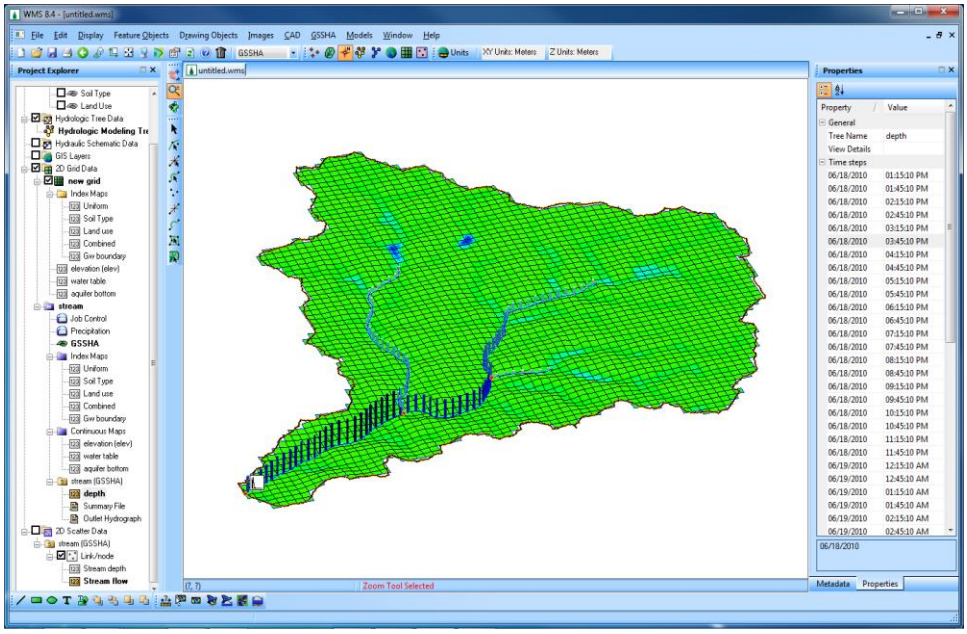
WMS

v. 10.1

WMS 10.1 Tutorial

GSSHA – Calibration – Manual Calibration of GSSHA models

Learn how to manually calibrate a GSSHA model



Objectives

This tutorial demonstrates how to calibrate a GSSHA model by running a sensitivity analysis on the input parameters. A sensitivity analysis helps with understanding how changes in input parameters impact the output of the model.

Prerequisite Tutorials

- GSSHA – Modeling Basics – Developing a GSSHA Model Using the Hydrologic Modeling Wizard in WMS

Required Components

- Data
- Drainage
- Map
- Hydrology
- 2D Grid
- GSSHA

Time

- 20-40 minutes

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1 Introduction

Creating a working GSSHA model is a preliminary step in hydrologic modeling. Such models can be used in analyzing different hydrologic problems only if the model developer has enough confidence in the model. Generally, such models should be calibrated.

In this tutorial, a pre-existing GSSHA project for the Goodwin Creek watershed will be imported and a sensitivity analysis will be performed on the parameter in order to understand how parameters can be modified to calibrate the model. In this tutorial we will manually adjust parameters for a calibration, in the next tutorial we will use a series of batch or stochastic runs to calibrate the model and then finally we will use an automated shuffle, complex, evolution scheme to automate the calibration. In all cases a sensitivity analysis on the parameters is helpful in guiding the calibration.

2 Open an Existing GSSHA Project

Open the GSSHA model for the Goodwin Creek Watershed

1. In the *2D Grid Module*  select ***GSSHA | Open Project File…***
2. Locate the ***\GSSHA Distributed Hydrologic modeling*** folder in the files for this tutorial. If needed, download the tutorial files from www.aquaveo.com.
3. Browse and open the file ***\GSSHA Distributed Hydrologic modeling\ Calibration\Manual\ goodwin.prj***
4. Select ***GSSHA | Save Project File*** to save the base project to a different location, so that the original project remains unchanged. Save the project as ***\GSSHA Distributed Hydrologic modeling\Personal \Calibration\Manual\ goodwin.prj***
5. Select ***GSSHA | Run GSSHA*** to compute the base model.

3 Replacing Parameters

As seen above, there are differences between the simulation results and the observed flow. Notice whether the model is under- or over-predicting the flow (under-predicting in this case). This indicates what needs to be done next with the parameters so that the simulation results match up with the observed data.

Although there are several parameters that affect the outflow, there are a few which are more sensitive. We will investigate some of these.

- Increase and Decrease Hydraulic Conductivity
- Increase and Decrease Initial Moisture (Initial Moisture tab)

- Increase and Decrease Overland Roughness (Roughness tab)
- Increase and Decrease Channel Roughness

Here are the steps that we will follow for the sensitivity analysis of each parameter:

1. In windows explorer, browse and open an Excel spreadsheet ***\GSSHA Distributed Hydrologic modeling\Calibration\ManualCalib.xls***.
2. For convenience, a table has been created in the spreadsheet (***\GSSHA Distributed Hydrologic modeling\Calibration\ManualCalib.xls***) which has the original values of the parameters to begin with and places to enter the weight.
3. In the spreadsheet, notice the blue color cells. Enter **1.25** to increase the parameter value by 25% and enter **0.75** to decrease those by 25%. Some formulae are created in it which will use the entered weights to compute the modified values for the parameters.
4. Then select and copy the values corresponding to 25% increase as we will paste those to WMS.
5. Switch back to WMS and switch to the *2D Grid Module* 
6. Select **GSSHA| Map Tables…**
7. In the "*Infiltration*" tab paste the hydraulic conductivity values just copied from the spreadsheet.
8. *Save* and run the model (just overwrite the same GSSHA project).
9. Copy the hydrograph to the same spreadsheet and paste the values under columns 'Hydraulic conductivity'.
10. Repeat the same process to get new values of Hydraulic conductivity, decreased by 25%.
11. Save and run the model and export hydrograph ordinates to the spreadsheet.
12. Now copy the original values of Hydraulic conductivity from the spreadsheet and paste in WMS map tables before changing other parameters.
13. Follow the same steps to adjust another parameter (1 at a time to see the sensitivity) for the following parameters. Do not forget to replace original values before moving on to another set of parameters.
    - Initial Moisture (Initial Moisture tab)
    - Overland Roughness (Roughness tab)
    - Channel Roughness (in the map module, click on *Select feature line branch*  tool and double click on the most downstream channel segment).

With all these sensitivity analyses, notice how each of these parameter affect the model results. Now, instead of just playing with one parameter at a time, change a combination of parameters (with the values believed to best calibrate the model) and rerun GSSHA one more time.

14. Copy the hydrograph to the spreadsheet
15. Toggle through all different plots in the spreadsheet.