milner, A.M. (2009). The development of hydraulic and geomorphic complexity in newly formed streams in Glacier Bay National Park, Alaska. *River Research and Applications* 25: 1331-1338

Hill, D.F., Ciavola, S.J., Etherington, L., and **Klaar, M.J.** (2009). Estimation of freshwater runoff into Glacier Bay, Alaska and incorporation into a tidal circulation model. *Estuarine and Coastal Shelf Science* 82: 95-107.

**Klaar, M.J.**, Copp, G.H. and Horsfield, R. (2004). Autumnal habitat use of non-native pumpkinseed *Lepomis gibbosus* and associations with native fish species in small English streams. *Folia Zoologica* 53(2): 189-202.

