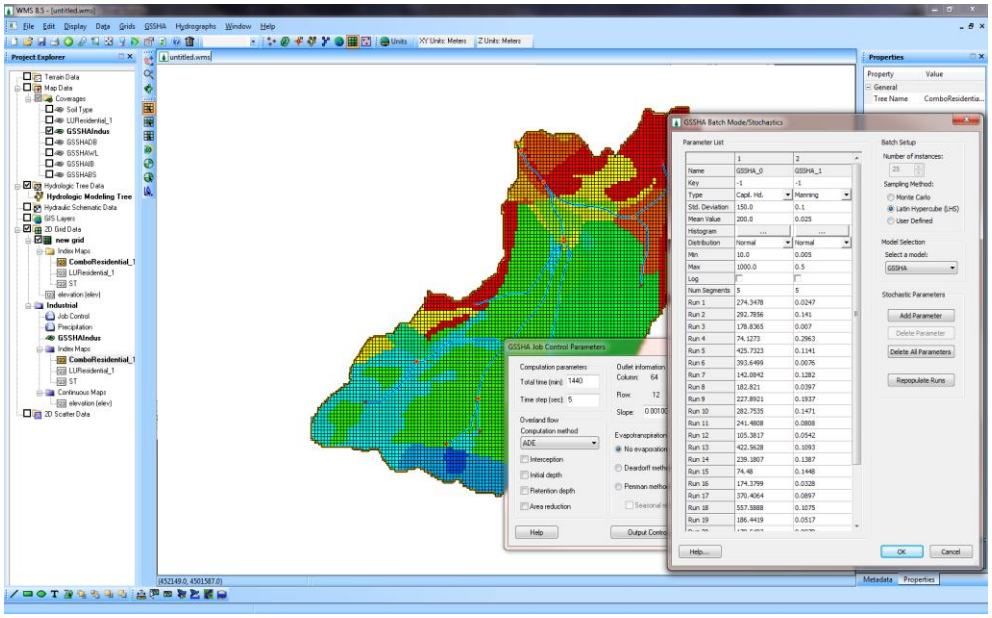
WMS

v. 9.0

WMS 9.0 Tutorial

GSSHA – Calibration – Stochastic Simulations of GSSHA models

Generate a variable set of input parameters and run these parameters in GSSHA



Objectives

This tutorial shows you how to define stochastic parameters, or input parameters for which the exact value is uncertain, in the WMS interface. You learn how to generate a set of values for these parameters and how to run GSSHA with the generated set of values.

Prerequisite Tutorials

- GSSHA – Calibration – Manual Calibration of GSSHA models

Required Components

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

Time

- 20-40 minutes

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2 Introduction

Manually updating parameters can become tedious as the size of the watershed and/or heterogeneity in the watershed increases. To facilitate this, WMS provides a way to generate a set of values for the parameters (of your choice) and have GSSHA make trial runs for a certain ranges of those parameters. This process is often called stochastic simulations or batch mode in WMS.

With stochastic simulations, you can select a few of the most sensitive parameters, define parameter ranges and have GSSHA run these several simulations in batch mode.

3 Open an Existing GSSHA Project

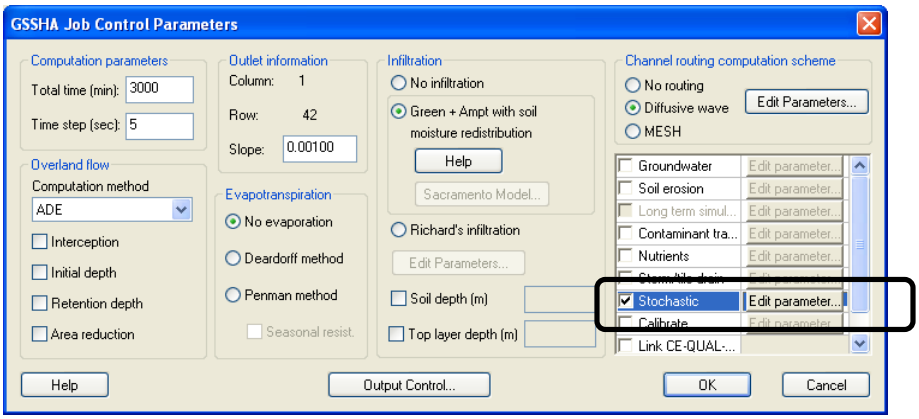
Open the GSSHA model for Goodwin Creek Watershed

1. In the *2D Grid Module*  select ***GSSHA | Open Project File…***
2. Locate the ***GSSHA Distributed Hydrologic modeling*** folder in your tutorial files. If you have used default installation settings in WMS, the tutorial files will be located in ***\My documents\WMS 9.0\Tutorials\.***
3. Browse and open the file ***\GSSHA Distributed Hydrologic modeling\ Calibration\Stochastic\goodwin.prj***
4. Select ***GSSHA | Save Project File*** to save the base project with a different name, so that the original project remains unchanged. Save your project as ***\GSSHA Distributed Hydrologic modeling\Personal\Calibration \Stochastic\sto.prj***

