



## United States Department of Agriculture Agricultural Research Service

# Development of Guidelines for Calibration and Validation of Hydrologic and Water Quality Models

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**Rationale:** Hydrologic and water quality models are increasingly used to evaluate the impacts of climate, land use, and land and crop management practices on quantity and quality of land and water resources. Calibration and validation of these models are necessary before using them in research and/or real-world applications in order to increase trustworthiness of simulation results.

Universally accepted guidelines for model calibration and validation offer many published benefits to the modeling community, for example 1) consistent reports of model application capabilities, which results in increased credibility of modeling studies, and 2) improved assessment and comparison of different models applied on the same study area or the same model(s) applied in different areas.

However, no universally accepted procedures or guidelines for calibration and validation currently exist in the literature.

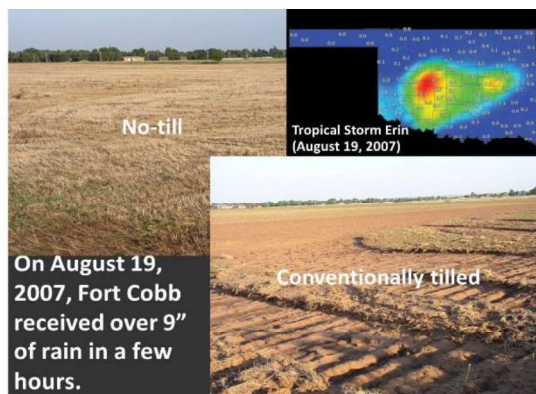


Photo courtesy: Larry Wright and Jean L. Steiner

**Objective:** Develop universally accepted guidelines for calibration and validation of hydrologic and water quality models.

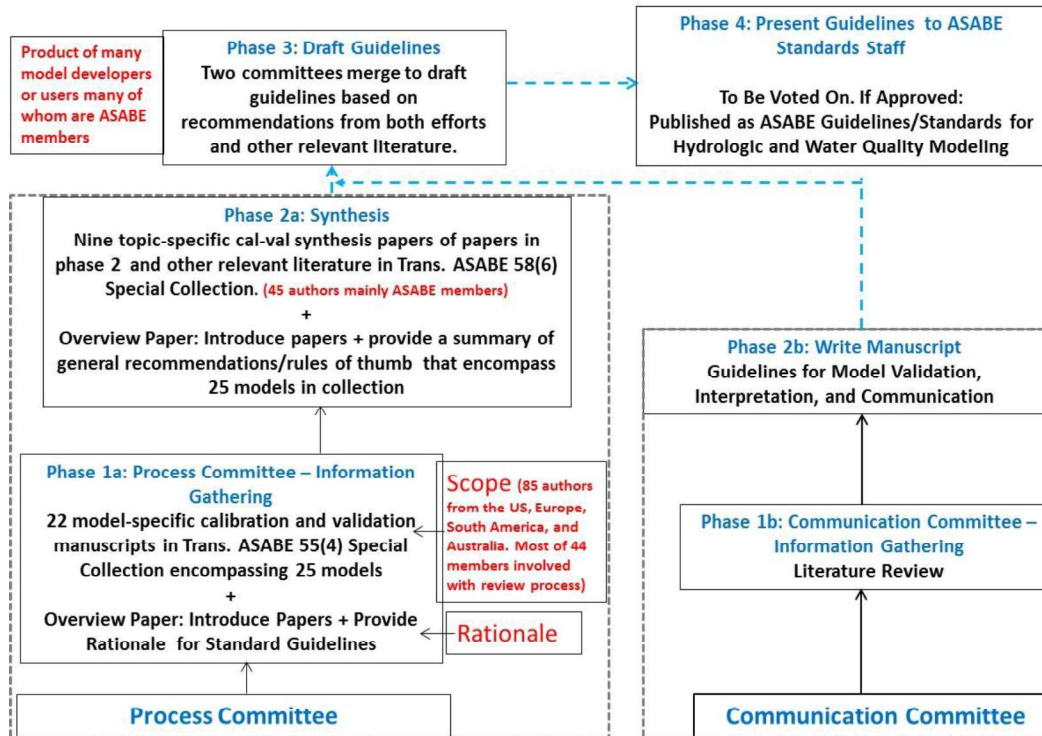
**What we have done:** In 2010, two committees (each led by a USDA ARS scientist) were established by the American Society of Biological and Agricultural Engineers (ASABE) with the goal of developing calibration, validation, evaluation guidelines, and documentation and reporting for hydrologic and water quality models. This multi-year process consisted of several phases as summarized below.

### Summary of development activities and progress:

- 2012 Model-specific Special Collection: 22 papers covering 25 models and an introductory paper were published in Trans. ASABE 55(4): a total of 85 authors from the US, Europe, South America, and Australia were involved.
- 2015 Synthesis Special Collection: Nine research articles covering key topics related to calibration and validation of H/WQ models were published in Trans. ASABE 58(6). These include: terminology, hydrologic processes and model representation, spatial and temporal scales, model parameterization, C/V strategies, sensitivity, uncertainty, performance measures and criteria, and documentation and reporting. The main product is general recommendations/rules of thumb that encompass 25 models in 2012 special collection.

- Topic-specific recommendations from the synthesis special collection and the communication subcommittee article will contribute to the discussion surrounding potential development of topic-specific ASABE engineering practices or standards for model calibration and validation ([http://www.asabe.org/media/226610/2016\\_04\\_20\\_x621\\_pr.pdf](http://www.asabe.org/media/226610/2016_04_20_x621_pr.pdf)).

#### Framework for Development of Guidelines for Hydrologic and Water Quality Modeling



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