

Dr Chris Bradley PhD, MA

Senior Lecturer

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About

Chris has been a lecturer in Geography and Environmental Science at the University of Birmingham from 1994 and became Senior Lecturer from 2007.

Qualifications

- 1994 - PhD 'Hydrology of a floodplain wetland' NERC Studentship - University of Leicester
- 1990 - MA Water quality dynamics in meltwaters draining Peyto Glacier, Alberta - Wilfrid Laurier University
- 1988 - BA, MA - University of Cambridge

Postgraduate supervision

Research Students since 2001

- **Sahana Harun:** Water quality dynamics in a lowland tropical catchment: the Kinabatangan River, Sabah, Malaysia. Malaysian Government Scholarship. Government Scholarship
- **Liz Hamilton:** Upland – wetland biogeochemical interactions in a tropical landscape. NERC Studentship.
- **Qiong Zhou:** Integrated river basin management: the Mountain – River – Lake (MRL) program, Jiangxi Province, China.
- **Jill Crossman:** Hydro-ecology of Upwelling Zones in a Glacierised Catchment, Denali National Park, Alaska. NERC Studentship
- **Tim Grapes:** August 2003. Groundwater – River Interaction in a Chalk Catchment: the River Lambourn, UK. NERC Studentship
- **Andy Clay:** March 2006. Hydrodynamics of floodplain wetlands: River Tern (Shropshire) and Afon Llwyd (Plynlimon). NERC Studentship

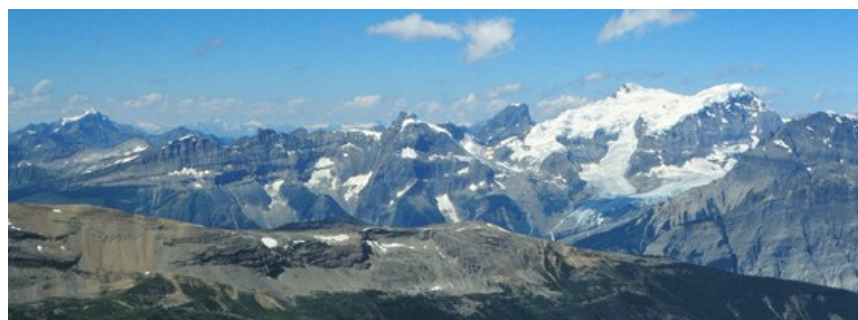
Research

Research Group

- Water Sciences

Research Interests

- Hydrodynamics of floodplain wetlands
- Soil-Water fluxes in macro-porous soils
- Hydrology of permeable catchment



Current / recent research

Hydrodynamics of floodplain wetlands

This on-going work seeks to advance ways to investigate the hydrology of lowland floodplain wetlands and includes the modelling of shallow groundwater flows and river-aquifer interaction. Specific research projects have included the modelling of transient water table variations on floodplain wetlands using the USGS groundwater modelling program, MODFLOW (Bradley, 2002). The research has been associated with the use of hydrological data to characterise wetland hydrology, within the context of floodplain / wetland sedimentology. Joint work with David Gilvear (University of Stirling) has investigated the movement of water to

and from the water-table at sites in the Insh Marshes, Speyside, using a lysimeter and nests of tensiometers (Gilvear & Bradley, 2000; Gilvear & Bradley, 2009). Other work, recently completed, has included an investigation of the use of stable isotopes to fingerprint water sources from a small headwater wetland in North Shropshire (Clay et al., 2004), and the use of a network of 12 recording tensiometers to identify variations in the direction and rate of water movement through a small upland floodplain wetland near Plynlimon.

Soil – Water fluxes in Macro-porous soils

Many studies of wetland hydrology assume that water fluxes can be estimated using Darcy's Law. The limitations of this approach have been considered in a number of

papers that examine water flow through peat deposits, and, for a cracking clay soil at Brimstone Farm, Oxfordshire. Bradley and van den Berg (2005) describe a novel field experiment to determine the hydraulic conductivity of a herbaceous peat deposit, in which four infiltration experiments were conducted on the same isolated peat column. Bradley et al (2005 & 2007) examined seasonal soil-water dynamics in an instrumented plot, comprising four nests of recording tensiometers, in a cracking clay soil, and investigated the factors contributing to macro-pore flow.

