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Professor David Hannah PhD

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Professor of Hydrology

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About

David is a physical geographer with interdisciplinary research interests focusing on 3 complementary themes within **hydroclimatology** (interface between hydrology-climatology): (1) hydroclimatological processes within alpine, Arctic, mountain and glacierized river basins; (2) climate and river flow regimes; and (3) river energy budget and thermal dynamics. He has cross-cutting interests in **hydroecology**, specifically ecological response to hydro-climatological and physico-chemical habitat variability/ change, and development of **new methods for monitoring, analysing and modelling environmental dynamics**

Biography

- Head of School, School of Geography, Earth and Environmental Sciences, University of Birmingham (2014-)
- Chair of Hydrology, School of Geography, Earth and Environmental Sciences, University of Birmingham (2012-)
- Reader in Hydrology, School of Geography, Earth and Environmental Sciences, University of Birmingham (2009-12)
- Senior Lecturer in Physical Geography, School of Geography, Earth & Environmental Sciences, University of Birmingham (2005-2009)
- Lecturer in Physical Geography, School of Geography, Earth & Environmental Sciences, University of Birmingham (1998-2005)
- Postdoctoral Associate, School of Geography, Earth & Environmental Sciences, University of Birmingham (1997-1998)
- Fellow of the Higher Education Academy (2007); Member of the Institute of Learning and Teaching and Register Practitioner of The Higher Education Academy (2005)
- Postgraduate Certificate in Learning and Teaching in Higher Education, University of Birmingham (2002)
- PhD, Meltwater generation and drainage within a small glacierized basin in the French Pyrénées, University of Birmingham (1997)
- BSc (Hons) in Physical Geography, University of Aberdeen (1994)

Teaching

Undergraduate modules

- Physical Environment of Birmingham (Year 1; module GGM 106B)
- Preston Montford Field Course (Year 1; module GGM 105)
- Hydroclimatology (Year 2; module GGM 207)
- Research Methods for Dissertations (Year 2; module GGM 201)
- Techniques in Physical Geography (Year 2; module GGM 204)
- Applied Micrometeorology (Year 3; module GGM 314)

Masters courses (project / dissertation supervision)

MSc River Environment Management

- Advances in Water Science (seminar-based module)
- Research and Management (group research project module)
- Project / dissertation supervision

MSc Applied Meterorology and Climatology

- Project / dissertation supervision

Teaching-related resesarch projects

- University of Birmingham LeAP project, Integrating e-learning and mobile technologies in geography with W.J. Eastwood, P. Jones and J. Southworth; Project

Coordinator: D.G.Kingston (2006-07)

- University of Birmingham Alumni Fund, Water monitoring: enhancing student learning through hands-on experience of automated and near real-time observation (2009)

Postgraduate supervision

Doctoral researchers

Current

Alharbi M. (05/12-), Impact of climate change on water resources in Saudi Arabia, The Royal Embassy of Saudi Arabia scholarship, co-supervisors S. Krause and M. Widmann

Royan A. (10/11-), Assessing the vulnerability of river birds to hydrological disturbance, NERC with CASE support from British Trust for Ornithologists (BTO), co-supervisors J.P. Sadler, S.J. Reynolds and D. Nobel (BTO)

Aidoo I.A. (10/10-), Urban river sediment pollution dynamics in storm events, Ghana Education Trust Fund (GETFund), co-supervisor D.M. Lawler

Garner G. (10/10-), River and stream temperature in a changing climate, NERC funded, co-supervisors J.P. Sadler and H. Orr (EA)

Khamis K. (04/10 -), Hydroecology of alpine streams in a changing climate, EU-FP7 ACQWA funded, co-supervisors A.M. Milner and L.E. Brown (Leeds) – 50% supervision

Semmahasak S. (11/09-), Soil erosion hazard assessment, prediction and management in northern Thailand, Chiang Mai Rajabhat University scholarship, co-supervisors D.M. Lawler and J.R.A. Clarke

Sittilert C. (11/09-), Sustainable water management in the upper Ping River basin, Thailand, Chiang Mai Rajabhat University scholarship, co-supervisors J.R.A. Clarke