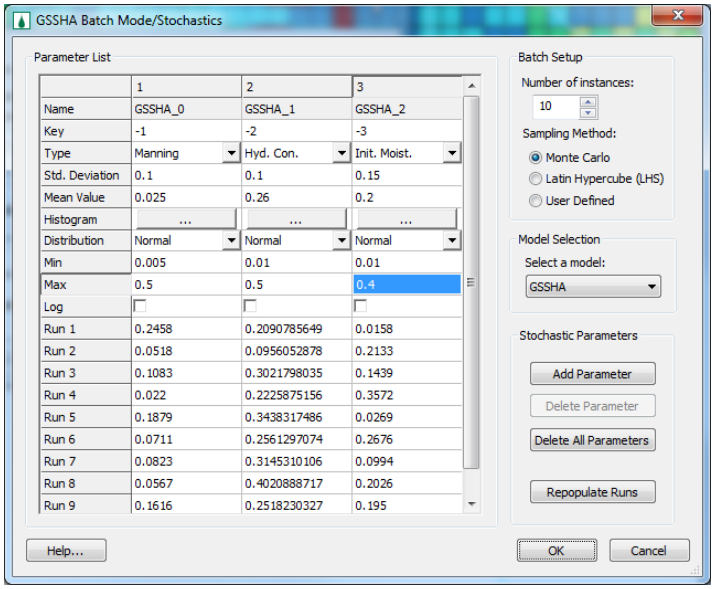
4 Creating Stochastic Runs

1. Select **GSSHA | Job Control…**and select the *Stochastic* Option (See the following figure)
2. Click on the *Edit Parameter* button just to the right.
3. Enter 10 for *Number of Instances* which defines how many times we want to run GSSHA, thus that many sets of parameter values will be needed.
4. Make sure *GSSHA* is selected as the model to use.

5. Click on the *Add Parameter* button. Add two more parameters (for a total of three) to the *Parameter List.* You may resize the box so that all three parameters are visible.
6. Change the Key values on the very first row to -1, -2 and -3 for consecutive columns.



7. Select *Manning's Roughness, Hydraulic Conductivity and Initial Moisture* for the three parameters. Any of the parameters listed in the Type dropdown and any number of parameters can be defined in a similar fashion
8. Now you can see a list of values with each rows named Run1, Run2 and so on to Run 10 which means that GSSHA will be run ten times with each sequential run using one of the parameter sets for the three parameters we have added.
9. You can edit the max and min range of each parameter (You will have to change the mean value to do this).
10. Let us leave the values of Manning's n the same for now.
11. Change the standard deviation for hydraulic conductivity to 0.2, mean to 0.26, min to 0.01 and the max value to 0.5
12. Similarly, change the mean for Initial moisture to 0.2 and enter 0.4 for max. Do not change the standard deviation and the min values.
13. Once you change the range of these values, the list will update itself. You can generate another set of these values by clicking *Repopulate Runs* button.
14. Click OK and OK again.



	1	2	3
Name	GSSHA_0	GSSHA_1	GSSHA_2
Key	-1	-2	-3
Type	Manning	Hyd. Con.	Init. Moist.
Std. Deviation	0.1	0.1	0.15
Mean Value	0.025	0.26	0.2
Histogram	...	...	...
Distribution	Normal	Normal	Normal
Min	0.005	0.01	0.01
Max	0.5	0.5	0.4
Log			
Run 1	0.2458	0.2090785649	0.0158
Run 2	0.0518	0.0956052878	0.2133
Run 3	0.1083	0.3021798035	0.1439
Run 4	0.022	0.2225875156	0.3572
Run 5	0.1879	0.3438317486	0.0269
Run 6	0.0711	0.2561297074	0.2676
Run 7	0.0823	0.3145310106	0.0994
Run 8	0.0567	0.4020888717	0.2026
Run 9	0.1616	0.2518230327	0.195

5 Changing the Mapping Tables

Once you defined the stochastic runs, you will need to tell GSSHA which parameters (Index ID's) you want to have these values substituted for. This is done in the mapping table.

1. Select **GSSHA | Map Tables…**
2. Enter -1 for the roughness value for ID 1 (Pine 27%) which sets this roughness as a parameter and links it with the stochastic parameters for ID -1 you created in the previous step.
3. Switch to the *Infiltration* tab and move to the last column. Enter -2 for hydraulic conductivity in column 9 (pasture-silt-loam 39%).
4. In the *Initial Moisture* tab, enter -3 for column 9 (pasture-silt-loam 39%) again.
5. Click *Done*

GSSHA will change the values of these three parameters in each consecutive run.

6 Save and Run the Model

1. Save the project as ***\GSSHA Distributed Hydrologic modeling\Personal \Calibration\Stochastic\sto.prj***
2. Select ***GSSHA|Run GSSHA***
3. GSSHA will now run for ten times and thus will take a while (a couple of minutes).

Once it completes, close the model wrapper. Double click the hydrograph icon which plots the simulation results for all these runs. You can compare all these

simulations with the observed flow and chose the one that matches most closely. You may chose to change the set of parameters to make these simulation runs and see if that produces better result. For this tutorial, we will not make further runs.

4. Copy the hydrograph to the spreadsheet ***\GSSHA Distributed Hydrologic modeling\Calibration\Stochastic.xls***

7 Results

Your results might look something like the figure below.