

HYDROLOGIC AND WATER QUALITY SYSTEM WEBCAST

Presented by:

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Management Office

Dr. Raghavan Srinivasan, Texas A&M University

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**United States Environmental Protection Agency
Washington, DC**

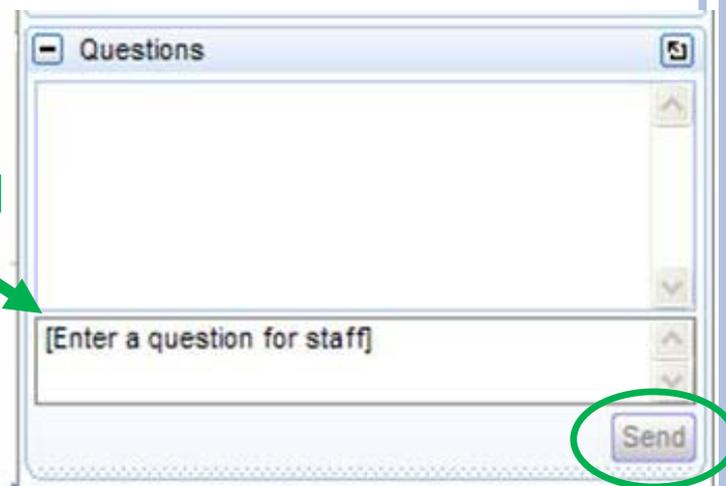
August 16, 2016





Webinar Logistics

- Presentation slides from this webinar will be available to download within about a week or two at: <http://epa.gov/hawqs>
- Attendees will be in listen-only mode (muted) throughout today's webinar.
- During the webinar, you may submit a question by typing into the **Enter a question for staff** box and clicking the **Send** button. Staff will read and answer these questions as time allows.
- Please complete the survey questions at the end of the webinar. Your feedback is important to us!





TOPICS FOR TODAY'S WEBCAST

- HAWQS Beta Background
- Using HAWQS
 - Registration, User Guide, Getting Help
 - SWAT and HAWQS
 - Starting and completing a project and scenarios
 - Inputs and Outputs
- Use Case Example – Maumee River Basin
- HAWQS Next Steps
- Where to go for Help



POLL QUESTION #1

- Who runs your water quality models?
 - Yourself – you're a water quality modeling professional.
 - A colleague who is a water quality modeling professional
 - Contractor/consultant
 - Others



POLL QUESTION #2

- Which WQ Models do you use for your projects?
 - WASP
 - SPARROW
 - BASINS
 - SWAT
 - OTHER



POLL QUESTION #3

- Which area of modeling are you involved in?
 - Stormwater
 - TMDL
 - Climate Change
 - Agriculture
 - Other



HAWQS BACKGROUND

- Conceived by an EPA Cross-Office Planning Committee in 2005
- Solicited input from a diverse group during a workshop
- Key themes the Committee/Workshop considered:
 - Impact from regional and national scale policies and programs
 - National or large scale economic benefit assessment
- Full scale development began in 2010



HAWQS BACKGROUND (CONT.)

- Original themes evolved into the current web-based beta Version of HAWQS
- 2015 – EPA-sponsored peer review:
 - Douglas C. Beyerlein, P.E., WRE (Consultant)
 - Kaye L. Brubaker, Ph.D., University of Maryland
 - Timothy Randhir, Ph.D., University of Massachusetts Amherst.
- 2016 – Addressed peer review comments and other enhancements
 - HAWQS Beta released on June 16, 2016
 - Future releases will integrate additional features and re-visit remaining peer review comments
 - Formal release of Version 1.0 planned sometime in late 2016 early 2017



HAWQS HOMEPAGE (HTTPS://EPAHAWQS.TAMU.EDU/)

HAWQS

Hydrologic and Water Quality System
A National Watershed and Water Quality Assessment Tool

Log in

What is HAWQS?

The Hydrologic and Water Quality System (HAWQS) is a web-based interactive water quantity and quality modeling system that employs as its core modeling engine the Soil and Water Assessment Tool (SWAT), an internationally-recognized public domain model. HAWQS provides users with interactive web interfaces and maps; pre-loaded input data; outputs that include tables, charts, and raw output data; a user guide, and online development, execution, and storage of a user's modeling projects.

HAWQS substantially enhances the usability of SWAT to simulate the effects of management practices based on an extensive array of crops, soils, natural vegetation types, land uses, and climate change scenarios for hydrology and the following water quality parameters:

- Sediment
- Pathogens
- Nutrients
- Biological oxygen demand
- Dissolved oxygen
- Pesticides
- Water temperature

HAWQS users can select from three watershed scales or hydrologic unit codes (HUCS) – 8-digit ~700mi²; 10-digit ~227 mi²; and 12-digit ~40mi² – to run simulations. HAWQS allows for further aggregation and scalability of daily, monthly, and annual estimates of water quality across large geographic areas up to and including the continental United States.

The United States Environmental Protection Agency (USEPA) Office of Water 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. The United States Department of Agriculture (USDA) and Texas A&M University jointly developed SWAT and have actively supported the model for more than 25 years.

HAWQS beta was released in June 2016. Comments and proposed enhancements by prospective end-users will be used to plan, prioritize, and release future versions.

View the [HAWQS brochure](#).

How does HAWQS work?

- 1 Log in or register for a new account to get started
 - Read our [user guide](#) for additional help.
- 2 Create a project
 - Choose a desired catchment resolution: HUC8, HUC10 or HUC12
 - Select your ending HUC ID from a map
- 3 Create a scenario
 - Specify the model run duration and model run frequency
- 4 Make further customizations to your model
 - Set HRUs to eliminate minor land uses, soils and slopes
 - Edit general watershed inputs and databases (basin, fertilizer, urban, nutrient efficiency, land use update)
 - Edit subbasin inputs (curve number, potholes, sediment routing, climate change/sensitivity, point source)
 - Modify SWAT output by selecting reach, subbasin and HRU parameters
- 5 Generate SWAT input files
- 6 Generate SWAT Access database for SWATeditor
- 7 Run the available versions of SWAT
- 8 Analyze your results
 - Run SWAT Check—a program designed to identify potential model problems
 - Generate output reach statistics
 - View output summary charts
 - Download a zip of all project files



REGISTERING FOR HAWQS

HAWQS

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 - Modify SWAT output by selecting reach, subbasin and HRU parameters



REGISTERING FOR HAWQS

HAWQS

Hydrologic and Water Quality System
A National Watershed and Water Quality Assessment Tool

Log in

Register for a New Account

New accounts are subject to approval by an administrator. Please submit the information below, and we will follow up with you by email.

Personal details

First name

Last name

Email address

Once registration information is complete, the HAWQS Administrator will approve/deny request.

Beta testing interest?

Please check if you are interested in becoming a beta tester. You will be asked to participate in user design sessions, provide testing support and other support.

hawqs@epa.gov



HAWQS USER GUIDE

<https://epahawqs.tamu.edu/>

HAWQS User Guide

Prepared by the

**Spatial Sciences Laboratory
Texas A&M AgriLife Research
College Station, TX**

For the

**Office of Water, Immediate Office
US Environmental Protection Agency
Washington, DC**

Version 1.0 Beta – Released June 16, 2016



HELP IN HAWQS

Selected SWAT model
Documentation

HAWQS methodology, input
and database documentation

SWAT Model Documentation

[SWAT2012 Input/Output Documentation](#)

SWAT Theoretical Documentation

- [Channel Processes](#)
- [Climate](#)
- [Erosion](#)
- [Hydrology](#)
- [Management Practices](#)

[SWAT Publications](#)

[SWAT Check Documentation](#)

HAWQS Data Documentation

[HAWQS Appendix](#)

[HAWQS Input Database Citation](#)

Calibration/Validation

- [Methodology](#)
- [SWAT Manual Chapter on Calibration](#)
- [SWAT: Model Use, Calibration, and Validation](#)

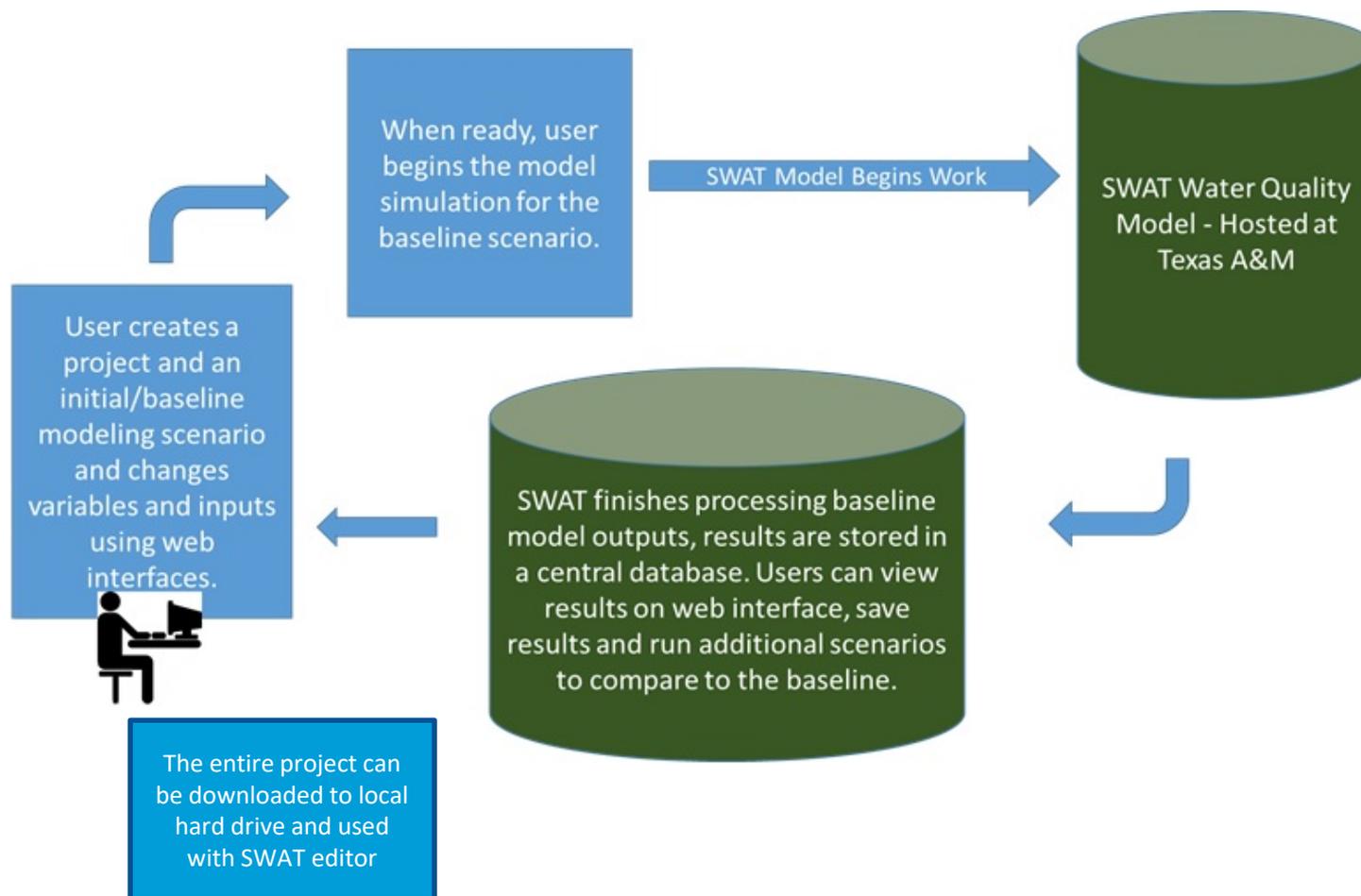
[Climate Change Data and Resources](#)

