

# Journal of Environmental Hydrology

ISSN 1058-3912

Electronic Journal of the International Association for Environmental Hydrology

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JEH Volume 12 (2004), Paper 14 Posted August 7, 2004

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## AIRBORNE THERMAL INFRARED REMOTE SENSING OF STREAM AND RIPARIAN TEMPERATURES IN THE NICOLA RIVER WATERSHED, BRITISH COLUMBIA, CANADA

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### ABSTRACT

*Airborne thermal remotely sensed images of riparian and water surface temperatures were acquired at 12 sites in the Nicola River watershed of south-central British Columbia, Canada, using a forward-looking infrared (FLIR) camera. Ground-truth observations to correlate radiant ( $T_r$ ) versus kinetic ( $T_k$ ) water temperatures were performed at 3 sites and showed an accuracy of  $\pm 0.4^\circ\text{C}$ . Landscape and water thermograms obtained at 3 representative sites in the study area were analyzed and revealed apparent thermal landscape-water interactions contributing to the observed spatial heterogeneity in stream temperatures. However, a critical analysis of remotely sensed stream heating patterns revealed that approximated solar energy inputs and conduction from adjacent streambanks and the atmosphere could only account for ca. 0.5% of the apparent required heat influx in some locations, suggesting imaging interference by emissive radiation from the exposed land surfaces. Pixel mixing of land and water surface temperatures was also found to be a potential interferant in narrow braided channels with widths near the resolution of the camera (0.15-0.5 m). The utility of the method for assessing mixing in and between riverine systems was also shown. Overall, aerial remote sensing of stream and riparian surface temperatures appears to be a promising technology for assessing spatial heterogeneity, and may be useful in conjunction with conventional in-stream methods as part of a hybrid spatial-temporal observing system for aquatic management, provided further work is performed to validate observed temperatures near exposed streambanks, in vegetation shadows, and other areas where emissive interference may be problematic.*

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**Reference:** Rayne, S. and G.S. Henderson; Airborne Thermal Infrared Remote Sensing of Stream and Riparian Temperatures in the Nicola River Watershed, British Columbia, Canada, *Journal of Environmental Hydrology*, Vol. 12, Paper 14, August 2004.

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