Blaen P. (10/09 -), Hydroecological response of high latitude river systems in Svalbard to climate change, NERC funded, co-supervisors A.M. Milner and L.E. Brown (Leeds)

Kantola K.M.H. (10/08-), Predicting stream temperature response to changes in riparian land management, NERC Open CASE Studentship, co-supervisor I.A. Malcolm (FRS-FL)

Kordomenidi E. (01/07-; part-time), Impacts of climate change on the freshwater resources of the central Mediterranean, self-funded – working for private sector environmental consultants

Laizé C. (09/06-; part-time), Modification of climate-flow-ecology associations by basin properties, CEH, co-supervisor M. Acreman (CEH-Wallingford)

Mellor C. (10/07-09/11; making corrections), Arctic water source dynamics, stream habitat and biodiversity in a changing climate, University of Birmingham funded, co-supervisor A.M. Milner

Completed

Sariş F.(10/07-08/11), Hydroclimatology of the eastern Black Sea mountain region, High Education Council of Turkey, co-supervisors W.J. Eastwood and H. Aksoy (Istanbul Technical University) – now Lecturer at Çanakkale Onsekiz Mart University, Turkey

O'Callaghan M.J. (10/07-02/11) The occupancy of exposed riverine sediments (ERS) by specialist invertebrates: an evaluation of population threats in the UK, Environment Agency, co-supervisors J.P. Sadler and M.C. Williams (EA) – now PDRA at Birmingham

Lavers D.A. (01/07-10/10), Comparison and combination of statistical and dynamic approaches to seasonal forecasting of river flow anomalies in the UK and Europe, NERC, co-supervisor C. Prudhomme (CEH-Wallingford) – now PDRA at Reading

Henshall S.E. (10/05-01/10), Identifying 'hotspots' of ERS biodiversity: can physical habitat dynamics predict beetle distributions?, NERC with CASE support from EA, co-supervisors J.P. Sadler and M.C. Williams (EA) – now at Buglife (NGO)

Dixon H. (10/03-11/07), PhD Evaluating recent river flow changes in England and Wales, EPSRC with CASE support from Hydro-Logic, co supervisors D.M. Lawler, J. Powell (Hydro-Logic) and A. Shamseldin (Auckland) – now at CEH – 25% supervision

Cadbury S.L. (10/03-06/07), PhD Hydroecology of alpine streams in New Zealand, NERC with CASE support from NIWA, co-supervisors A.M. Milner and C. Pearson (NIWA) – now at EA

Kingston D.G. (10/03-06/07), PhD Recent change in river flood magnitude-frequency in North Atlantic arctic and subarctic environments: Impact of atmospheric circulation fluctuations, University of Birmingham funded, co supervisors D.M. Lawler and G.R. McGregor – now Lecturer at University of Otago, New Zealand

Monk W.A. (10/02-01/06), PhD Scales of hydroecological variability within riverine ecosystems, Loughborough University with CASE support from EA, co-supervisors P.J. Wood (Loughborough) and D.A. Wilson (EA) - now PDRA at Canadian Rivers Institute and University of New Brunswick

Brown L.E. (10/01-12/04), PhD Hydroecological response of alpine streams to dynamic water store contributions, NERC, co-supervisor A.M. Milner – now Senior Lecturer at University of Leeds

Bower D. (10/00-11/04), PhD Western European climate and river flow regimes, NERC, co supervisor G.R. McGregor - now at Norwegian Water and Energy Secretariat (NVE)

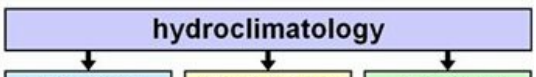
Kansakar S.R. (10/99-09/04), PhD Hydroclimatological Regimes of River Basins of Nepal, UK Department For International Development (DFID) grant AG2206, co-supervisors A.J. Gerrard and A. Gustard (CEH) – now at EA