[Land Use Definition Table](#)

[Point Sources Methodology](#)

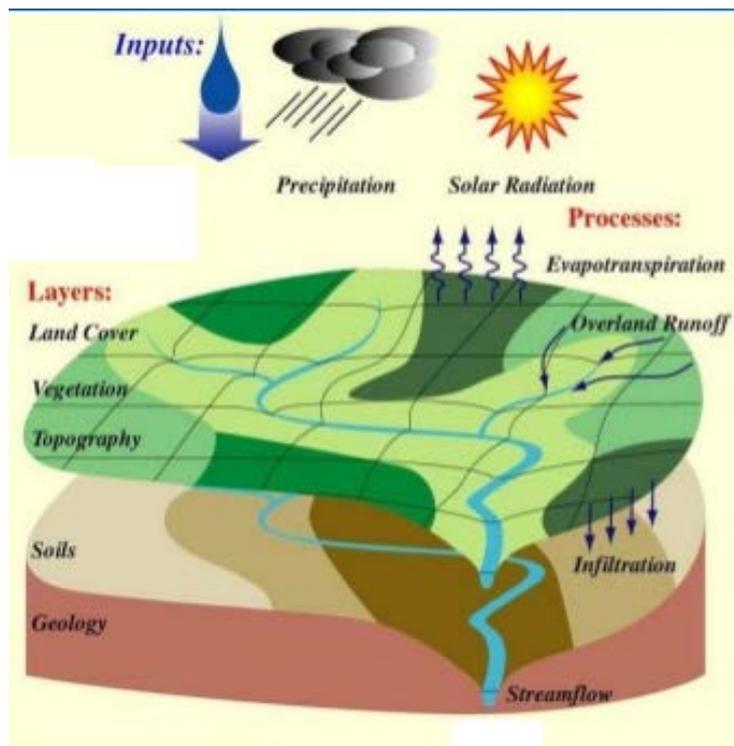
hawqs@epa.gov

OVERVIEW OF THE HAWQS MODELING PROCESS



SWAT – THE MODEL BEHIND HAWQS

○ SWAT



- In use for more than 25 years and 2,700 peer reviewed publications
- Requires specific information about weather, soil properties, topography, vegetation, land management
- Physical processes associated with water movement, sediment movement, crop growth, and nutrient cycling are directly modeled.
- Aggregation of outputs (stream flow, pollutants) across large scales (e.g., Mississippi River Basin) both spatial and temporal



WHY USE HAWQS?

- Interactive web-based/cloud based applications;
- Can be accessed with any platform/browser;
- No GIS software necessary;
- No need for the user to update to the latest version of SWAT;
- Pre-loaded input data at three spatial resolutions (8, 10 and 12 digit watersheds) to reduce manual processing of input data;
- Output data in standardized charts and tables;
- Store baseline model simulation and then the “what-if” simulations in a central database;
- Download projects to desktop for more complex analysis;
- Many users can collaborate on a single project in future versions.



HAWQS INPUTS

Input	Source	Notes	Date Accessed
Weather*	NCDC corrected for PRISM ¹	1967-2010	October 2010
Soil	USDA-NRCS ²	STATSGO	October 2010
Land Use	MRLC (Fry) ³	NLCD (2006) and CDL (2011-2012)	October 2010 and January 2015
Aerial Deposition	NADP ⁴	(1980-2010) monthly	October 2010
Watershed Boundaries	USGS ⁵	HUCS 8, 10, and 12	October 2010
Stream Networks	NHDPlus ⁶	Reduced form	October 2010
Elevation	NED ⁷	30 meter DEM	October 2010
Point Sources	USGS ⁸	Regression of population and SPARROW model outputs	October 2010
Management Data	NRCS ⁹	CDL (tillage, fertilizer/manure, crop yields)(NRCS field database)	January 2015
Reservoirs	USACE ¹⁰	National Inventory of Dams	October 2010
Livestock and Crops	USDA-NASS ¹¹		October 2010
Model	USDA-ARS and Texas A&M	Soil Water Assessment Tool	January 2015



HAWQS PROJECT INTERFACE

Users are provide a listing of all of their projects.

HAWQS

Hydrologic and Water Quality System
A National Watershed and Water Quality Assessment

☰ Projects ▾

Webcast Example1

Test Project Pravin

HUC 8 - 10080009 (Delta -
Improve Water Quality)

HUC 8 - 10250017

HUC 8 - 10080009

HUC 8 - 05130205 (delta)

HUC 8 - 05130205

Create a new project

👤 Account settings

? Help

🚪 Log off

Welcome!

☰ Projects

Name	Last Modified ▾	Res.	Start HUC	End HUC
Webcast Example1	8/1/2016 10:51 AM	HUC 8	Head	10290110
Test Project Pravin	6/1/2016 2:23 PM	HUC 8	Head	05120203
HUC 8 - 10080009 (Delta - Improve Water Quality)	5/24/2016 7:56 AM	HUC 8	Head	10080009
HUC 8 - 10250017	5/24/2016 7:28 AM			
HUC 8 - 10080009	3/30/2016 1:30 PM			
HUC 8 - 05130205 (delta)	3/29/2016 2:53 PM			
HUC 8 - 05130205				

Projects can be archived or permanently deleted.

- 📁 = Archive a project you are no longer using, but may want to come back to at a later date - [more about archiving](#). You have **0** archived projects.
- ✖ = Permanently delete project.

HAWQS navigation panel

hawqs@epa.gov



HAWQS PROJECT INTERFACE

The screenshot shows the HAWQS Project Interface. The top header includes the HAWQS logo, the text 'Hydrologic and Water Quality System' and 'A National Watershed and Water Quality Assessment Tool', and a 'Log off' button. The left sidebar contains a 'Projects' menu with options like 'Webcast Example1', 'Test Project Pravin', and 'Create a new project'. The main content area displays a table of projects with columns for HUC ID, name, date, and user. A red box highlights the 'Create a new project' button, with a red arrow pointing to it from a text box below. The text box contains the following text:

Click here to launch a new project. A HAWQS Project consists of:

- Input data files
- Scenarios



CREATE PROJECT – SELECT A WATERSHED

Hydrologic and Water Quality System
A National Watershed and Water Quality Assessment Tool

Projects > Create

HAWQS interface navigation using this link from any of the current menu to any previous menu

Click the map near the downstream point of your watershed to begin. The map will display the upstream HUCs of your watershed as well as other nearby HUCs.

Click on the map to select a watershed

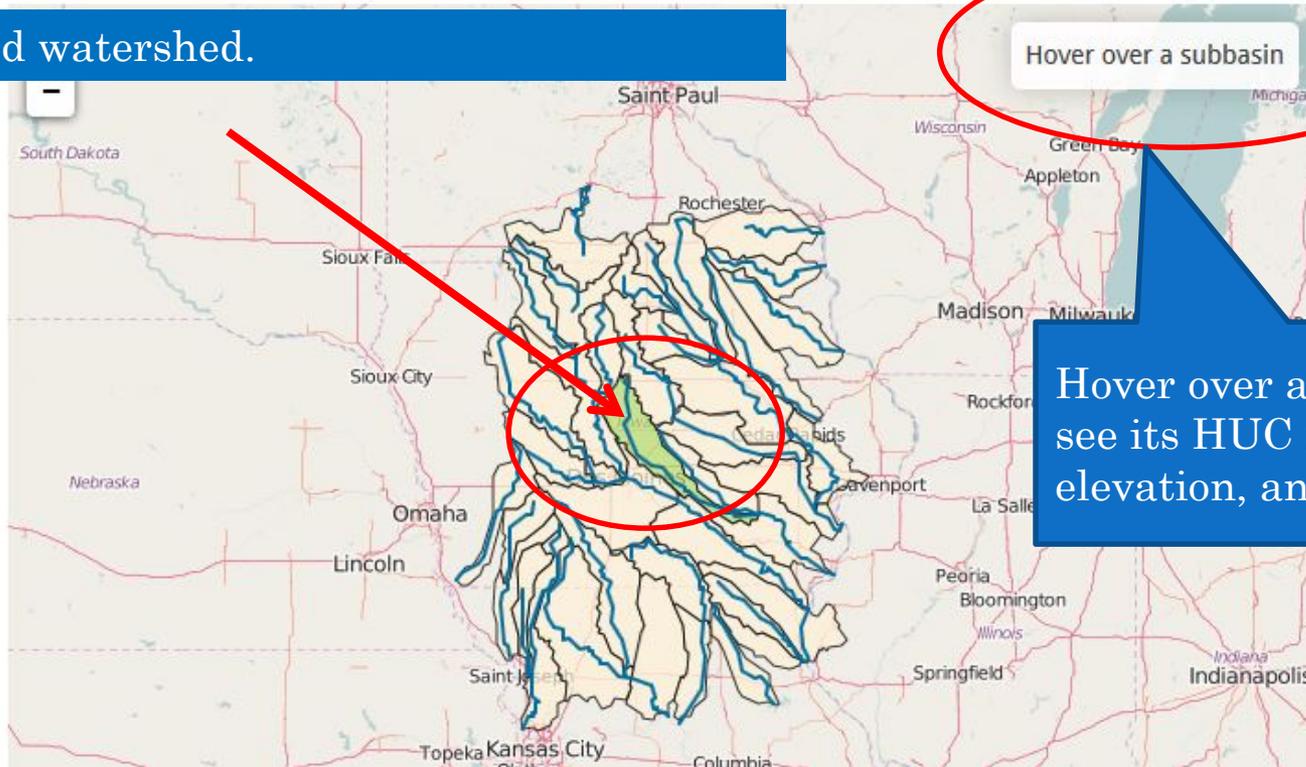
CREATE PROJECT – SELECT A WATERSHED AND SUB-BASINS



Projects > Create

Click the map near the downstream point of your watershed to begin. The map will display the upstream HUCs of your watershed as well as other nearby HUCs.

Selected watershed.

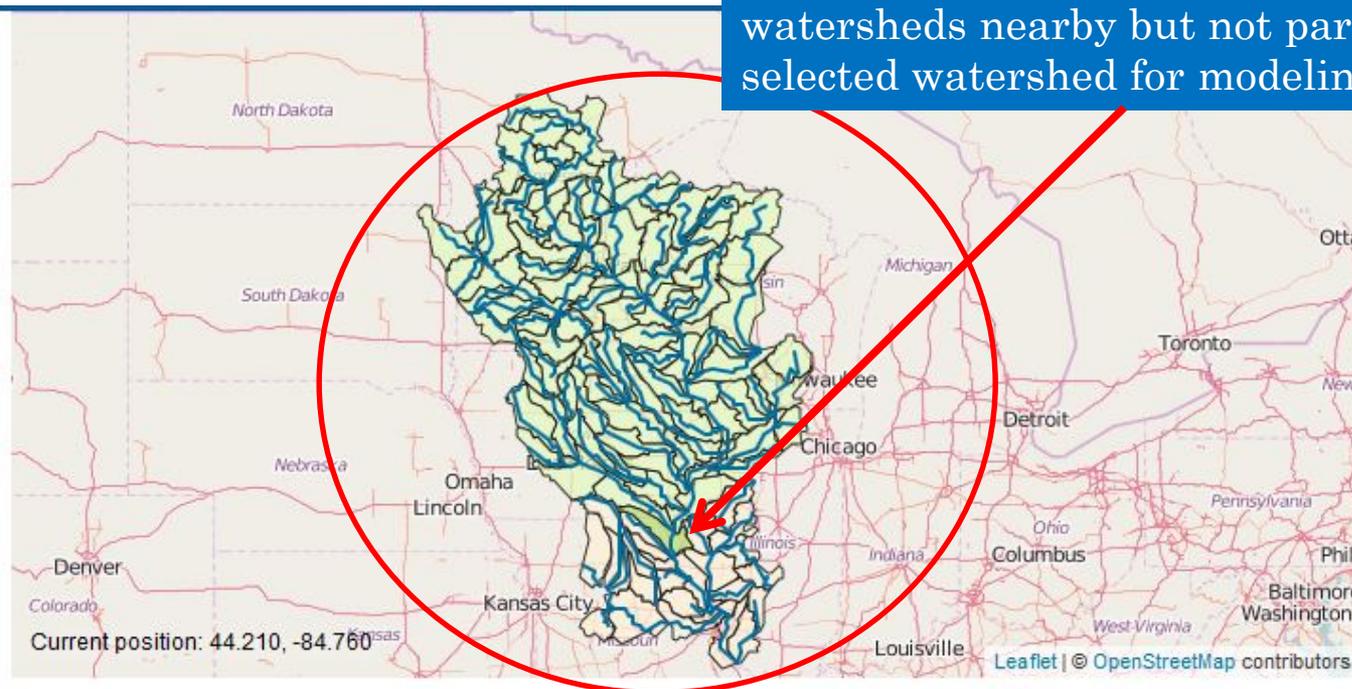


Hover over a subbasin to see its HUC number, area, elevation, and coordinates.