Hydrology of Permeable Catchments

A recently completed project (with Dr Tim Grapes) investigated surfacewater - groundwater interactions in a permeable chalk catchment in the UK (the River Lambourn). The project included the modelling of groundwater flows using an enhanced version of MODFLOW (Groundwater Vistas). An extensive flow accretion survey highlighted characteristic variations in seepage to and from the river, related to catchment topography.

On-going work with Prof. Andy Baker (University of New South Wales) seeks to quantify the uncertainty in stalagmite $\delta^{18}\text{O}$ that arises specifically as a function of the variation in karst water flow pathways. A lumped hydrological model to summarise the dynamics of water movement and has been successfully applied to karst systems in differing climates (Bradley et al. In Press). Current work seeks to calibrate the model for individual speleothems to compare the sensitivity of stalagmite $\delta^{18}\text{O}$ to changes in temperature, and precipitation, over various time-scales.

On-going work in the Tern Catchment (North Shropshire) is investigating carbon fluxes from small riparian wetlands, and looking at the connectivity between the river and different floodplain units (Bradley et al. 2007). A further project with A. Milner and J. Crossman seeks to understand the Hydro-ecology of Upwelling Zones in the Denali National Park, Alaska.

Other activities

Administrative Responsibilities

- Programme Leader, Environmental Science and Management
- Year 3 Tutor, BSc Environmental Science and Management

Publications

Key Publications since 2001

Bradley, C., Baker, A., Jex, C.N., & Leng, M.J. In Press. Hydrological uncertainties in the modelling of cave drip-water $\delta^{18}\text{O}$ and the implications for stalagmite palaeoclimate reconstruction. *Quaternary Science Reviews*.

Baker, A., **Bradley, C.** 2010. Modern stalagmite $\delta^{18}\text{O}$: Instrumental calibration and forward modelling. *Global and Planetary Change*, 71, pp. 201-206.

Hannah, D.M., Malcolm, I.A., & **Bradley, C.** 2009. Seasonal hyporheic temperature dynamics over riffle bedforms. *Hydrological Processes*, 23, pp. 2178-2194.

Gilvear, D & **Bradley, C.** 2009. Hydrological Dynamics II: Groundwater and hydrological connectivity. Chapter 7 in *"The Wetlands Handbook"*, edited by E. Maltby, Wiley, pp. 169-193.

Rosales, J.L., Belmont-Blanco, L. & **Bradley C.** 2007. Hydrogeomorphological and ecological interaction in the confluence zones of the Orinoco River, Venezuela. In: "Hydroecology and Ecohydrology: Past, Present and Future" Edited by D.M. Hannah, P. Wood & J. Sadler. Wiley, pp. 295-316.

Bradley, C., Baker, A., Cumberland, S., Boomer, I., & Morrissey, I.P. 2007. Dynamics of water movement and trends in dissolved carbon in a headwater wetland in a permeable catchment. *Wetlands*, 27 (4), pp. 1066-1080.

Bradley, C., Mosugu, M & Gerrard AJ. 2007. Seasonal dynamics of soil-water pressure in a cracking clay soil. *Catena*, 69, 253-263.

Bradley, C. 2006. Classics Revisited: Lewis 1949: the Pegsdon Dry Valleys. *Progress in Physical Geography*, 30 (3), 394-398.

Grapes, T, **Bradley, C** & Petts, GE. 2006. Hydrodynamics of floodplain wetlands in a Chalk catchment: the River Lambourn, UK. *Journal of Hydrology*. 320, 324-341.

Bradley, C., Mosugu, M, & Gerrard AJ. 2005. Simulation modelling of water movement in a cracking clay soil. *Soil Use and Management*. 21, 386-395

Bradley, C. & van den Berg, JA. 2005. Infiltration mechanisms in a herbaceous peat: results of an infiltration experiment. *Hydrological Sciences Journal*, 50 (4) pp. 713-725

Grapes, T, **Bradley, C** & Petts, GE. 2005. Spatial and temporal dynamics of river - aquifer interaction along a Chalk stream: the River Lambourn, UK. *Hydrological Processes*. 19, 2035-2053.

Bradley, C. 2002. Simulation of the annual water table dynamics of a floodplain wetland, Narborough Bog, UK. *Journal of Hydrology*, 261, pp. 150-172

