

Stream temperature response to 50% strip-thinning in a temperate forested headwater catchment

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Abstract

We examined stream temperature response to 50% strip-thinning of a 20- to 50-year-old Japanese cedar and cypress plantation in a 17-ha headwater catchment. The thinning lines extended through the riparian zone. Paired-catchment analysis was applied to estimate changes in daily maximum, mean, and minimum stream temperatures for the first year following treatment. Significant effects on daily maximum stream temperature were found for April to August, ranging from 0.6 to 3.9 °C, similar to the magnitude of effect found in previous studies involving 50% random thinning. Multiple regression analysis revealed that treatment effects for maximum daily stream temperature were positively related to solar radiation and negatively related to discharge. Frequent precipitation during the summer monsoon season produced moderate increases in discharge (from 1 to 5 mm day⁻¹), which mitigates stream temperature increases associated with solar radiation. Catchment hydrologic response to rain events can play an important role in controlling stream thermal response to forest management practices.

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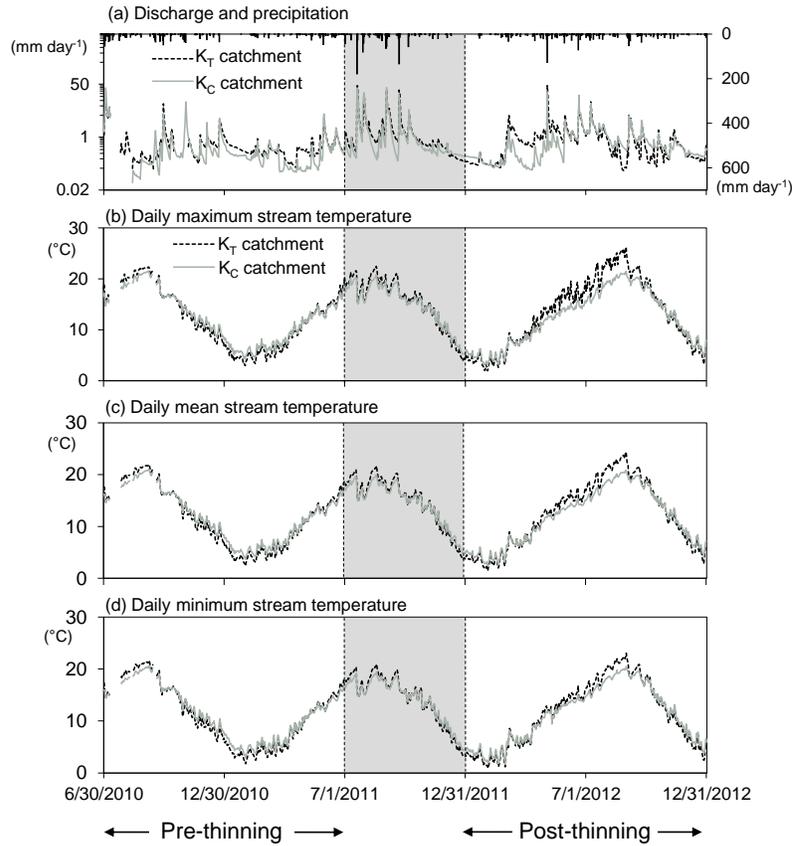


Figure 4. (a) Daily stream discharge and total daily precipitation, (b) daily maximum stream temperatures, (c) daily mean stream temperatures, and (d) daily minimum stream temperatures at K_T and K_C catchments. Shaded area indicates during thinning operation period.

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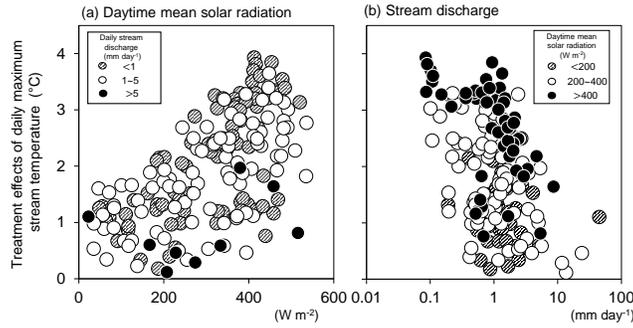


Figure 6. (a) Relationship between daytime mean solar radiation and treatment effects of daily maximum stream temperature by the classification of discharge classes. (b) Relationship between stream discharge and treatment effects of daily maximum stream temperature by the classification of solar radiation classes. Data from April to September 2012 is used for these plots.

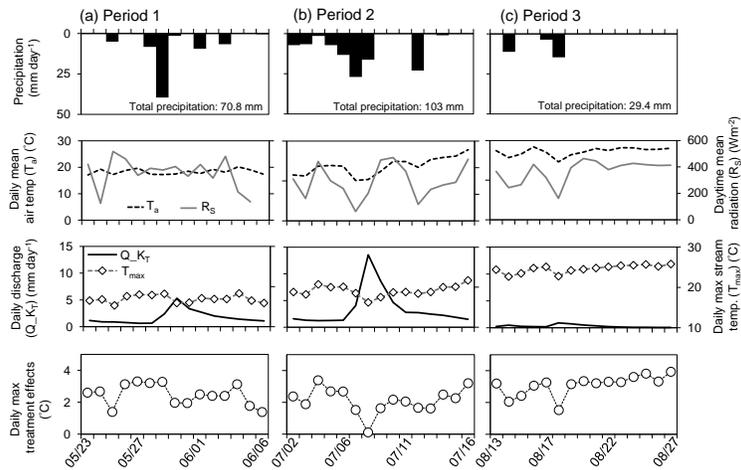


Figure 7. Changes in precipitation, runoff, climate condition, and treatment effect in selected periods of May, July, and August in post-thinning period.

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