CREATE PROJECT – WATERSHEDS AND SUB-BASINS SELECTED



Watershed in dark green, sub-basins in lighter green color. Light yellow are other watersheds nearby but not part of the selected watershed for modeling



Create your project

The watershed shown above contains **92** subbasins and **28,523** HRUs from the head of the watershed to HUC **07110001**. [View watershed routing.](#)

CREATE PROJECT – WATERSHEDS AND SUB-BASINS SELECTED



Create your project

The watershed shown above contains **92** subbasins and **28,523** HRUs from the head of the watershed to HUC **07110001**. [View watershed routing.](#)

Give your project a unique name:

Receive an email notification when the project is set up? ([Help me decide](#))

Advanced

1 – create a name for the project.

Advanced

2 – watershed routing can be changed – but not recommended.

Map options

Data resolution:

Enter a downstream HUC:

3 – Simulations can be done at the HUC8, 10, or 12 resolutions.

PROJECT SUMMARY

1 – watershed summary

Projects > HUC 8 - 07110001

2 – set HRUs

Set HRUs

You can set threshold levels to eliminate minor land uses, soils, and slopes in each subbasin. This will reduce the number of HRUs in your project, allowing for quicker input file writing and SWAT model runs.

Thresholds may only be modified before any scenarios are added to your project. After creating scenarios, you will need to create a new project or delete all scenarios if you want to reset thresholds.

Set HRUs

3 – create a scenario

Scenarios

Create a scenario for your project. A project scenario is where you go to customize SWAT input variables and run the model. You can create multiple scenarios and make side-by-side output comparisons.

Create a scenario

4 – download project files

Project Files

Create a zip of all your project files and download them to your computer for offline use. We recommend waiting until you are done running all scenarios for this project before creating this file. It may take several hours if you have multiple scenarios and your project is large (>10,000 HRUs).

Create zip of project files Receive an email when complete?

5 – upload and store project related docs

Project Documents

You don't have any documents uploaded for this project.

Upload a new document

Project Error Reports

You don't have any error reports submitted for this project.

Create a new error report

HUC 8 Watershed - Head to 07110001



Project area: 351,482.61 km²

Number of subbasins: 92 [Download SWAT to HUC Mapping](#)

Number of HRUs: 28,523 [Download](#)

View metadata

Change project name

6 – report and track HAWQS system errors

PROJECT SUMMARY - WATERSHED

HUC 8 Watershed - Head to 07110001

Hover over a subbasin

View metadata

Change project name

Project area:	351,482.61 km ²	
Number of subbasins:	92	Download SWAT to HUC Mapping
Number of HRUs:	28,523	Download

Metadata includes all input data changes for each scenario in your project

Hover over a subbasin to view its HUC number, area, elevation, and coordinates

View SWAT designated IDs and corresponding HUC numbers



SET PROJECT HRUs

Setting HRUs eliminates minor land uses, soils, and slopes in order to reduce the number of HRUs in your project to improve SWAT model run time.

Projects > HUC 8-07110001 > HRUs

Threshold can be set by % of land use, soil and slope or by area

Set threshold levels below to eliminate minor land uses, soils, and slopes in each subbasin. Land uses, soils, or slopes that cover area less than the threshold levels are eliminated.

The original total area of your project without a threshold is **351,482.61 km²** over **92** subbasins with **28,523** HRUs. The land use is broken down below. [See a pie chart of land use area distribution.](#)

Set thresholds by

Percentage

Check the box next to any land use in the table below that you would like to exempt from elimination based on your threshold settings above.

Land use threshold:
5 %

Soil threshold:
0 %

Slope class threshold:
0 %

Land Use	Area	% of Total Area
<input type="checkbox"/> FRSD	69,618.10 km ²	19.81 %
<input type="checkbox"/> SOYC	50,984.79 km ²	14.51 %
<input type="checkbox"/> CSOY	49,556.04 km ²	14.10 %
<input type="checkbox"/> CORN	40,984.39 km ²	11.66 %
<input type="checkbox"/> HAY	34,079.57 km ²	9.70 %
<input type="checkbox"/> URLD	18,218.71 km ²	5.18 %
<input type="checkbox"/> WETF	16,797.74 km ²	4.78 %
<input type="checkbox"/> RNGE	16,343.95 km ²	4.65 %
<input type="checkbox"/> WATR		
<input type="checkbox"/> WETN		

Check the box next to any land use in the table on the right that you would like to exempt from elimination based on your threshold settings above.

Receive an email notification when we're done setting your HRUs? ([Help me decide](#))

Set HRUs

Hover over to get the full description of the land use



SET HRUs - RESULTS

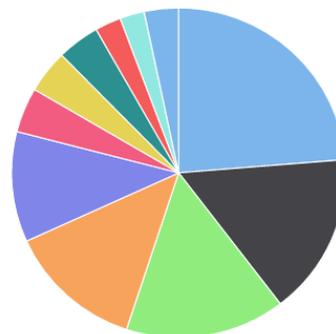
Your project originally had 28,523 HRUs. Setting thresholds reduced the number to 2,978 HRUs.

⚠ Note: once you create scenarios for your project, you will no longer be able to modify your HRUs.

Reset your HRUs

	Land Use	Soil Type	Slope Class
Thresholds	5%	5%	5%
Area redistribution	55,463.35 km ²	69,218.86 km ²	0.00 km ²

Land use distribution with thresholds applied



FRSD SOYC CSOY CORN HAY WETF URLD RNGE WATR
WETN Others under 1% each

Highcharts.com



CREATE SCENARIO

Scenario name
Default

Simulation start date
01/01/1961

Simulation end date
12/31/1965

Set-up/warm-up years
2

SWAT output print setting
Daily

SWAT model version to run
SWAT 2012 rev. 636

Create Cancel

By default, we set the simulation dates and warm-up years to a short time period to save server resources. A more realistic model run time will span 10-20 years with 5-10 years of model warm-up. The weather data available from 1960-2010

User can choose SWAT output frequency as daily, monthly or annual. Some of the output analysis tools will work with only daily output.

As the SWAT Model is updated, users may choose which version to run. Existing scenarios will not be updated unless the user requests it from the edit screen.



SCENARIO SUMMARY PAGE

Projects > HUC 8 - 07110001 > Default

Scenario Settings

Scenario name	Default
Simulation start date	1/1/1961
Simulation end date	12/31/1980
Set-up/warm-up years	5
SWAT output print setting	Daily
SWAT model version to run	SWAT 2012 rev. 636
Last modified	8/5/2016 2:51 AM

[Edit](#)

Run Scenario Tasks

<input type="checkbox"/> Write SWAT input files	
<input type="checkbox"/> Write SWAT editor tables	Never
<input type="checkbox"/> Run SWAT 2012 rev. 636 (Time estimate)	Never
<input type="checkbox"/> Process SWAT output files	Never
<input checked="" type="checkbox"/> Receive email notifications when tasks complete? (Help me decide)	

[Run selected tasks](#)

Select tasks to be performed such as write SWAT input files, create SWAT editor tables, Run the SWAT model, Process SWAT outputs for visualization, Zip and download the project files for use at the user desktop

Customize SWAT Input Data

General watershed inputs and databases	Last modified
Basin input data	
Fertilizer input data	
Nutrient efficiency	

Menus to customize various inputs to the SWAT model (explained in the subsequent slides)



CUSTOMIZE SWAT INPUT – BASIN INPUT DATA

Basin wide input data such as water balance, surface runoff, nutrient cycling and reach data can be edited in this screen. The interface shows what is the default value in the model, typical range for the variable based on the literature and what is the value used by the model for this project which can be edited further by the user

Projects > HUC 8 - 07110001 > Default > Basin input data

General watershed attributes are defined in the basin input file. These attributes control a diversity of physical processes at the watershed level. The interfaces will automatically set these variables to the default or recommended values listed in the variable documentation. You can use the default values or change the available values below to better reflect what is happening in your watershed. [Read the SWAT2012 IO documentation chapter on basin inputs](#).

Water Balance Surface Runoff Nutrient Cycling Reaches

Input Variable	Value	Valid Range	Default
SFTMP: Snowfall temperature ⓘ	<input type="text" value="1"/> °C	-5 to 5	1
SMTMP: Snow melt base temperature ⓘ	<input type="text" value="0.5"/> °C	-5 to 5	0.5
SMFMX: Melt factor for snow on June 21 ⓘ	<input type="text" value="4.5"/> mm H2O/°C-day	0 to 10	4.5
SMFMN: Melt factor for snow on December 21 ⓘ	<input type="text" value="4.5"/> mm H2O/°C-day	0 to 10	4.5
TIMP: Snow pack temperature lag factor ⓘ	<input type="text" value="1"/>	0 to 1	1
IPET: Potential evapotranspiration (PET) method ⓘ	<input type="text" value="1 - Penman/Monteith method"/>		1
ESCO: Soil evaporation compensation factor ⓘ	<input type="text" value="0.95"/>	0 to 1	0.95
EPCO: Plant uptake compensation factor ⓘ	<input type="text" value="1"/>	0 to 1	1

Next: Surface Runoff >

When you are done making changes in the tabs above, click save below. Please note that no changes will be saved until you click this button. To cancel, exit the page or press the cancel button.

Save changes

Cancel and go back to scenario



CUSTOMIZE SWAT INPUT – FERTILIZERS

Projects > HUC 8 - 07110001 > Default > Fertilizer input data

The fertilizer database summarizes the relative fractions of nitrogen and phosphorus pools in the different fertilizers. Read the [SWAT2012 IO documentation chapter on fertilizer inputs](#).