Research

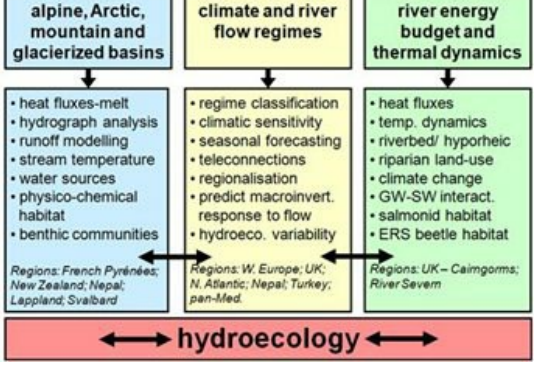
Research groups

- Water sciences
- **Hydroecology (/research/activity/water/themes/hydroecology/index.aspx)**

Research interests



David Hannah's research is interdisciplinary, focusing on 3 complementary themes within **hydroclimatology** (interface between hydrology-climatology):



- hydroclimatological processes within alpine, Arctic, mountain and glacierized river basins
- climate and river flow regimes
- river energy budget and thermal dynamics

He has a crosscutting interest in **hydroecology**, specifically ecological response to hydroclimatological and physico-chemical habitat variability / change.

Professor Hannah also develops new **methods for monitoring, analysing and modelling environmental dynamics** at range of space-time scales.

Current and recent research

Hydroclimatological processes within alpine, Arctic, mountain and glacierized river basins

- ACQWA (EU FP7): Assessing Climatic change and impacts on the Quantity and quality of Water. WP4.1 **Running Water Ecosystems (http://www.acqwa.ch/)**
- Hydroecological response of high latitude river systems in Svalbard to climate change (NERC studentship plus ARCFAC-V grant from the European Centre for Arctic Environmental Research and Research Council or Norway Arctic Fieldwork Grant)
- Arctic water source dynamics, stream habitat and biodiversity in a changing climate (Birmingham studentship plus EU-ATANS transnational access programme support for fieldwork in Swedish Lappland)
- Hydroecology of alpine streams in New Zealand (NERC studentship CASE with National Institute of Water and Atmospheric [NIWA] research, Christchurch, plus NERC ICP Analytical Support)
- Hydroclimatological regimes of Himalayan river basins of Nepal (Royal Society and DFID studentship, in collaboration with HMG Department of Hydrology and Meteorology-Kathmandu, Society of Hydrologists and Meteorologists of Nepal, and Centre for Ecology and Hydrology [CEH])
- Participant in UNESCO IHP Hindu-Kush-Himalayan FRIEND

Climate and river flow regimes

- UK National Representative for IAHS (International Association of Hydrological Sciences), and Chair of the UK Committee for the IAHS
- Vice President of IAHS-**International Commission on Surface Water (http://www.icsw.bham.ac.uk/site/)**
- Coordinator of UNESCO-IHP Northern European FRIEND Project 3 - Large-scale variations in hydrological characteristics
- Participant in UNESCO IHP Northern European FRIEND Project 2 - Low Flow and Project 1 - Hydrological Data Base
- Hydroclimatology of drought (in collaboration with Universities of Oslo and Otago-New Zealand, plus CSA network partner in an EU-FP7 project on **drought risk-XEROCHORE (http://www.feem-project.net/xerochore/)**
- Seasonal forecasting of river flow anomalies in the UK and Europe (NERC studentship, in collaboration with CEH)
- Climatic sensitivity of river flow regimes in: northern North Atlantic region (Birmingham studentship), Western Europe (NERC studentship) Turkey (High Education Council of Turkey studentship), pan-Mediterranean (self-funded studentship) and UK (CEH studentship)
- Scales of hydroecological variability within riverine systems (in collaboration with Loughborough University and Environment Agency [EA])
- Vulnerability of river birds to hydrological disturbance (NERC studentship with CASE support from BTO)
- Soil erosion and river sediment dynamics in urban environment (Ghana Education Trust Fund studentship) and in Thailand (Chiang Mai Rajabhat University scholarship)

