A Large-Scale Field Assessment Using Underwater Epoxy to Install Annual Temperature Monitoring Sites in Rivers and Streams

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Stream temperature regimes are fundamentally important to understanding pattern and process in aquatic communities. Modern digital sensors can provide accurate and repeated temperature measurements that span multiple years, but are rarely deployed for more than a few summer months due to logistical constraints with seasonal stream access and concerns that large annual floods will destroy sensors. We developed an inexpensive, rapid protocol (sensor installation takes ~20 minutes) that uses underwater epoxy to attach sensors to large rocks and cement bridge structures so that annual temperature monitoring is feasible. Initial field trials suggested sensors were not biased by heat conduction through the attachment structure as long as solar shields were used. Subsequently, a large field assessment was initiated during the summers 2010 - 2012 wherein more than 500 temperature monitoring sites were established with epoxy in streams ranging in channel slope from 0.1% - 16% across the northwest U.S. Revisits to 179 sites indicate good sensor retention rates, with 88% – 100 % of sensors retained after one year in low-gradient streams (< 3%) and 70% - 78% retained in high-gradient streams (> 3%). The underwater epoxy technique is viable for installing temperature sensors in a wide range of streams and rivers and can be used anytime during low flows over a wide range of stream temperatures (2˚C – 20˚C). The technique increases the efficiency of temperature monitoring by reducing the number of site visits to < 1/year rather than the current norm of 2/year for summer data and facilitates the collection of continuous data over multi-year periods for ~$120 in initial equipment costs (primarily sensor costs).

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