ID	Name	Description	Mineral N	Mineral P	Organic N	Organic P	Mineral N applied as NH3	
Edit	1	Elem-N	Elemental Nitrogen	1.000	0.000	0.000	0.000	0.000
Edit	2	Elem-P	Elemental Phosphorous	0.000	1.000	0.000	0.000	0.000
Edit	3	ANH-NH3	Anhydrous	Elemental Nitrogen				
Edit	4	UREA	Urea					
Edit	5	46-00-00	46-00-00					
Edit	6	33-00-00	33-00-00					

Input Variable	Value	Valid Range	Default	
FMINN: Fraction of mineral N (NO3 and NH4) in fertilizer	<input type="text" value="1"/>	kg min-N/kg fertilizer	0 to 2	1
FMINP: Fraction of mineral P in fertilizer	<input type="text" value="0"/>	kg min-N/kg fertilizer	0 to 2	0
FORGN: Fraction of organic N in fertilizer	<input type="text" value="0"/>	kg min-N/kg fertilizer	0 to 1	0
FORGP: Fraction of organic P in fertilizer	<input type="text" value="0"/>	kg min-N/kg fertilizer	0 to 1	0
FNH3N: Fraction of mineral N in fertilizer applied as ammonia	<input type="text" value="0"/>	kg min-N/kg fertilizer	0 to 1	0

[Save Changes](#) [Cancel](#)

Nutrients concentration can be modified in the fertilizer and manure data to run scenarios

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CUSTOMIZE SWAT INPUT – NUTRIENT EFFICIENCY

Projects > HUC 8 - 07110001 > Default > Nutrient efficiency

The amount of fertilizer applied in auto fertilization is based on the amount of nitrogen removed at harvest. If you set nutrient efficiency value to 1.0, the model will apply enough fertilizer to replace the amount of nitrogen removed at harvest. If you enter a number greater than 1.0, the model will apply fertilizer to meet harvest removal plus an extra amount to make up for nitrogen loss due to surface runoff/leaching. If nutrient efficiency value is less than 1.0, the model will apply fertilizer at the specified fraction of the amount removed at harvest.

Your project does not contain any land use that would be affected by the nutrient efficiency variable. [Go back to your scenario summary page.](#)

Enter a new nutrient efficiency value (number ranging from 0 to 2) for your entire project area below. The default value is 0.

Nutrients efficiency can be changed in the fertilizer run scenarios

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CUSTOMIZE SWAT INPUT – URBAN INPUT DATA

Projects > HUC 8 - 07110001 > Default > Urban input data

The urban database summarizes variables used by the model to simulate different types of urban areas. Read the [SWAT2012 IO documentation chapter on urban inputs](#).

ID	Name	Description	FIMP	FCIMP	CURBDEN	URBCOEF	DIRTMX	THALF	TNCONC	TPCONC	TNO3CONC	URBCN2	
Edit	1	URHD	Residential-High Density	0.550	0.402	0.240	0.180	225.000	0.750	550.000	223.000	7.200	98.000
Edit	2	URMD	Residential-Medium Density	0.292	0.231	0.240	0.180	225.000	0.750	550.000	223.000	7.200	98.000
Edit	3	URML	Residential-Med/Low Density	0.200	0.170	0.240	0.180	225.000	0.750	460.000	196.000	6.000	98.000
Edit	4	URLD	Residential-Low Density										
Edit	5	UCOM	Commercial										
Edit	6	UIDU	Industrial										

Edit Residential-High Density

Input Variable	Value	Valid Range	Default	
FIMP	Fraction total impervious area in urban land type	<input type="text" value="0.5501"/>	0 to 1	0.5501
FCIMP	Fraction directly connected impervious area in urban land type	<input type="text" value="0.4016"/> km/ha	0 to 1	0.4016
CURBDEN	Curb length density in urban land type	<input type="text" value="0.23999"/>	0 to 1	0.23999
URBCOEF	Wash-off coefficient for removal of constituents from impervious area	<input type="text" value="0.18"/> mm ⁻¹	0 to 1	0.18
DIRTMX	Maximum amount of solids allowed to build up on impervious areas	<input type="text" value="225"/> kg/curb km	0 to 2000	225
THALF	Number of days for amount of solids on impervious areas to build up from 0 kg/curb km to half the maximum allowed, i.e. 1/2 DIRTMX	<input type="text" value="0.75"/> days	0 to 100	0.75

To update the urban land use properties such as pervious/impervious cover, N and P concentration loading can be modified to run urban land use scenarios

hawqs@epa.gov



CUSTOMIZE SWAT INPUT – LAND USE UPDATE

Projects > HUC 8 - 07110001 > Default > Land use update

The land use update file (lup.dat) is an optional file which allows HRU fraction updating during a simulation run. The lup.dat file is particularly useful to initialize conservation measures mid-simulation. After their initialization, the practices remain in effect for the remainder of the simulation.

The lup.dat file must contain five parameters per line: sequential number, month, day, year, and name of the file that contains the fraction update. You are restricted to **25 lines** in lup.dat. Each file referenced in lup.dat must reserve the first line for comments, then for each line after contain the HRU number and updated HRU fraction value. The number of HRUs in the file must match the number of HRUs in your project or you will receive an error. In addition, the HRU fraction for each subbasin in your project must add up to one.

[Download a sample zip file](#)  containing the file structure needed for your project.

[Download your project HRUs.](#) 

[Read the SWAT2012 IO Documentation chapter on land use update](#) 

Upload land use update zip file

Choose File No file chosen

Upload file

Cancel and go back to scenario

To update the land use the HAWQS menu provides listing of HRUs in the watershed being modeled along with sample input file for formatting the land use change scenarios and upload the same.



CUSTOMIZE SWAT INPUT – CLIMATE CHANGE SCENARIOS

This interface helps to choose a climate change model (9 GCM models are available), select time period of future simulation, and climate change scenarios. (in addition more reading resources are linked to learn more about various GCM models)

Projects > HUC 8 - 07110001 > Default > Climate change scenarios

By default, the system uses actual climate data. Using the form below you may change your model to use downscaled global climate model simulations (CMIP), developed by [The Nature Conservancy for The World Bank](#).

Select a climate model:

CCCMA CGCM3.1

Select a time series:

Future data (2046-2064)

Select a scenario:

SRES A1B

Update your SWAT simulation dates. Currently your simulation is set to run from 1/1/1961 to 12/31/1980 with 5 years of warm-up. Your simulation run dates need to fall within the time period selected above; if needed, please select new dates below.

Simulation start date

01/01/2046

Simulation end date

12/31/2064

Set-up/warm-up years

5

Save changes

Cancel and go back to scenario

Help and more information

The background and methods are described by [Girvetz et al. \(2013\)](#), with added details in [Thrasher et al. \(2012\)](#). As unconstrained coupled models, the climate simulations do not ingest observed sea surface temperatures, precipitation, or other weather or land surface observations. Thus, there is no expected correspondence on a year-to-year basis of historic simulated climate and observed weather. In addition, because of the bias correction involved in the downscaling, climate model skill (based on these downscaled data) in reproducing historic observations is not meaningful for ranking GCM performance ([Maurer et al., 2014](#)).

See the links below for more information on each model (where available):

- [CCCMA CGCM3.1](#)
- [CNRM-CM3](#)
- [GFDL CM2.0 - wiki](#)
- GFDL CM2.1
- [IPSLCM4](#)
- [MIROC3.2 \(medres\)](#)
- MIUB ECHO-G - Meteorological Institute University of Bonn (MIUB), ECHO-G, Germany
- [MPI ECHAM5](#)
- [MRI CGCM2.3.2](#)



CUSTOMIZE SWAT INPUT – CLIMATE SENSITIVITY/VARIABILITY ANALYSIS

Projects > HUC 8 - 07110001 > Default > Climate sensitivity/variability analysis

Adjust monthly rainfall and temperature for each subbasin in your project. Read the [SWAT2012 IO documentation chapter on subbasin inputs](#), see page 6 for climate sensitivity variables.

Increase or decrease rainfall by up to 100%:
 20 %

Increase or decrease temperature by up to 20°C:
 0 °C

Apply to all subbasins and months ▼ Save changes Cancel and go back to scenario

Here climate sensitivity analysis can be performed by adjusting precipitation and temperature values by subbasin and by month



CUSTOMIZE SWAT INPUT – CLIMATE SENSITIVITY/VARIABILITY ANALYSIS

This screen shows how the user can apply the change in climate variables by all or selected subbasins and all or selected months

Projects > HUC 8 - 07110001 > Default > Climate sensitivity/variability analysis

Adjust monthly rainfall and temperature for each subbasin in your project. Read the [SWAT2012 IO documentation chapter on subbasin inputs](#), see page 6 for climate sensitivity variables.

Increase or decrease rainfall by up to 100%:

20 %

Increase or decrease temperature by up to 20°C:

0 °C

Apply to selected subbasins and months

Select subbasins

07010101

07010102

07010103

07010104

07010105

07010106

07010107

07010108

Select months

January

February

March

April

May

June

July

Save changes

Cancel and go back to scenario



CUSTOMIZE SWAT INPUT – WEATHER GENERATOR

Projects > HUC 8 - 07110001 > Default > Weather generator

Adjust weather generator (WGN) input data using the form below. Read the [SWAT2012 IO documentation chapter on weather generator inputs](#) .

Select a WGN variable to change:

Increase or decrease the selected variable by up to 100%:

%

This menu allows to customize weather generator variables by subbasin and by month

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CUSTOMIZE SWAT INPUT – CURVE NUMBER

Projects > HUC 8 - 07110001 > Default > Curve number

The SCS curve number is a function of the soil's permeability, land use and antecedent soil water conditions. Read the [SWAT2012 IO documentation chapter on MGT inputs](#), pages 4-6, for more information about curve numbers (CN2).

[Download your HRUs](#) to see current curve number values.

Increase or decrease curve number by up to 10%:

2 % Apply to selected HRUs ▾

Select subbasins	Select land use	Select soils	Select slopes
<input checked="" type="checkbox"/> 07010101	<input checked="" type="checkbox"/> FRSD	<input checked="" type="checkbox"/> MN015	<input checked="" type="checkbox"/> 0-1
<input checked="" type="checkbox"/> 07010102	<input type="checkbox"/> FRSE	<input checked="" type="checkbox"/> MN026	
<input type="checkbox"/> 07010103	<input type="checkbox"/> WATR	<input checked="" type="checkbox"/> MN045	
<input type="checkbox"/> 07010104	<input type="checkbox"/> WETF	<input type="checkbox"/> MN055	
<input type="checkbox"/> 07010105	<input type="checkbox"/> WETN	<input type="checkbox"/> MN056	
<input type="checkbox"/> 07010106		<input type="checkbox"/> MN264	
<input type="checkbox"/> 07010107			

Save changes

Cancel and go back to scenario

This menu allows to change SCS CN variable in the model by subbasin and by land use, soils and slope

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CUSTOMIZE SWAT INPUT – CURVE NUMBER – SAVED CHANGES TABLE

Saved curve number modifications

We will provide a CSV file with your curve number values after you write your SWAT input files. [Download your HRUs](#) to see original curve number values without the modifications shown below.

NOTE: Each row below is applied in order, starting from the top. Bottom settings may overwrite rows above. [Click here to remove all changes](#) and use the default curve numbers.

CN2	Subbasins	Land Use	Soil	Slopes	Added	
2%	07010101	FRSD	MN026, MN045	0-1	8/5/2016 3:24 AM	✘
1%	07010102	WETF, WETN	MN015, MN026	0-1	8/5/2016 3:25 AM	✘

Once the inputs are modified the screen shows what HRUs in what subbasin will be affected and also allows to download the changes as a CSV file for user reference



CUSTOMIZE SWAT INPUT – SEDIMENT ROUTING METHOD

Projects > HUC 8 - 07110001 > Default > Sediment routing method

Read the [SWAT2012 IO documentation chapter on main channel inputs](#), see page 9 for sediment routing methods (CH_EQN).