River energy budget and thermal dynamics

- River and stream temperature in a changing climate (NERC studentship in collaboration with EA)
- Predicting stream temperature response to changes in riparian land management (NERC Open CASE studentship with FRS-Freshwater Laboratory)
- Stream temperature response to changes in Scottish forest management; temperatures and heat exchanges within Cairngorm rivers (Carnegie Trust, in collaboration with University of Aberdeen and FRS-Freshwater Laboratory)
- Physical habitat (especially thermal and inundation regimes) dynamics of exposed riverine sediments (NERC studentship CASE EA, EA-funded studentship and NERC Geophysical Equipment Facility Support)

NERC Knowledge Transfer Network

- Work Package Leader (with S. Krause) on hydroecology and biogeochemistry as part of the **Hyporheic Network (http://www.hyporheic.net/)** : a knowledge transfer network on groundwater - surface water interactions and hyporheic zone processes

Other activities

- Leader, Water Sciences research group

Publications

International Peer-Reviewed Journal Publications since 2007
(in reverse chronological order)

Carrivick J., Brown L.E., Hannah D.M. and Turner A.G. (2012), Numerical modelling of spatio-temporal thermal heterogeneity in a complex river system, *Journal of Hydrology*, 414–415 (2012) 491- 502 DOI: 10.1016/j.jhydrol.2011.11.026

Kingston D.G., Eastwood W.J., Jones P.I, Marshall S., Johnson R.H. and Hannah D.M. (2012), Experiences of using mobile technologies and virtual fieldtrips in Physical Geography: implications for hydrology education, *Hydrology and Earth Systems Science*, 16, 1281–1286 DOI:10.5194/hess-16-1281-2012

Monk W.A., Wood P.J., Hannah D.M., Extence C.A., Chadd R.P. and Dunbar M.J. (2012), How does macroinvertebrate taxonomic resolution influence ecohydrological relationships in riverine ecosystems?, *Ecohydrology*, 5, 36–45 DOI: 10.1002/eco.192

Hannah D.M., Demuth S., van Lanen H.A.J., Looser U., Prudhomme C., Rees G., Stahl K. and Tallaksen L.M. (2011), Large-scale river flow archives: importance, current status and future needs, *Hydrological Processes - HPToday Invited Commentary*, 25, 1191–1200 DOI: 10.1002/hyp.7794

Cloke H.L. and Hannah D.M. (2011), Preface - Large-scale hydrology: advances in understanding processes, dynamics and models from beyond river basin to global scale, *Hydrological Processes*, 25, 991–995 DOI: 10.1002/hyp.8059

Cadbury S.L, Milner A.M. and Hannah D.M. (2011) Hydroecology of a New Zealand glacier-fed river: linking longitudinal zonation of physical habitat and macroinvertebrate communities, *Ecohydrology*, 4, 520–531 DOI: 10.1002/eco.185

Fleig A.K., Tallaksen L.M., Hisdal H. and Hannah D.M. (2011), Regional hydrological drought in north-western Europe: linking a new Regional Drought Area Index with weather types, *Hydrological Processes*, 25, 1163–1179 DOI: 10.1002/hyp.7644

Henshall S.E., Sadler J.P., Hannah D.M. and Bates A.J. (2011), The role of microhabitat and food availability in determining riparian invertebrate distributions on gravel bars: a habitat manipulation experiment, *Ecohydrology*, 4, 512–519 DOI: 10.1002/eco.188

Krause S., Hannah D.M. and Blume T. (2011), Interstitial pore-water temperature dynamics across a pool-riffle-pool sequence, *Ecohydrology*, 4, 549–563 DOI: 10.1002/eco.199

Krause S., Hannah D.M., Fleckenstein J.H., Heppell C.M., Pickup R., Pinay G., Robertson A.L. and Wood P.J. (2011), Interdisciplinary perspectives on processes in the hyporheic zone, *Ecohydrology*, 4, 481–499 DOI: 10.1002/eco.176

Krause S., Hannah D.M., Sadler J.P. and Wood P.J. (2011), Ecohydrology on the edge: interactions across the interfaces of wetland, riparian and groundwater-based ecosystems, *Ecohydrology*, 4, 477–480 DOI: 10.1002/eco.240

