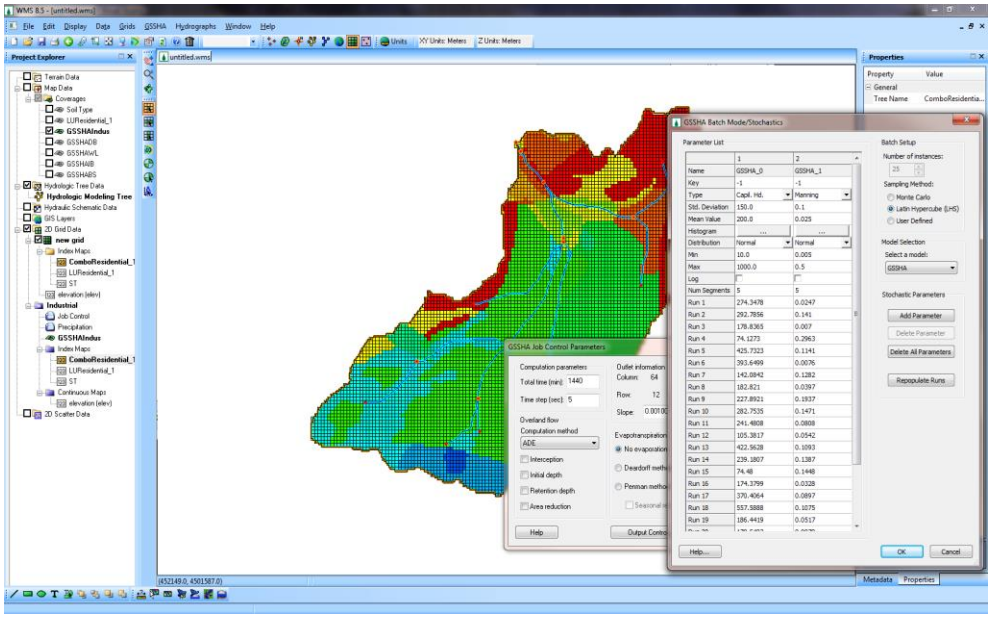
WMS

v. 11.0

WMS 11.0 Tutorial

Stochastic Simulations of GSSHA Models

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



Objectives

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

Prerequisite Tutorials

- Manual Calibration of GSSHA models

Required Components

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

Time

- 20–40 minutes

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1 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 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.

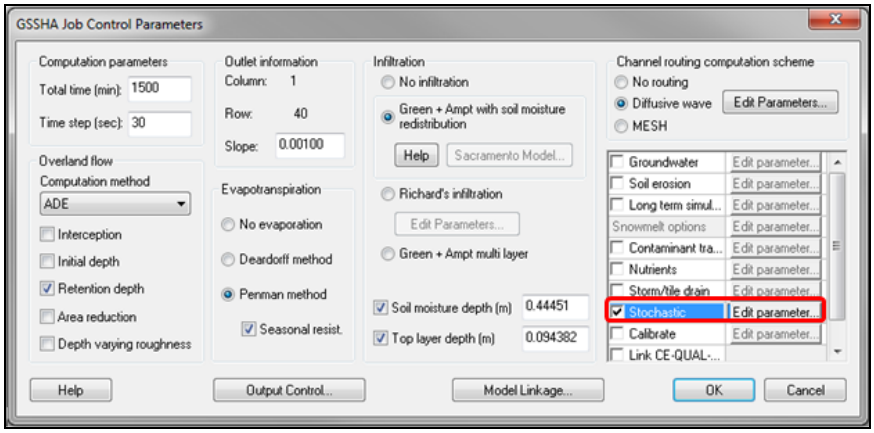
With stochastic simulations, a few of the most sensitive parameters can be selected, parameter ranges can be defined, and GSSHA can run these several simulations in batch mode.

2 Getting Started

1. Open WMS. If WMS is already open select *File* | **New** to reset to the defaults.
2. Switch to the **2-D Grid Module** .
3. Select *GSSHA* | **Open Project File** to bring up the *Open* dialog.
4. Navigate to *GSSHACalibration2\Calibration\Stochastic\goodwin.prj*.
5. Select **Open** to open the project and to exit the *Open* dialog.

