

## Extreme climatic events: impacts of floods and droughts on freshwater ecosystems

Mark Ledger, John Sadler, (UoB) and Francois Edwards (CEH)

*Project Summary:* Climate change is expected to increase the future occurrence of extreme climatic events, such as severe rainstorms and droughts, with potentially devastating effects on ecosystems, yet to date most research effort has centred on the impacts of gradually shifting 'average' conditions, not extremes. In freshwaters, shifts in precipitation patterns will alter water supply to freshwaters, altering their hydrology. Extreme events are difficult to study in natural waters because they are, by definition, rare and unpredictable. Experiments have been advocated recently as useful alternative to surveys that are often confounded by long-term change in environmental conditions, and unable to discern causal relationships among the many underlying stressors associated with extreme events. This project will take an experimental approach to determine the effect of weather extremes on community structure and functioning (studying algae, invertebrates and fish) in replicate freshwater mesocosms located in the new Environmental Change Outdoor Laboratory (ECO-LAB) on the University of Birmingham campus. This project also benefits from being closely linked with a NERC grant investigating drought impacts on stream ecosystems. The successful candidate will also benefit from being part of a large, interdisciplinary, research team based at the University of Birmingham.

*Research Training:* The successful candidate will receive inter-disciplinary training in hydroecology and hydrochemistry from staff and students within the Water Sciences Research Group in the School of Geography Earth and Environmental Sciences (GEES), University of Birmingham. The School supports a large, vibrant and well resourced community of postgraduate researchers.

### *Further reading:*

- Ledger, M.E., Brown, L.E., Edwards, F.K., Hudson, L.N., Milner, A.M., Woodward, G. (2013). Extreme climatic events alter complex food webs: evidence from a mesocosm drought experiment. *Advances in Ecological Research*, 48, 343-395.
- Ledger M.E., Brown L.E., Edwards F., Woodward G., Milner A.M. (2013) Drought impacts on the structure and functioning of complex food webs. *Nature Climate Change*, 3, 223-227.
- Ledger M.E., Harris R.M.L., Armitage P.D. & Milner, A.M. (2012). Climate change impacts on community resilience: experimental evidence from a drought disturbance experiment. *Advances in Ecological Research*, 46, 211-258.
- Ledger, M.E., Edwards, F., Brown, L.E., Woodward, G. & Milner, A.M. (2011) Impact of simulated drought on ecosystem biomass production: an experimental test in stream mesocosms. *Global Change Biology*, 17, 2288-2297.
- Ledger, M.E., Harris, R.M.L., Armitage, P.D. & Milner, A.M.M. (2008) Disturbance frequency influences patch dynamics in stream benthic algal communities. *Oecologia*, 155, 809-819.

*Contact details:* for applications: Gretchel Coldicott: [m.e.ledger@bham.ac.uk](mailto:m.e.ledger@bham.ac.uk) [g.coldicott@bham.ac.uk](mailto:g.coldicott@bham.ac.uk); for further information about the project contact Mark Ledger:

Applicants should apply via

<http://www.birmingham.ac.uk/postgraduate/courses/research/gees/geog-environmental-sciences.aspx> where they should click on 'Apply now' and choose the option 'PhD in Department of Geography and Environmental Science (Physical Geography)' and give the PhD title in the 'Funding details' section of the online application.