Kingston D.G., Hannah D.M., Lawler D.M. and McGregor G.R. (2011), Regional classification, variability and trends of northern North Atlantic river flow, *Hydrological Processes*, 25, 1021–1033 DOI: 10.1002/hyp.7655

Brown L.E., Milner A.M. and Hannah D.M. (2010), Predicting glacial river ecosystem response to meltwater reduction: comparing the utility of quantitative water sourcing and glaciality index approaches, *Aquatic Sciences*, 72, 325-334 DOI: 10.1007/s00027-010-0138-7

Fleckenstein J.H., Krause S., Hannah D.M. and Boano F. (2010), Groundwater-surface water interactions: new methods and models to improve understanding of processes and dynamics, *Advances in Water Resources*, 33, 1291-1295 DOI:10.1016/j.advwatres.2010.09.011

Fleig A.K., Tallaksen L.M., Hisdal H., Stahl K. and Hannah D.M. (2010), Inter-comparison of weather and circulation type classifications for hydrological drought development, *Physics and Chemistry of the Earth*, 35, 507–515 DOI: 10.1016/j.pce.2009.11.005

Laizé C.L.R. and Hannah D.M. (2010), Modification of climate-river flow associations by basin properties, *Journal of Hydrology*, 389, 186–204 DOI: 10.1016/j.jhydrol.2010.05.048

Lavers D., Prudhomme C. and Hannah D.M. (2010), Large-scale climatic influences on precipitation and discharge for a British river basin, *Hydrological Processes*, 24, 2555–2563 DOI:10.1002/hyp.7668

Lavers D., Prudhomme C. and Hannah D.M. (2010), Large-scale climate, precipitation and British river flows: identifying hydroclimatological connections and dynamics, *Journal of Hydrology*, 395, 242–255 DOI:10.1016/j.jhydrol.2010.10.036

Şaris F., Hannah D.M and Eastwood W.J. (2010), Spatial variability of precipitation regimes across Turkey, *Hydrological Sciences Journal*, 55, 234- 249 DOI: 10.1080/02626660903546142

Wilby R.L., Orr H., Watts G., Battarbee R.W., Berry P.M., Chadd R., Dugdale S.J, Dunbar M.J., Elliott J.A., Extence C., Hannah D.M., Holmes N., Johnson A.C., Knights B., Milner N.J., Ormerod S.J., Solomon D., Timlett R., Whitehead P.J. and Wood P.J. (2010), Evidence needed to manage freshwater ecosystems in a changing climate: turning adaptation principles into practice, *Science of the Total Environment*, 408, 4150–4164 DOI: 10.1016/j.scitotenv.2010.05.014

Hannah D.M., Malcolm I.A. and Bradley C. (2009), Seasonal hyporheic temperature dynamics over riffle bedforms, *Hydrological Processes*, 23 2178-2194 DOI: 10.1002/hyp.7256

Bates A.J., Sadler J.P., Henshall S.E. and Hannah D.M. (2009), Ecology and conservation of arthropods of exposed riverine sediments (ERS), *Terrestrial Arthropod Reviews*, 2, 77-98 DOI: 10.1163/187498309X455052

Brown L.E., Hannah D.M. and Milner A.M. (2009), ARISE: A classification tool for Alpine RIver and Stream Ecosystem management, *Freshwater Biology*, 54, 1357–1369 DOI:10.1111/j.1365-2427.2008.02161.x

Kingston D.G., Hannah D.M., Lawler D.M. and McGregor G.R. (2009), Climate-river flow relationships across montane and lowland environments in northern Europe, *Hydrological Processes*, 23, 985–996 DOI: 10.1002/hyp.7202

Krause S., Hannah D.M. and Fleckenstein J.H. (2009), Preface - Hyporheic hydrology: interactions at the groundwater-surface water interface, *Hydrological Processes*, 23, 2103-2107 DOI: 10.1002/hyp.7366

Milner A.M., Brown L.E. and Hannah D.M. (2009), Hydroecological response of river systems to shrinking glaciers, *Hydrological Processes*, 23, 62-77 DOI: 10.1002/hyp.7197

