

QUANTIFYING RIPARIAN CANOPY ENERGY ATTENUATION AND STREAM TEMPERATURE USING AN ENERGY BALANCE APPROACH

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ABSTRACT

Forested riparian buffers play an important role in modulating stream water quality, including temperature. Few studies have quantified the relationship between stream temperature and canopy cover in the climatologically distinct deciduous forests of the central U.S. Hydroclimate data were collected from two intensively instrumented stream reaches of opposite orthogonal compass orientation in a semi-karst watershed on the border of southern Missouri's Ozark region, USA, during the 2010 water year. Data were compared to above canopy reference measurements to calculate an energy budget for each stream reach. Average leaf area index (LAI) during the year was 2.64 in the riparian zone adjacent to the E-W oriented reach, and 2.43 in the N-S reach riparian zone. Air temperature and relative humidity transect data analysis indicated that riparian microclimate was significantly different ($\alpha=0.01$) from the stream edge 25 or 40 meters away for 3 of 4 transects. Average stream discharge was 0.15 m³/s and 0.25 m³/s within the E-W and N-S reaches respectively. Mean stream temperature was greatest in August and was 24.4 °C in the E-W reach and 24.0 °C in the N-S reach. Net shortwave radiation was the primary energy flux causing stream heating (average 44.7 W/m² for E-W reach and 46.8 W/m² for N-S reach). Results suggest that riparian management practices in Missouri should potentially be altered to include wider buffers (40 meters) with less thinning (density dependent on stream size and discharge) to maintain pre-harvest stream temperature regimes.