0 - Simplified Bagnold Equation (Default) ▾ Apply to all subbasins ▾ Save changes Cancel and go back to scenario

- 0 - Simplified Bagnold Equation (Default)
- 1 - Simplified Bagnold Equation by each particle size
- 2 - Kodatie model
- 3 - Molinas and Wu model
- 4 - Yang sand and gravel model



CUSTOMIZE SWAT INPUT – POINT SOURCE

User can update point source inputs in the HAWQS system. This menu provides sample file format of constant, daily, monthly or annual point source loadings by subbasin. Once the file is prepared on the desktop in a CSV format and zip them, the zipped file can be uploaded to be used as a point source scenario input in HAWQS

Projects > HUC 8 - 07110001 > Default > Point source

SWAT directly simulates the loading of water, sediment and other constituents off of land areas in the watershed. To simulate the loading of water and pollutants from sources not associated with a land area (e.g. sewage treatment plants, regional groundwater recharge, etc.), SWAT allows point source information to be read in at any point along the channel network. The point source loadings may be summarized on a daily, monthly, yearly, or constant basis.

[Read the SWAT2012 IO Documentation chapter on measured inputs](#) (Keep in mind we accept CSV files instead of spaced .dat files described in the documentation).

Sample data

Please format your files like the samples below. Note: you will need to match the dates to your scenario simulation dates. The files below are only an example.

- [Constant sample](#)
- [Daily sample](#)
- [Monthly sample](#)
- [Yearly sample](#)

Uploading guidelines

- You may mix types; for example, you can have one subbasin with constant data, another two with daily, and one with monthly.
- Do not upload more than one type per subbasin.
- You do not need to upload data for all subbasins in your project.
- Keep the file names as shown in the samples above.

Upload a zip file of CSV files. For daily, monthly, and yearly point source data, you will have one file for each subbasin in your project. For constant point source data, you will have a single CSV file containing data for each subbasin on a separate row.

Select a zip file to upload

Choose File No file chosen

Upload file

Cancel and go back to scenario



CUSTOMIZE SWAT INPUT – PRINT VARIABLES

Projects > HUC 8 - 07110001 > Default > Reach, subbasin, and HRU variables to print

User can select up to 20 variables for each of the model output, if none selected all SWAT output variables will be printed

Click through each tab and check specific variables to display in the SWAT output files. All variables are displayed by default (when all boxes are unchecked in a tab).

Reach Subbasin HRU

Check up to **20** reach variables. Check none to print all.

Name	Description
<input type="checkbox"/> FLOW_IN	Average daily streamflow into reach (m3/s)
<input type="checkbox"/> FLOW_OUT	Average daily streamflow out of reach (m3/s)
<input type="checkbox"/> EVAP	Average daily loss of water from reach by evaporation (m3/s)
<input type="checkbox"/> TLOSS	Average daily loss of water from reach by transmission (m3/s)
<input type="checkbox"/> SED_IN	Sediment transported with water into reach (metric tons)
<input type="checkbox"/> SED_OUT	Sediment transported with water out of reach (metric tons)



CUSTOMIZE SWAT INPUT – PRINT HRUs

Projects > HUC 8 - 07110001 > Default > HRUs to print

Select up to 20 [HRU IDs](#) to print when running SWAT. Select IDs by typing them in the textbox below, separating each ID by a comma (e.g. 1,2,3).

By default, only the first HRU is printed in SWAT output in order to minimize SWAT model run time and output size. Due to the number of HRUs in your project, we cannot print all of them. You will need to reduce your HRUs to 1000 or fewer.

1

[Download your HRUs](#) and use the number written in the **Print ID** column in the text box above.

User can select up to 20 HRUs, if none selected all HRU outputs will be printed



SCENARIO SUMMARY – RUN TASKS

When you are done modifying SWAT inputs for a summary, select tasks to run:

Run Scenario Tasks

	Last run
<input checked="" type="checkbox"/> Write SWAT input files	Never
<input checked="" type="checkbox"/> Write SWAT editor tables	Never
<input checked="" type="checkbox"/> Run SWAT 2012 rev. 636 (Time estimate)	Never
<input checked="" type="checkbox"/> Process SWAT output files	Never
<input checked="" type="checkbox"/> Receive email notifications when task is complete? (Help me decide)	

[Run selected tasks](#)

Click on the “Time estimate” to get a rough idea on how long will it take the simulation based on number of hrus, number of years and output frequency request setup in the model



SCENARIO SUMMARY – OUTPUT DATA

Scenario Output Data

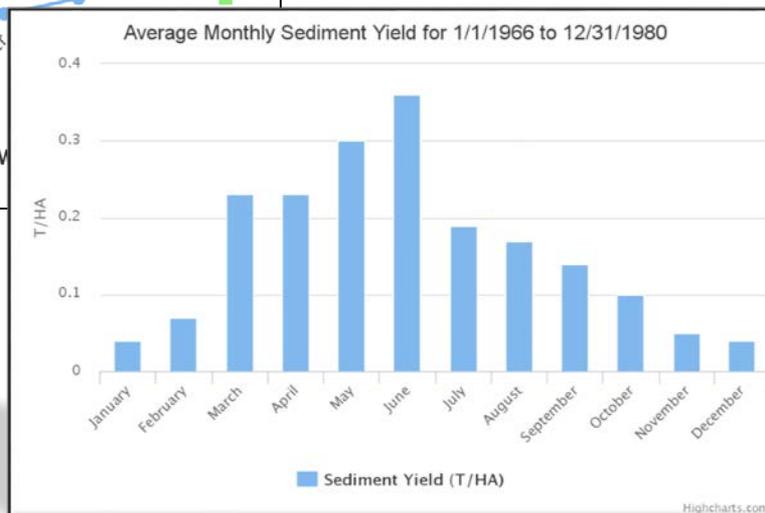
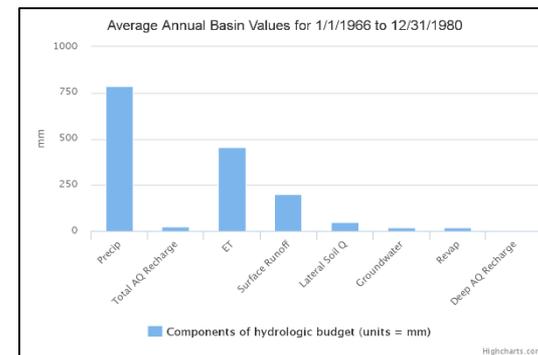
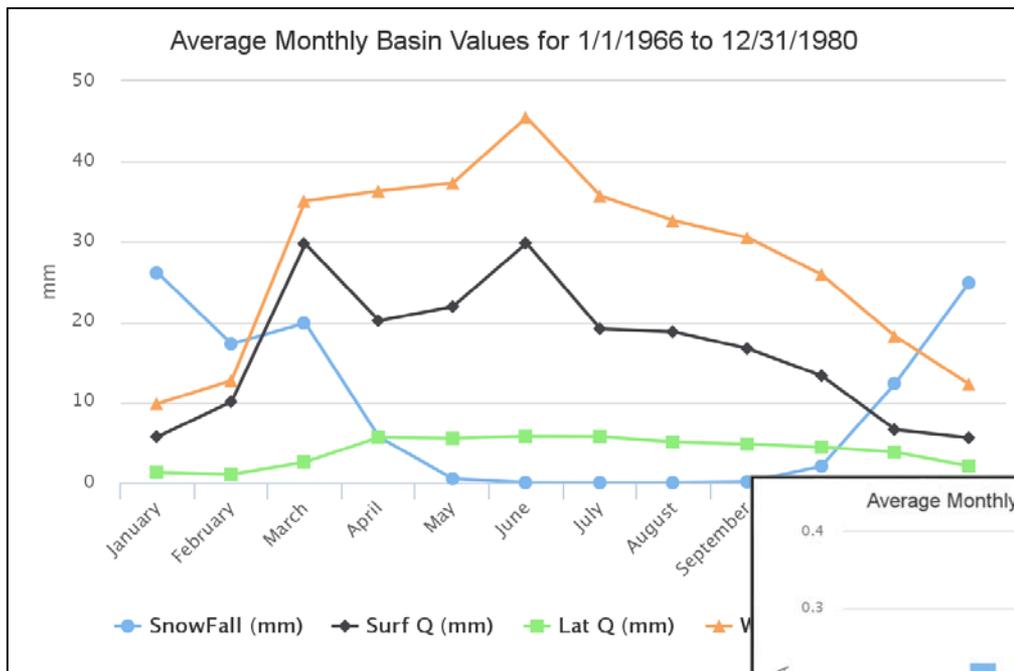
SWAT 2012 rev. 636 execution results

- [Output reach data](#)
- [Output summary charts](#)
- [Download input.std](#)
- [Download output.std](#)

[Run SWAT Check to identify potential model problems](#)

Here user can download summary input and output files, view summary charts of hydrology and sediment by month and select to analyze the reach outputs. In addition the SWAT_check program can be run online to diagnose any issues with SWAT model inputs

SWAT OUTPUT ANALYSIS – OUTPUT SUMMARY CHARTS





SWAT OUTPUT ANALYSIS – OUTPUT REACH

Generate charts of SWAT reach output by subbasin. Available statistics are:

- Load/Flow Duration Curve
- Average
- Maximum
- Minimum
- Exceedances
- Percentile

1. Request reach output statistics

Values:

Variables:

Select all/none

FLOW_IN

FLOW_OUT

EVAP

TLOSS

SED_IN

SED_OUT

SEDCONC

SEDCON

Subbasins:

Select all/none

07010101

07010102

07010103

07010104

07010105

07010106

07010107

07010108

Request statistics

Cancel and go back to scenario



SWAT OUTPUT ANALYSIS – OUTPUT REACH

2. Process data

Download

CSV of output.rch data

This file will include total N and total P concentrations if total N and total P were selected as [reach output variables](#) before you ran SWAT.

Unprocessed

Load/Flow Duration Curve



Variables: FLOW_IN, FLOW_OUT

Subbasins: 07010101, 07010102, 07010103, 07010104, 07010105

Submitted: 8/5/2016 4:58 AM

Click the button below to process all items marked **unprocessed** above.

Receive an email notification when processing is complete?

