Hydrologic and Water Quality System (HAWQS) 2.0

Introduction to HAWQS
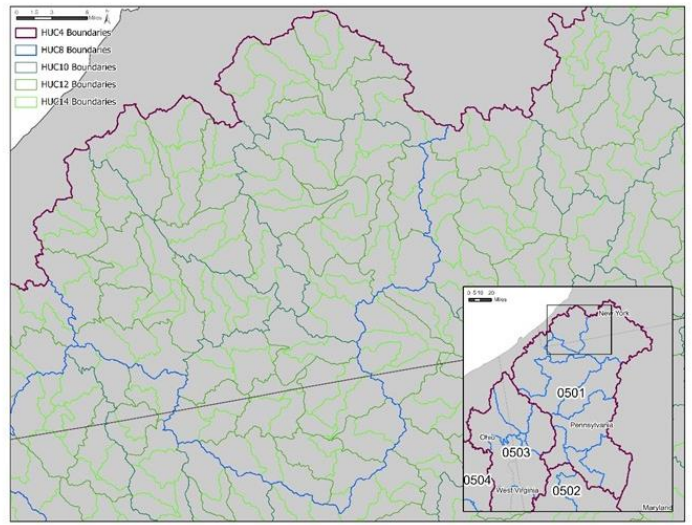
The Hydrologic and Water Quality System (HAWQS, available at https://hawqs.tamu.edu/) is a web-based interactive water quantity and quality modeling system. It employs the modeling engine of the Soil and Water Assessment Tool (SWAT), an internationally recognized public domain model. HAWQS provides users with: (1) interactive web interfaces and maps; (2) pre-loaded input data that can be further customized; (3) visualization and processing of results as tables, charts, and raw output data; (4) a user guide; and (5) online development, execution, and storage of a user's modeling projects to reduce local computing requirements.

HAWQS users can select from four subbasin scales to run simulations: HUC8 (~1,425 mi^2), HUC10 (~197 mi^2), HUC12 (~38 mi^2), and new to HAWQS 2.0, HUC14 (~8 mi^2).[1] HAWQS allows for further aggregation and scalability of daily, monthly, and annual estimates of flow and water quality across large geographic areas up to the conterminous United States.

The United States Environmental Protection Agency (EPA) supports and provides project management and funding for HAWQS. The Texas A&M University Spatial Sciences Laboratory and EPA subject matter experts provide ongoing technical support including system design, modeling, and software development.

HAWQS is capable of modeling large river basins like HUC4 watersheds (figure outlines the Ohio River Basin e.g., HUC 0501 in purple), or relatively small watersheds, ranging in extent from HUC8 to HUC14 (figure outlines HUC8 05010002 in blue and HUC10 to HUC14 subbasins in varying shades of green).

HAWQS 2.0 Updates

Compared to HAWQS 1.2, HAWQS 2.0 features new and updated input datasets, new modeling functionality and novel interface features to enhance user experience.

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[1] The HUC boundaries used within HAWQS 2.0 are based on the National Hydrography Dataset Plus v2 (NHDPlus) catchments released in 2012. Since NHDPlus v2 was produced from static snapshots of the NHD, national elevation dataset, and watershed boundary dataset (WBD), the watershed boundaries in HAWQS may differ from HUC boundaries from other sources like more recent USGS WBD dataset.

New and Updated Input Datasets in HAWQS 2.0

Point Sources
Based on 2019 discharges covered by National Pollutant Discharge Elimination System (NPDES) individual permits. Companion datasets facilitate customization of modeled point sources.

Wetlands
More detailed wetland representation based primarily on the USFWS National Wetland Inventory (NWI), EPA National Wetland Condition Assessment, and NOAA precipitation frequency data.

Ponds, Potholes, and Reservoirs
Based primarily on data from the National Inventory of Dams (NID) and the National Hydrography Dataset Plus v2 (NHD).

Soils
Based on the USDA-NRCS SSURGO and STATSGO2 data.

Land Use
More specific land use/land cover classification, based on data from the 2016 National Land Cover Database (NLCD), NWI, U.S. Department of Agriculture 2014-2017 Cropland Data Layer (CDL), and 2006-2010 cropland field boundaries datasets.

Weather
Expanded weather records through 2020, based on PRISM and NEXRAD

Calibrated Model Parameters
Expanded set of calibrated model parameters with national calibration at the HUC8 and HUC12 levels (ongoing).

See hyperlinked Web pages for additional details on input data sources.

New Modeling Functionality

Finer Resolution Using HUC14 Watersheds
Users can create projects and execute simulations at the HUC14 level. This increased spatial resolution allows for more detailed modeling of smaller watersheds.

Increased Control Over HRU Specifications
Users have more control over the selection and aggregation of modeled hydrologic response units (HRUs) when setting up a watershed project.

Selection of Pre-Calibrated Model Parameters
Users can select from existing calibrated model parameter datasets and review calibration statistics. HAWQS 2.0 expands on the coverage of calibrated models at different scales and adds calibrated areas as data become available.

Novel Interface Features

Data Visualization and Downloads

- Users can export a geospatial vector file of the stream network within their project watershed.
- Users can view the location and names of ponds and reservoirs in the map interface.
- Users can view the location of long-term USGS gaging stations and download real-time daily streamflow data.
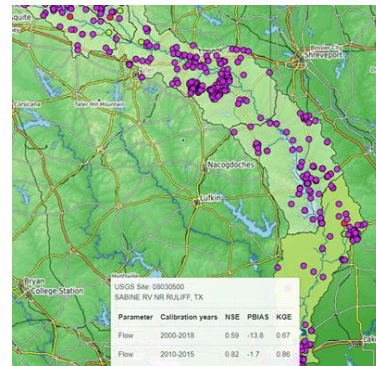
Example screenshot of watershed model with stream network (blue lines), reservoirs (red dots), ponds (green dots), point sources (purple dots), and USGS gage calibration sites (blue dots).

Daily Average TOT_N kg

Graphing, Statistics, and Mapping Capabilities
HAWQS 2.0 provides expanded capabilities for reviewing simulation results within the interface in maps or plots and for calculating key statistics of model parameters for user-selected locations within the watershed.

Example map of summary statistics for average daily modeled instream total nitrogen loads.