



Headwater river temperature response to forestry management (Loch Ard, Scottish Highlands)

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Understanding of the role of forest cover as a control on river and stream temperature has become increasingly important in the context of potential for adaption to climate change and buffering of water temperature extremes. Impacts of land use change on stream temperature regimes in forested catchments are still poorly understood. Only a few studies examine forest cover impacts on stream temperature outside North America. The main research focus has been on summer maximum temperature; and there is a general lack of medium- and long-term monitoring. No long-term study has focused on Scottish headwater rivers, despite extensive commercial forestry and the critical importance of these streams as a habitat for protected species such as Atlantic salmon. This study addresses these research gaps by examining river temperature regimes for catchments the in Loch Ard forest over a 20 year period that includes pre- and post-clear felling of commercial coniferous plantations. Sub-hourly water and air temperature data sets are combined with detailed felling maps (held within a GIS framework). Felled catchments are paired with unaltered (control) catchments and their diurnal stream temperature range and seasonal temperature patterns are compared before and after felling. Stream temperature regime changes are examined in relation to extent and spatial arrangement of felling. Felling altered both diurnal stream temperature range and seasonal temperature regimes with the magnitude of change dependent on prior land use and spatial arrangement of felling. Findings indicate that modified felling strategies may be used to mitigate impact of forestry operations on stream temperature; but more research is needed to improve processes understanding of heat fluxes between stream and land use.