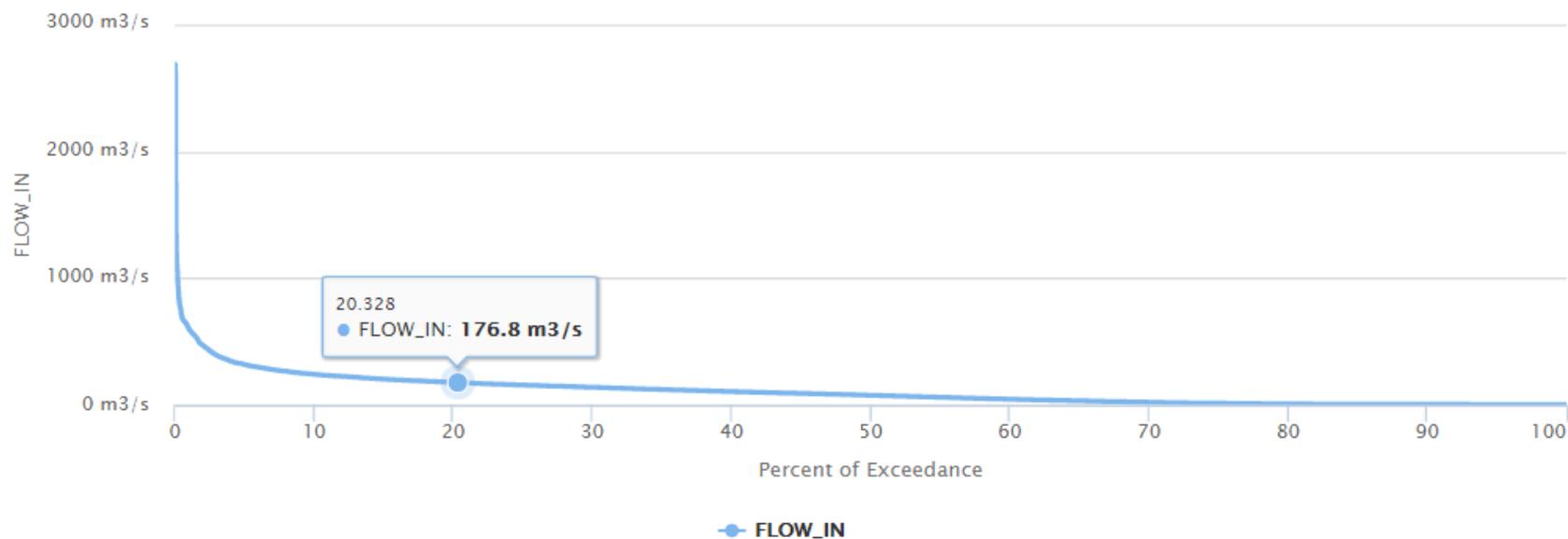
Process data



SWAT OUTPUT ANALYSIS – OUTPUT REACH

Load/Flow Duration Curve

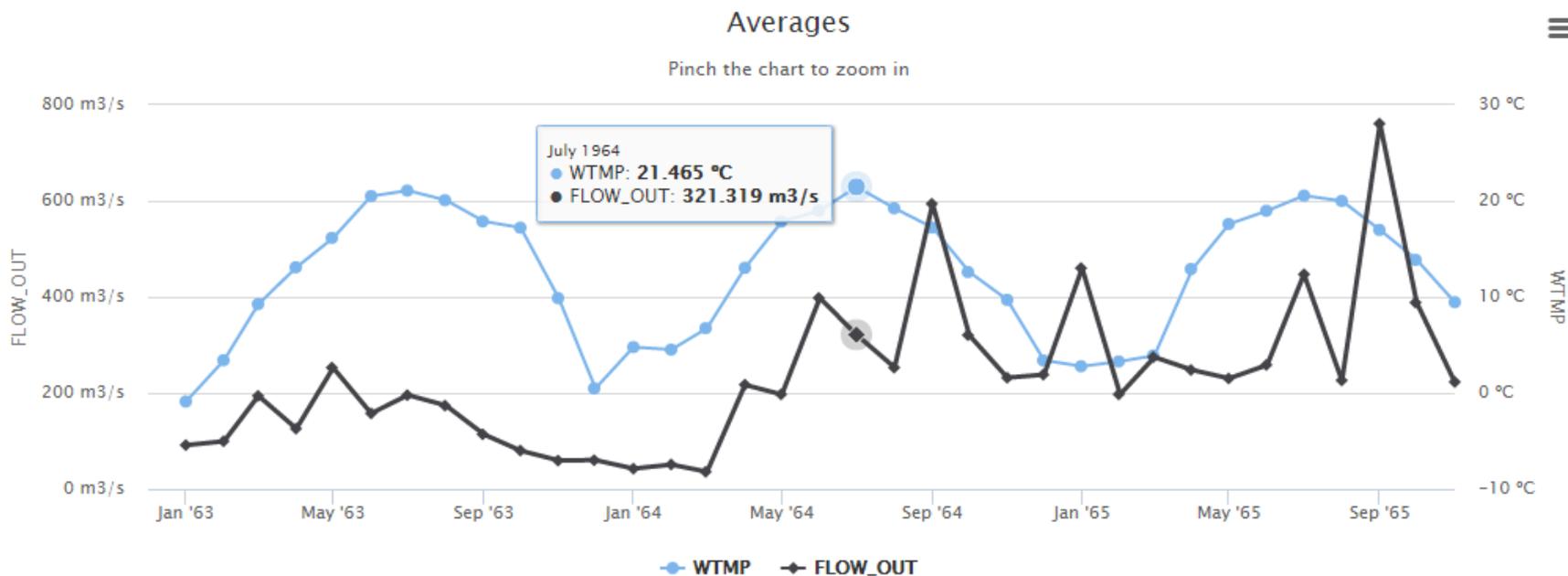
Click and drag on the plot points to zoom in



Highcharts.com

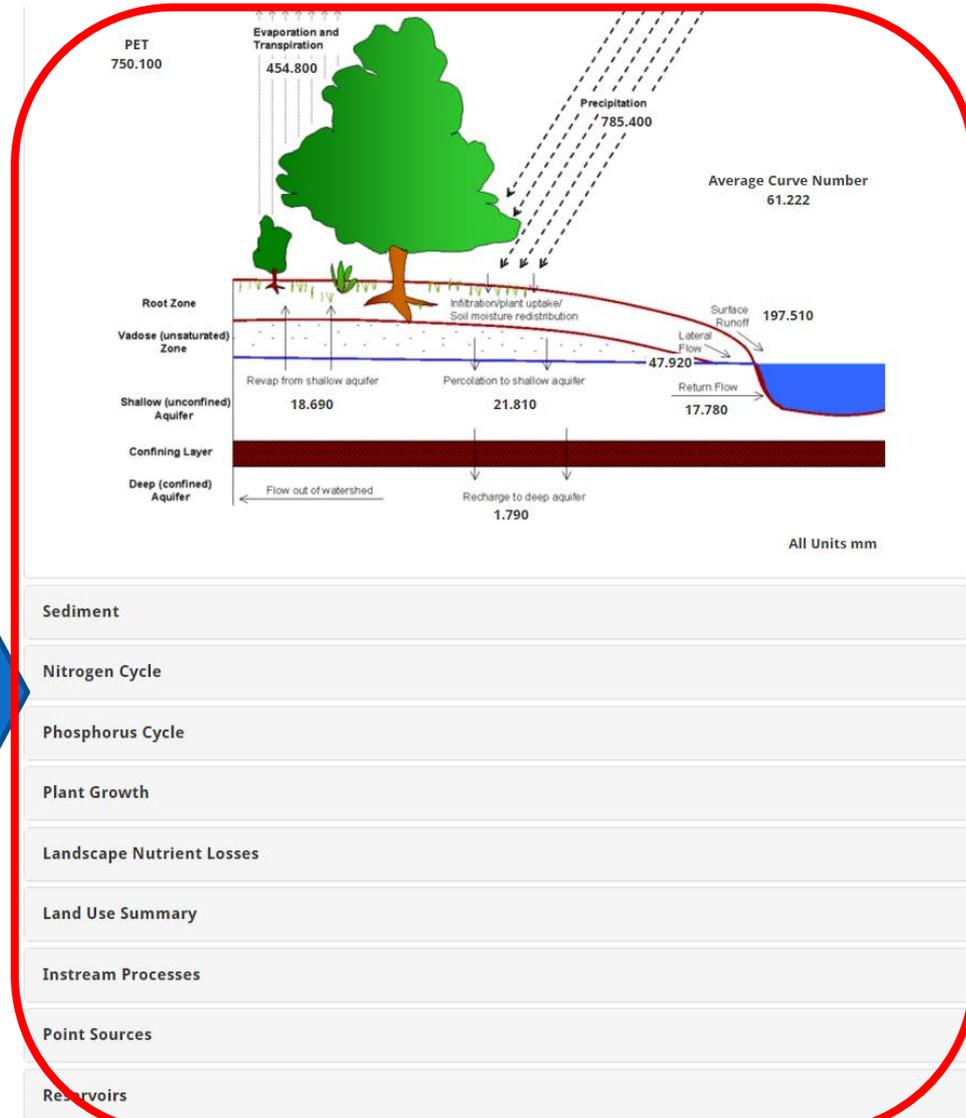


SWAT OUTPUT ANALYSIS – OUTPUT REACH



SWAT OUTPUT ANALYSIS – SWAT CHECK

SWAT Check reads model output from a SWAT project and performs many simple checks to identify potential model problems. The intended purpose of this program is to identify model problems early in the modeling process



- Sediment
- Nitrogen Cycle
- Phosphorus Cycle
- Plant Growth
- Landscape Nutrient Losses
- Land Use Summary
- Instream Processes
- Point Sources
- Reservoirs

METADATA

Metadata keeps tracks of all inputs and changes in inputs for default and all the scenario runs



Projects > HUC 8 - 01070006 - merrimack > Metadata

This page lists your SWAT input data settings for each scenario in your project.

Watershed

Name	HUC 8 - 01070006 - merrimack
Data Resolution	HUC 8
Starting HUC ID	Head
Ending HUC ID	01070006
Number of Subbasins	6
Project Area	12,968.29 km ²

HRUs

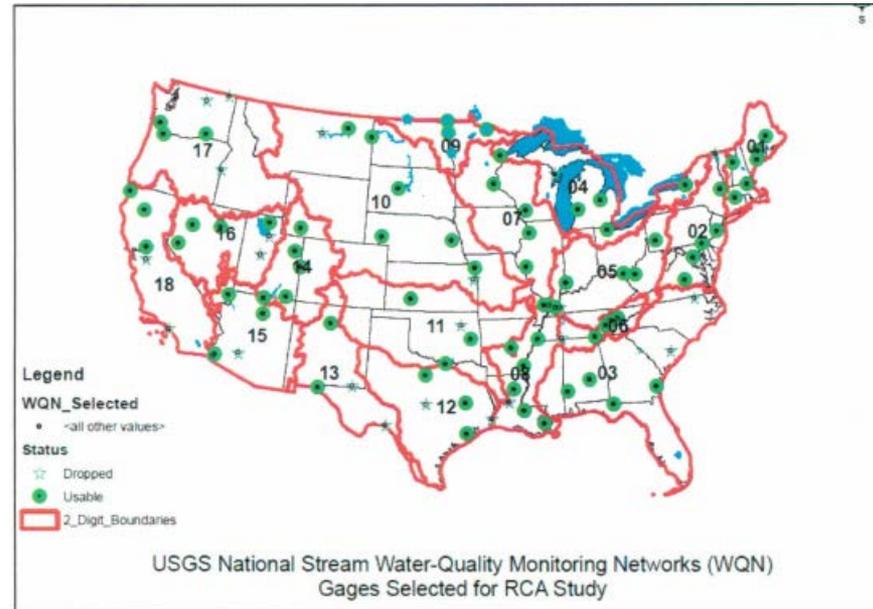
Original number of HRUs	1,302
Number of HRUs	823
Land Use Threshold	1 km ²
Soil Type Threshold	1 km ²
Slope Class Threshold	1 km ²
Land Use Classes Exempted	None

Scenarios

Scenario Name	Simulation Start Date	Simulation End Date	Set-up/Warm-up Years	Print Setting	Climate Data
Climate change - cmip5 - hadgcm-85-2070-2100	1/1/2065	12/31/2099	5	Daily	HadGEM2-ES, RCP85, Future data (2006-2099)
Climate change - cmip5 - rcp85 - esm (Copy)	1/1/2065	12/31/2099	5	Daily	CanESM2, RCP85, Future data (2006-2099)
Climate change - cmip5 - rcp85 - esm	1/1/2015	12/31/2050	5	Daily	CanESM2, RCP85, Future data (2006-2099)
Climate change - cmip5	1/1/2015	12/31/2050	5	Daily	HadGEM2-ES, RCP85, Future data (2006-2099)
Default	1/1/1965	12/31/2000	5	Daily	Actual climate data (default)

HAWQS - CALIBRATION

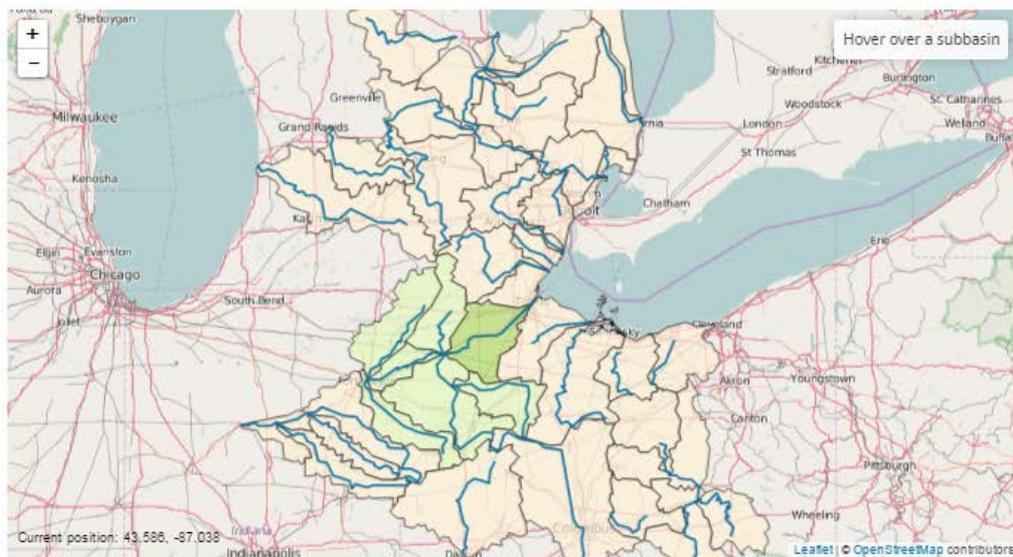
- Monthly calibration for flow, sediment, Total N and P were performed on selected sites at the 8-digit basin for the available data
- The calibrated parameters were extended to other 10 and 12 digit basin scales
- Calibration is a continuous process as more data becomes available and from current and prospective users





USE CASE EXAMPLE: MAUMEE RIVER BASIN

Click the map near the downstream point of your watershed to begin. The map will display the upstream HUCs of your watershed as well as other nearby HUCs.