Pinay G. and Hannah D.M. (2009), Evaluation of global change impacts on diffuse pollution, *F1000 (Faculty of 1000) Biology Reports*, 1:82 DOI: 10.3410/B1-82

Hannah D.M., Webb B.W. and Nobilis F. (2008), Preface - River and stream temperature: dynamics, processes, models and implications, *Hydrological Processes*, 22, 889-901 DOI: 10.1002/hyp.6997

Hannah D.M., Malcolm I.A., Soulsby C. and Youngson A.F. (2008), A comparison of forest and moorland stream microclimate, heat exchanges and thermal dynamics, *Hydrological Processes*, 22, 919-940 DOI: 10.1002/hyp.7003

Brown L.E. and Hannah D.M. (2008), Spatial heterogeneity of water temperature across an alpine river basin, *Hydrological Processes*, 22, 954-967 DOI: 10.1002/hyp.6982

Cadbury S.L., Hannah D.M., Milner A.M., Pearson C.P. and Brown L.E. (2008), Stream temperature dynamics within a New Zealand glacierized river basin, *River Research and Applications*, 24, 68–89 DOI: 10.1002/rra.1048

Malcolm I.A., Soulsby C., Hannah D.M., Bacon P.J., Youngson A.F. and Tetzlaff D. (2008), The influence of riparian woodland on stream temperatures: implications for the performance of juvenile salmonids, *Hydrological Processes*, 22, 968-979 DOI: 10.1002/hyp.6996

Monk W.A., Wood P.J., Hannah D.M. and Wilson D.A. (2008), Macroinvertebrate community response to inter-annual and regional river flow regime dynamics, *River Research and Applications*, 24, 988–1001 DOI: 10.1002/rra.1120

Webb B.W., Hannah D.M., Moore R.D., Brown L.E. and Nobilis F. (2008), Recent advances in stream and river temperature research, *Hydrological Processes*, 22, 902-918 DOI: 10.1002/hyp.6994

Hannah D.M., Brown L.E., Milner A.M., Gurnell A.M., McGregor G.R., Petts G.E., Smith B.P.G. and Snook D.L. (2007), Integrating climate-hydrology-ecology for alpine river systems, *Aquatic Conservation: Marine and Freshwater Ecosystems*,17, 636–656 DOI:10.1002/aqc.800

Hannah D.M., Sadler J.P. and Wood P.J. (2007), Hydroecology and ecohydrology: a potential route forward?, *Hydrological Processes - HPToday Invited Commentary*, 21, 3385–3390 DOI:10.1002/hyp.6888

Bower D., McGregor G.R., Hannah D.M. and Sheridan S.C. (2007), Development of a Spatial Synoptic Classification Scheme for Western Europe, *International Journal of Climatology*, 27, 2017–2040 DOI:10.1002/joc.1501

Brown L.E. and Hannah D.M. (2007), Alpine stream temperature response to storm events, *Journal of Hydrometeorology*, 8, 952-967 DOI:10.1175/JHM597.1

Brown L.E., Hannah D.M. and Milner A.M. (2007), Vulnerability of alpine stream biodiversity to shrinking glaciers and snowpacks, *Global Change Biology*, 13, 958–966

Brown L.E., Milner A.M. and Hannah D.M. (2007), Groundwater influence on alpine stream ecosystems, *Freshwater Biology*, 52, 878–890

Kingston D.G., McGregor G.R., Hannah D.M., and Lawler, D.M. (2007), Climatic controls on New England streamflow, *Journal of Hydrometeorology*, 8, 367-379 DOI:10.1175/JHM584.1

Monk W.A., Wood, P.J., Hannah, D.M. and Wilson, D.A. (2007), Selection of river flow indices for the assessment of hydroecological change, *River Research and Applications*, 23, 113–122

Expertise

Climate and hydrology interactions (hydroclimatology); mountain/alpine/glacier environments; climate and river flows (flood/drought); stream/river temperature; biological/human response to climate/hydrological change

Expertise

Climate and hydrology interactions (hydroclimatology); mountain/alpine/glacier environments; climate and river flows (flood/drought); stream/river temperature; biological/human response to climate/hydrological change

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