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- Recent Final Revised Papers
- Volumes and Issues**
- Special Issues
- Library Search
- Title and Author Search

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Review

Production

Subscription

Comment on a Paper

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- Volumes and Issues
- Contents of Issue 3
- Special Issue

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The influence of riparian woodland on the spatial and temporal variability of stream water temperatures in an upland salmon stream

I. A. Malcolm¹, D. M. Hannah², M. J. Donaghy³, C. Soulsby¹, and A. F. Youngson³

¹Department of Geography and Environment, University of Aberdeen, Elphinstone Road, Aberdeen AB24 3UF, UK

²School of Geography, Earth and Environmental Sciences, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK

³Fisheries Research Services (FRS) Freshwater Laboratory, Faskally, Pitlochry, Perthshire PH16 5LB, UK

Email for corresponding author: i.a.malcolm@marlab.ac.uk

Abstract. The spatio-temporal variability of stream water temperatures was investigated at six locations on the Girnock Burn (30km² catchment), Cairngorms, Scotland over three hydrological years between 1998 and 2002. The key site-specific factors affecting the hydrology and climatology of the sampling points were investigated as a basis for physical process inference. Particular emphasis was placed on assessing the effects of riparian forest in the lower catchment versus the heather moorland riparian zones that are spatially dominant in the upper catchment. The findings were related to river heat budget studies that provided process detail. Gross changes in stream temperature were affected by the annual cycle of incoming solar radiation and seasonal changes in hydrological and climatological conditions. Inter-annual variation in these controlling variables resulted in inter-annual variability in thermal regime. However, more subtle inter-site differences reflected the impact of site-specific characteristics on various components of the river energy budget. Inter-site variability was most apparent at shorter time scales, during the summer months and for higher stream temperatures. Riparian woodland in the lower catchment had a substantial impact on thermal regime, reducing diel variability (over a period of 24 hours) and temperature extremes. Observed inter-site differences are likely to have a substantial effect on freshwater ecology in general and salmonid fish in particular.

Keywords: temperature, thermal regime, forest, salmon, hydrology, Girnock Burn, Cairngorm

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