Map options

Data resolution:

HUC 8

Enter a downstream HUC:

Go

Map legend

- HUC in the watershed
- Downstream HUC
- HUCs surrounding downstream HUC, but not in the watershed
- Stream

Disclaimer

You may find that the total area of a watershed in HUC 8 does not match the area of the watershed in HUC 10 or HUC 12 resolutions. Some of the 10 and 12-digit basins do not flow into the big subbasins because they are closed subbasins; i.e., the rivers do not flow out of the subbasin.

Watershed area still look incorrect? Please [submit an error report](#) and we will look into it.

Create your project

The watershed shown above contains 7 subbasins and 1,892 HRUs from the head of the watershed to HUC 04100009. [View watershed routing.](#)

Give your project a unique name:

HUC 8 - 04100009

Receive an email notification when the project is set up? ([Help me decide](#))

▶ Advanced

Create project



USE CASE EXAMPLE: MAUMEE RIVER BASIN

Projects

- Maumee River Basin
 - HUC 8 - 08070100 (1)
 - HUC 8 - 07130011 (1)
 - HUC 8 - 02080205
 - HUC 8 - 07130011 (3)
 - HUC 8 - 07130011 (2)
 - HUC 8 - 07130011
 - HUC 12 - 071100090107
 - HUC 8 - 08070100
 - HUC 8 - 05090103
 - HUC 8 - 09020301
 - HUC 12 - Kaskaskia
 - HUC 10 - 0711000901
 - HUC 8 - 10120113
- region1-kenbeck at north sidney
- Region4-Maumee at waterville
- Region3_alabama at clairbone
- Region2-James at Cartersville
- HUC 8 - 07030005
- HUC 8 - 07020012
- HUC 8 - 07010201

Projects > Maumee River Basin

Set HRUs

You can set threshold levels to eliminate minor land uses, soils, and slopes in each subbasin. This will reduce the number of HRUs in your project, allowing for quicker input file writing and SWAT model runs.

Thresholds may only be modified before any scenarios are added to your project. After creating scenarios, you will need to create a new project or delete all scenarios if you want to reset thresholds.

[Set HRUs](#)

Scenarios

Create a scenario for your project. A project scenario is where you go to customize SWAT input variables and run the model. You can create multiple scenarios and make side-by-side output comparisons.

[Create a scenario](#)

Project Files

Create a zip of all your project files and download them to your computer for offline use. We recommend waiting until you are done running all scenarios for this project before creating this file. It may take several hours if you have multiple scenarios and your project is large (>10,000 HRUs).

[Create zip of project files](#) Receive an email when complete?

HUC 8 Watershed - Head to 04100009

Hover over a subbasin

Current position: 40.578, -82.725

Leaflet | © OpenStreetMap contributors

Project area:	17,022.21 km ²
Number of subbasins:	7 Download SWAT to HUC Mapping
Number of HRUs:	1,892 Download

[View metadata](#) [Change project name](#)



USE CASE EXAMPLE: MAUMEE RIVER BASIN – SET HRUs

Projects > Maumee River Basin > HRUs

Set threshold levels below to eliminate minor land uses, soils, and slopes in each subbasin. Land uses, soils, or slopes that cover area less than the threshold levels are eliminated.

Set thresholds by: Percentage ▾

Land use threshold:
 5 %

Soil threshold:
 5 %

Slope class threshold:
 5 %

Check the box next to any land use in the table on the right that you would like to exempt from elimination based on your threshold settings above.

Receive an email notification when we're done setting your HRUs? ([Help me decide](#))

Set HRUs

The original total area of your project without a threshold is **17,022.21 km²** over **7** subbasins with **1,892** HRUs. The land use is broken down below. [See a pie chart of land use area distribution.](#)

Check the box next to any land use in the table below that you would like to exempt from elimination based on your threshold settings above.

Land Use	Area	% of Total Area
<input type="checkbox"/> CSOY	3,510.93 km ²	20.63 %
<input type="checkbox"/> SOYC	3,257.30 km ²	19.14 %
<input type="checkbox"/> SOYB	1,725.28 km ²	10.14 %
<input type="checkbox"/> FRSD	1,434.63 km ²	8.43 %
<input type="checkbox"/> URLD	1,326.71 km ²	7.79 %
<input type="checkbox"/> HAY	1,296.16 km ²	7.61 %
<input type="checkbox"/> WWHT	871.41 km ²	5.12 %
<input type="checkbox"/> SYWW	753.23 km ²	4.43 %
<input type="checkbox"/> URMD	584.56 km ²	3.43 %
<input type="checkbox"/> WWSY	569.64 km ²	3.35 %



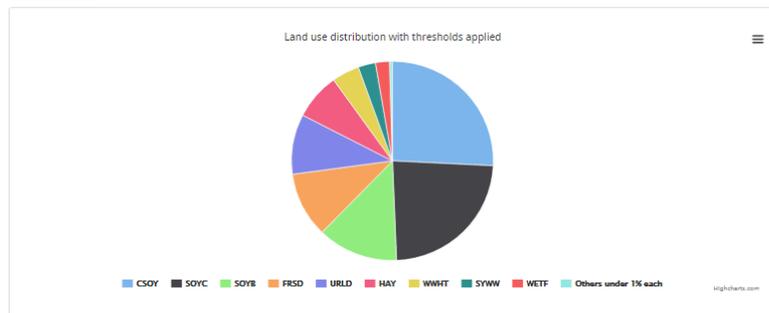
USE CASE EXAMPLE: MAUMEE RIVER BASIN – SET HRUs

Projects > Maumee River Basin > HRUs

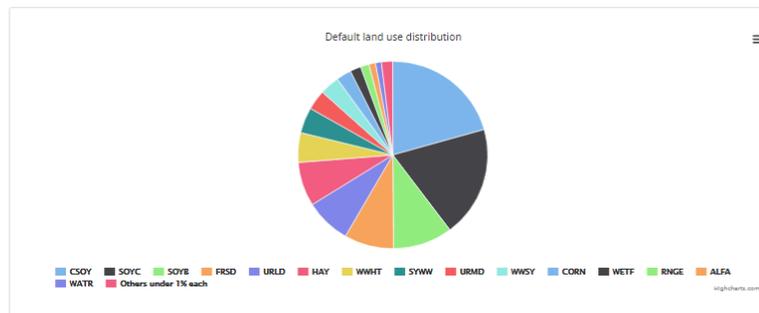
Your project originally had 1,832 HRUs. Setting thresholds reduced the number to 222 HRUs.

Note: once you create scenarios for your project, you will no longer be able to modify your HRUs.

Reset your HRUs



	Land Use	Soil Type	Slope Class
Thresholds	5%	5%	5%
Area redistribution	3,400.22 km²	2,490.64 km²	0.00 km²



Land use distribution comparison

Land Use	With thresholds applied		Original	
	Area	% of Total Area	Area	% of Total Area
CSOY	4,387.55 km²	25.78 %	3,510.93 km²	20.63 %
SOYC	4,015.94 km²	23.59 %	3,257.30 km²	19.14 %
SOYB	2,196.35 km²	12.90 %	1,725.28 km²	10.14 %
FRSD	1,803.18 km²	10.59 %	1,434.63 km²	8.43 %
URLD	1,657.15 km²	9.74 %	1,326.71 km²	7.79 %
HAY	1,277.65 km²	7.51 %	1,296.16 km²	7.61 %
WWHT	752.38 km²	4.42 %	871.41 km²	5.12 %
SYWW	473.08 km²	2.78 %	753.23 km²	4.43 %
URMD	74.02 km²	0.43 %	584.56 km²	3.43 %
WWSY	-	-	569.64 km²	3.35 %
CORN	-	-	439.55 km²	2.58 %

Soils and slope classes after applying thresholds

Soil Type	Area	% of Total Area
OH022	4,628.20 km²	27.19 %
OH006	2,867.75 km²	16.85 %
IN005	1,539.78 km²	9.05 %
IN004	1,410.36 km²	8.29 %
OH017	1,160.23 km²	6.82 %
OH009	1,115.83 km²	6.56 %
OH021	980.76 km²	5.76 %
OH014	814.39 km²	4.78 %
OH005	561.81 km²	3.30 %
MI017	515.63 km²	3.03 %
MI055	491.93 km²	2.89 %
OH011	334.02 km²	1.96 %

Slope Class	Area	% of Total Area
0-1	17,022.21 km²	100.00 %



USE CASE EXAMPLE: MAUMEE RIVER BASIN – CREATE DEFAULT (BASELINE) SCENARIO

Edit scenario settings

Scenario name
Default - baseline

Simulation start date
01/01/1981

Simulation end date
12/31/2000

Set-up/warm-up years
5

SWAT output print setting
Monthly

SWAT model version to run
SWAT 2012 rev. 636

Save changes Cancel



USE CASE EXAMPLE: MAUMEE RIVER BASIN – RUN SCENARIO TASKS

Run Scenario Tasks

	Last run
<input type="checkbox"/> Re-write SWAT input files	5/9/2016 3:15 PM
<input type="checkbox"/> Re-write SWAT editor tables	5/9/2016 3:15 PM
<input type="checkbox"/> Re-run SWAT 2012 rev. 636 (Time estimate)	5/9/2016 3:15 PM
<input type="checkbox"/> Re-process SWAT output files	5/9/2016 3:15 PM
<input type="checkbox"/> Receive email notifications when tasks complete? (Help me decide)	

[Run selected tasks](#)

Scenario Output Data

SWAT 2012 rev. 636 execution results

- [Output reach data](#)
- [Output summary charts](#)
- [Download input.std](#)
- [Download output.std](#)

[Run SWAT Check to identify potential model problems](#)



USE CASE EXAMPLE: MAUMEE RIVER BASIN – VISUALIZING OUTPUT

1. Request reach output statistics

✓ Your changes have been saved. Your new request is listed under 2. Process data.

You selected monthly output in your project settings, so some statistics are unavailable to you, including percentile and exceedance calculations. [Change your settings](#) to daily output and re-run SWAT to get these features.

