STREAM TEMPERATURE MODELING AND THERMAL RESTORATION POTENTIALS

KLAUS JORDE [1] and IVO SCHERRER [2]

[1] Professor of Civil Engineering, Center for Ecohydraulics Research, University of Idaho – Boise, 322 E. Front St., Boise, ID 83712, USA (e-mail: jorde@uidaho.edu)
[2] M.S. Student, Institute of Hydraulic Engineering, University of Stuttgart, Pfaffenwaldring 61, 70550 Stuttgart, Germany

High stream temperatures are a limiting factor for salmonid species in many rivers and streams in the Western United States. Increased temperatures often result from land use changes, such as deforestation or mining operations, that leave wide and shallow river beds. Restoration efforts to improve the ecological integrity of rivers and streams have to include thermal aspects. A physical process based temperature model was developed for Red River in central Idaho within a large scale restoration project to help quantify the energy balance of the river and to explore different options for thermal restoration. The model uses three tributaries as the upstream boundary, and includes two open meadows connected by a canyon reach, each comprising reaches with a variety of different morphological/hydraulic properties, shading from trees or topography etc. The model was calibrated with data from an on-site weather station and numerous stream temperature gauges and was then used to evaluate different options to lower the temperatures in the downstream meadow, a Chinook salmon spawning and rearing site, which is suffering from elevated temperatures. Results show that short wave solar radiation is the predominant component of the energy flux and signals from a reforested upstream watershed would be mostly lost by the time the water reaches the lower meadow, and that thermal restoration efforts will be most effective if focused on streamside vegetation within the meadow itself.

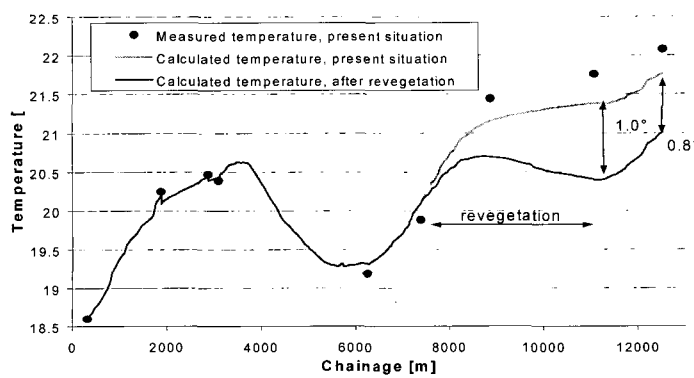

Fig. 4 Longitudinal temperature profiles for present situation and after revegetation during the study reach on August 13, 2002, at 18:00 h.

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