Watershed Hydrology Modeling: What is Considered Calibrated?

Watershed models are simplified mathematical representations of complex real world systems. Models cannot accurately depict the multitude of processes occurring at all physical and temporal scales. Models can however, make use of known interrelationships among variables to predict how a given quantity or variable would change in response to a change in an interdependent variable or forcing function. In this way, models can be useful frameworks for investigations of how a system would likely respond to a perturbation from its current state. To provide a credible basis for prediction and the evaluation of mitigation options, the ability of the model to represent real world conditions should be demonstrated through a process of model calibration and corroboration.

Watershed model calibration involves the adjustment of model parameters to achieve a best fit between model predictions and field observations over a specified period of time. Detailed calibration includes explicit focus on available stream gages at multiple locations in the watershed. After calibrating the watershed model, model corroboration (also known as model validation) is conducted. Model corroboration involves using the calibrated model to simulate a different period of time, at multiple locations in the watershed, and investigates whether a models predictive performance is similar to that achieved over the calibration period.

Watershed model calibration and corroboration generally involves looking at both statistical and graphical comparisons of observed and simulated data. Graphical comparisons generally include time-variable plots of model results versus observation data (typically on a daily, weekly, or monthly basis), flow-frequency curves, and flow accumulation curves. Statistical comparisons generally include comparisons assessing seasonal, base flow, and stormflow representation for the entire calibration/corroboration period as well as for each individual year within those respective periods.

Given the inherent errors in input and observed data and the approximate nature of model formulations, there is not a generally accepted method for determining model acceptance. However, most decision makers want definitive answers to the questions – “How accurate is the model?” and “Is the model good enough for this evaluation?” Tetra Tech is utilizing a procedure for model evaluation to expresses model fit in terms of ranges that correspond to “very good”, “good”, “fair”, or “poor” quality of fit. This procedure has been utilized on 30+ models located in the southeastern United States and the approach has demonstrated that it is very useful for assessing the fit of the model and when present modeling results to stakeholders.

**Presenter:**
Jeremy Wyss
Jeremy.Wyss@tetratech.com
Tetra Tech

**Co-authors:**
Jeremy Wyss and Brian Watson
Tetra Tech