Values:

Variables:

- Select all/none
- FLOW_IN
- FLOW_OUT
- EVAP
- TLOSS
- SED_IN
- SED_OUT
- SEDCONC
- ...

Subbasins:

- Select all/none
- 04100003
- 04100004
- 04100005
- 04100006
- 04100007
- 04100008
- 04100009

2. Process data

CSV of output.rch data
This file will include total N and total P concentrations if total N and total P were selected as [reach output variables](#) before you ran SWAT.

Unprocessed **Load/Flow Duration Curve**
Variables: FLOW_OUT
Subbasins: 04100009
Submitted: 5/10/2016 3:51 PM

Click the button below to process all items marked unprocessed above.

Receive an email notification when processing is complete?



USE CASE EXAMPLE: MAUMEE RIVER BASIN – CLIMATE CHANGE SCENARIO

Projects > Maumee River Basin > Climate Change > Climate change scenarios

By default, the system uses actual climate data. Using the form below you may change your model to use downscaled global climate model simulations (CMIP), developed by [The Nature Conservancy for The World Bank](#).

You last saved changes to your climate change scenario 6/16/2016 11:58 AM.

Select a climate model:
CCMA CGCM3.1

Select a time series:
Future data (2081-2100)

Select a scenario:
SRES A1B

Update your SWAT simulation dates. Currently your simulation is set to run from **1/1/1981** to **12/31/2000** with **5** years of warm-up. Your simulation run dates need to fall within the time period selected above; if needed, please select new dates below.

Simulation start date
01/01/2081

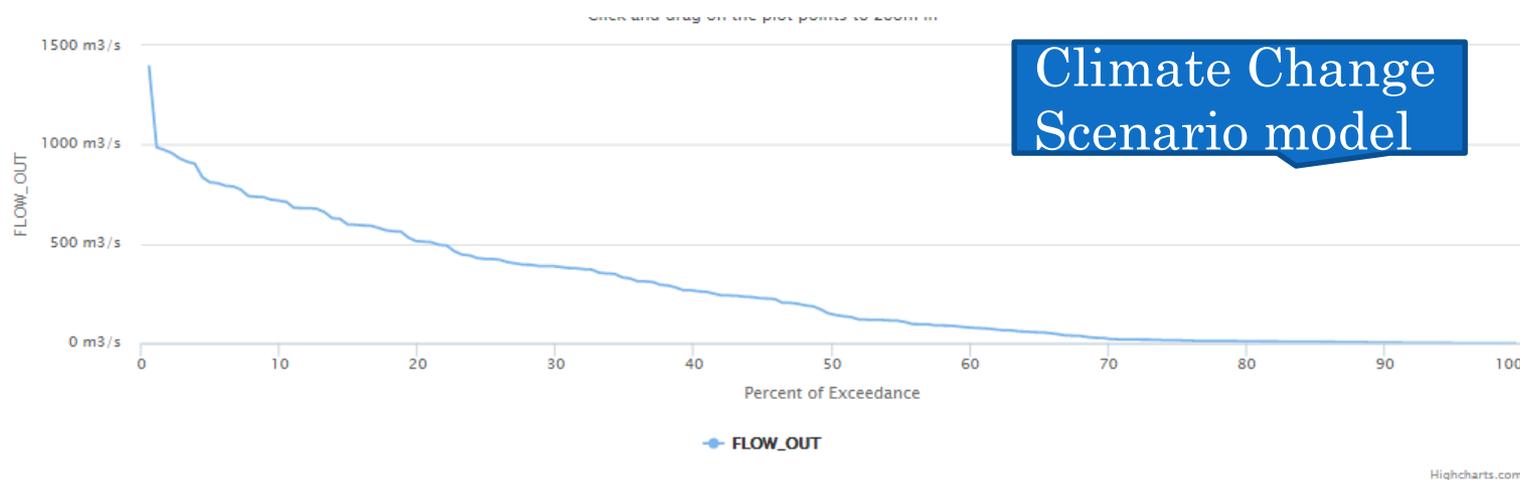
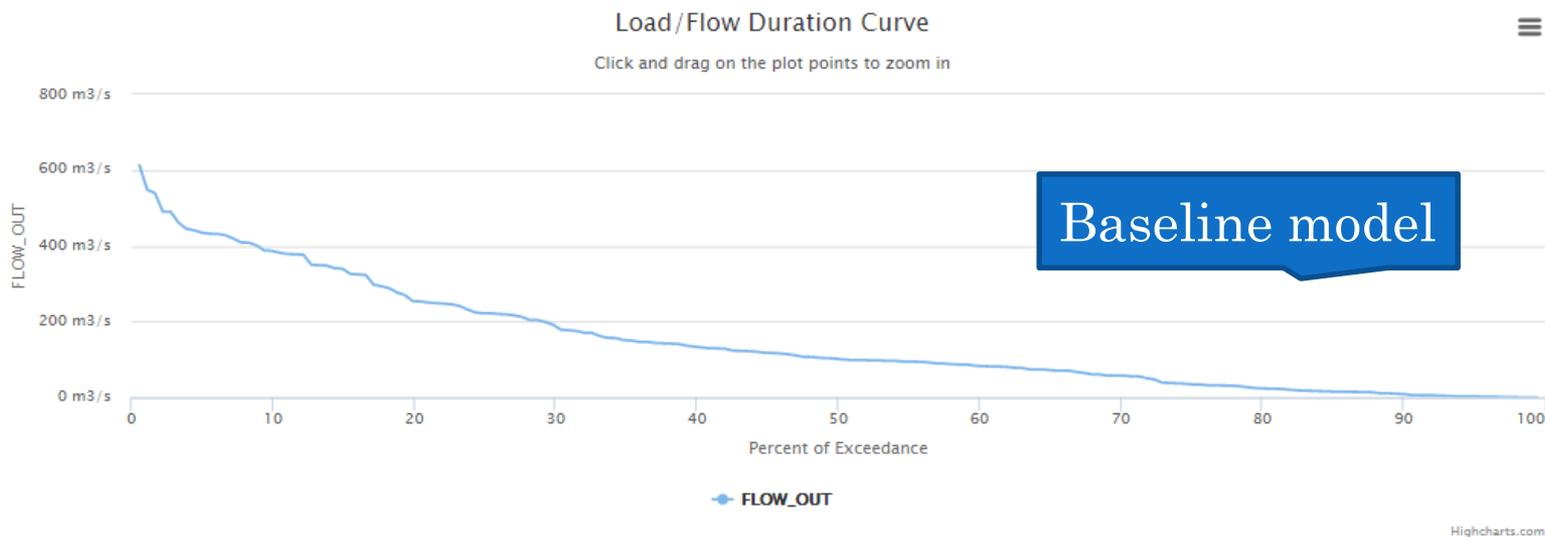
Simulation end date
12/31/2100

Set-up/warm-up years
5

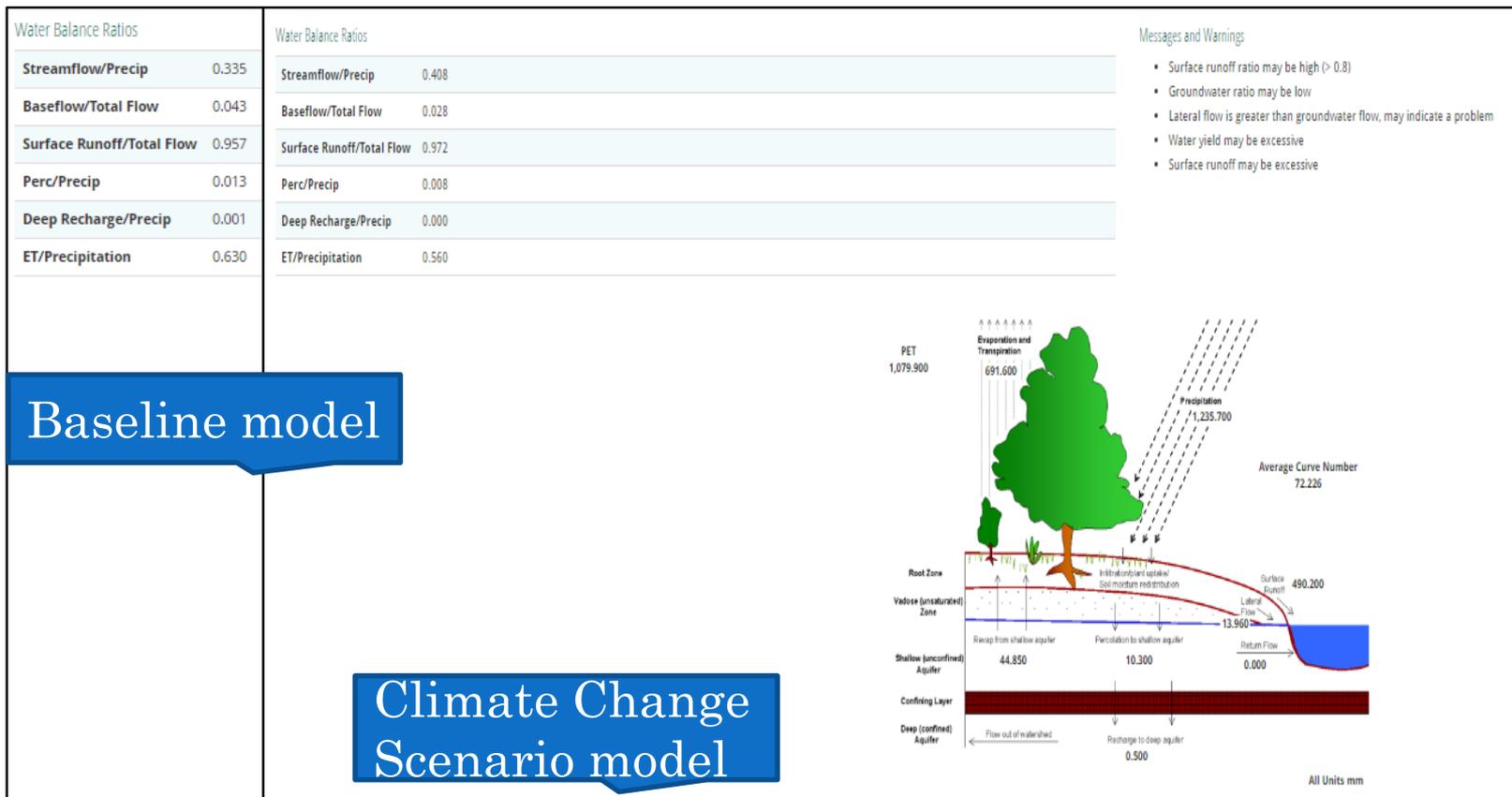
[Save changes](#) [Cancel and go back to scenario](#)



USE CASE EXAMPLE: MAUMEE RIVER BASIN – VISUALIZING OUTPUT



USE CASE EXAMPLE: MAUMEE RIVER BASIN – VISUALIZING OUTPUT





HAWQS – NEXT STEPS

- Identify and engage prospective users of HAWQS;
- Further enhance HAWQS interfaces;
- Improve output visualization tools including mapping the results, comparing multiple scenarios for a project;
- Enhance project-level sharing and collaboration;
- Add CMIP5 climate change models and scenarios;
- Improve water temperature model;
- Selectively update and analyze input data (e.g., atmospheric deposition and point sources)
- Improve agricultural inputs such as SSURGO soils and crop management
- Enhance uncertainty analysis on model outputs stemming from model input parameters.



POLL QUESTION #4

- Based on what you know about HAWQS now, do you envision using HAWQS to support any current or future water quality modeling work?
 - Yes
 - No
 - Maybe
 - Do not know at this time



QUESTIONS

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