BasinTemp: Stream Temperature Monitoring

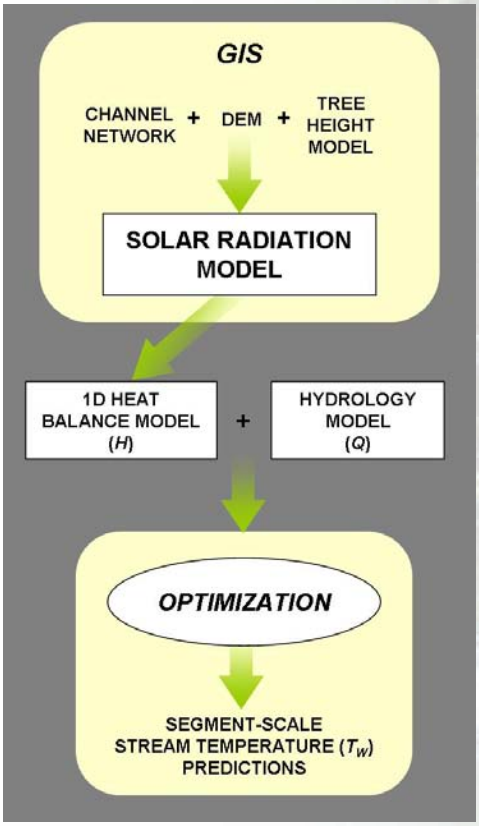
The BasinTemp© model predicts stream temperatures for entire watersheds while only requiring a minimum of input data. Developed to evaluate stream temperature controls on aquatic biological conditions at the scale of the entire basin, BasinTemp© employs an optimization scheme which uses a handful of well distributed, field-measured stream temperatures to improve temperature predictions.

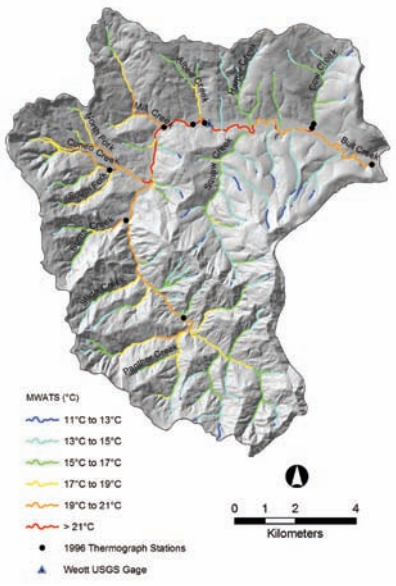
How does it work?

BasinTemp© draws on existing empirical and theoretical research and couples a solar radiation model, with a simple energy balance and hydrologic model, to calculate (1) the mass transfer of heat between each reach and the environment, and (2) the downstream transport of heat. Temperature predictions are then displayed using GIS functionality.

Why use BasinTemp?

One of the primary functions of BasinTemp© is to allow resource and land managers to explore the relationship between vegetation and stream temperatures. The model can predict various water temperature metrics (including MWATs) at time steps from 1 day to 1 month, and provides a way to identify portions of the stream channel network where elevated temperatures may degrade salmonid habitat. The model can also be used to identify optimal and near-optimal salmonid habitat across the channel network, and to evaluate how riparian-zone vegetation management strategies are affecting stream temperature.





First temperature TMDL in California

BasinTemp© was originally developed in response to the EPA's request for technical help in developing the first temperature TMDL in California, which was for the South Fork Eel basin. Cold-water salmonid habitat is the primary beneficial use in the South Fork Eel basin and the model was used to identify those parts of the basin where elevated temperatures were impairing coho salmon habitat. Cumulative effects of stream temperatures could then be evaluated for the entire basin.

Modeling forest canopy effects pre- and post-project

BasinTemp© was used to determine the natural thermal potential attainment of Deer Creek as part of relicensing studies for the Eugene Water and Electric Board's Carmen-Smith Project, Oregon. The model was used to demonstrate that even under pre-project conditions, shading by the forest canopy along their transmission line corridor was insufficient to meet current water temperature standards.

Climate change and long-term analysis

BasinTemp© is being used to assess the different controls on water temperature in a small, coastal watershed in Mendocino County, Northern California. Results for the first three years of the study have provided important insights into potential climate change impacts on water temperature.

Comparing effects of forest canopy and instream flow on summer rearing temps

Stillwater Sciences led the multi-agency Watershed Analysis in support of relicensing PacifiCorp's North Umpqua Hydroelectric Project, Oregon. As part of the watershed analysis, we applied the BasinTemp© model to predict the effects of forest canopy and instream flows on summertime stream temperatures for rearing salmonids. Model results showed that forest management practices had a greater role in governing in-stream temperatures than the changes in instream flows under consideration.

For more information, please contact Bruce Orr, at bruce@stillwatersci.com or 510.848.8098 x111.

Stillwater Sciences