

# Science

## BRIEFING

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## USING UNDERWATER EPOXY TO INSTALL TEMPERATURE SENSORS

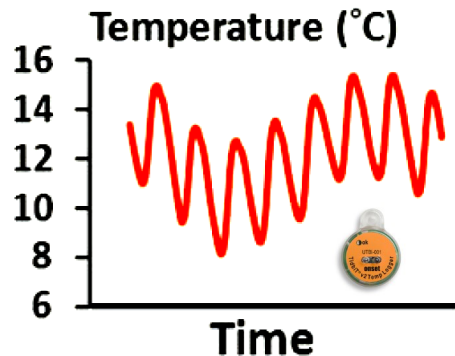
### BACKGROUND

Thermal regimes in rivers and streams are fundamental determinants of biological processes and are often monitored for regulatory compliance. Climate change and other factors associated with human development and land management pose significant threats to the thermal integrity of many streams and rivers. Our ability to quantify those threats with accurate measurements of temperature dramatically increased in the early 1990s with the advent of inexpensive, miniature temperature sensors.

### RESEARCH

**Research Activity:** RMRS researchers have developed a simple technique for establishing annual stream temperature monitoring sites. The protocol can be accessed online at [www.fs.usda.gov/treesearch/pubs/44251](http://www.fs.usda.gov/treesearch/pubs/44251). This method uses underwater epoxy to attach miniature sensors to large rocks and cement bridge supports, which then serve as protective anchors. Earlier research indicated that attachment to these features does not bias temperature measurements and that epoxy installations could withstand large floods. Estimates of sensor retention rates at 1- and 2-year intervals facilitate comparisons with other techniques and provide users with estimates of the amount of data that a temperature monitoring network will yield.

**Management Implications:** Establishing annual monitoring sites with underwater epoxy is inexpensive, can be done in a wide range of water temperatures, and improves data collection efficiency because few site visits are required and measurements are recorded throughout the year. The epoxy protocol facilitates expansion of monitoring efforts to all seasons of the year so that annual monitoring and long-term records become common in streams. Those data will enable better environmental assessments, a richer understanding of thermal regimes, and new scientific inquiries regarding the thermal ecology of aquatic species.



*A PVC canister assembled with epoxy is attached to a large rock so that the downstream surface is shielded from moving substrate and debris.*

### KEY FINDINGS

- Thermal regimes are fundamentally important to aquatic biotas and the advent of inexpensive, miniature digital sensors has resulted in widespread temperature monitoring efforts in recent decades
- With a simple protocol that uses underwater epoxy to attach sensors, more than 500 new monitoring sites were established from 2010 to 2012 in rivers and streams across the Rocky Mountains.
- Revisits to 179 sites indicate good sensor retention rates, with 88 - 100% of sensors retained after 1 year in low-gradient streams (<3%) and 70 - 78% retained in high-gradient streams (>3%).

### MORE INFORMATION

For more information about stream temperature monitoring, modeling, or to access temperature databases, please visit the Stream Temperature website ([www.fs.usda.gov/rm/boise/AWAE/projects/stream\\_temperature.shtml](http://www.fs.usda.gov/rm/boise/AWAE/projects/stream_temperature.shtml)) OR the NorWeST website ([www.fs.usda.gov/rm/boise/AWAE/projects/NorWeST.html](http://www.fs.usda.gov/rm/boise/AWAE/projects/NorWeST.html)). For additional information, please contact **Dan Isaak**, USFS Research Fishery Biologist, [disaak@fs.fed.us](mailto:disaak@fs.fed.us) or (208)373-4385.