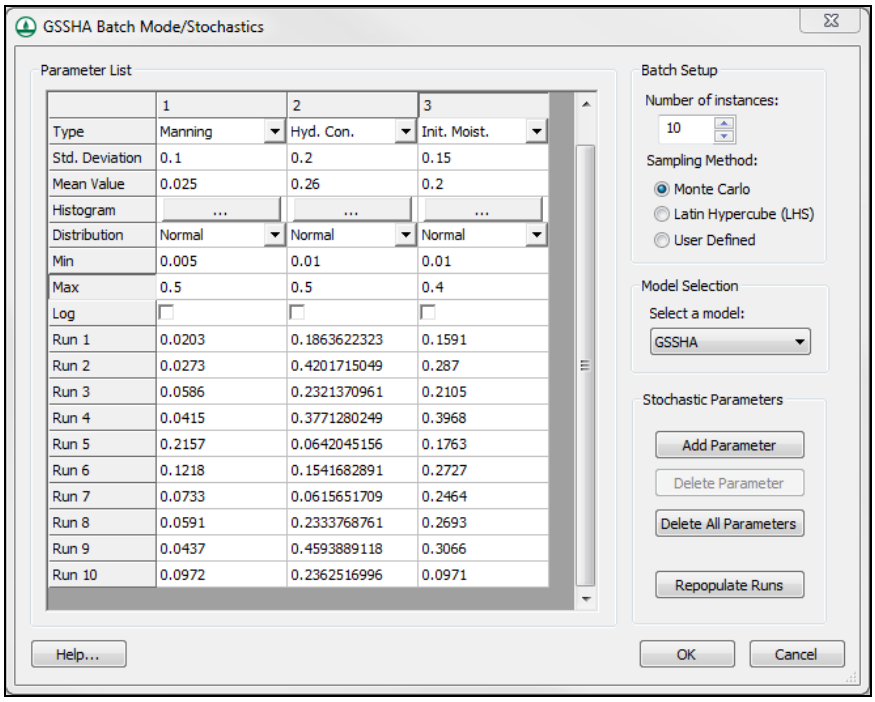
3 Creating Stochastic Runs

1. Select *GSSHA* | **Job Control…** to open the *GSSHA Job Control Parameters* dialog and select the *Stochastic* option (see Figure 1).



2. Click on the **Edit Parameter** button just to the right of *Stochastic* to open the *GSSHA Batch Mode/Stochastics* dialog.

3. In the *Batch Setup* section, enter "10" for the *Number of instances* which defines how many times to run GSSHA. This sets up the amount of parameter values that will be needed.
4. In the *Model Selection* section, make sure "GSSHA" is selected.
5. Under the *Stochastic Parameters* section, click on the **Add Parameter** button. Add two more parameters (for a total of three) to the *Parameter List*. 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. Moving from right to left in the columns, change the *Type* to "Manning", "Hyd. Con." and "Init. Moist." respectively. Notice the list of values with rows named Run 1, Run 2 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 just added.
8. Change the *Std. Deviation* for "Hyd. Con." to "0.2", the *Mean Value* to "0.26", the *Min* to "0.01" and the *Max* to "0.5".
9. Similarly, change the *Mean Value* for "Init. Moist." to "0.2" and enter "0.4" for *Max*. Do not change the standard deviation and the min values.
10. Once the range of these values is changed, the list will update itself. Generate another set of these values by clicking the **Repopulate Runs** button.
11. Click **OK** to exit the *GSSHA Batch Mode/Stochastics* dialog.
12. Click **OK** to exit the *GSSHA Job Control Parameters* dialog.



	1	2	3
Type	Manning	Hyd. Con.	Init. Moist.
Std. Deviation	0.1	0.2	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	0.0203	0.1863622323	0.1591
Run 2	0.0273	0.4201715049	0.287
Run 3	0.0586	0.2321370961	0.2105
Run 4	0.0415	0.3771280249	0.3968
Run 5	0.2157	0.0642045156	0.1763
Run 6	0.1218	0.1541682891	0.2727
Run 7	0.0733	0.0615651709	0.2464
Run 8	0.0591	0.2333768761	0.2693
Run 9	0.0437	0.4593889118	0.3066
Run 10	0.0972	0.2362516996	0.0971

4 Changing the Mapping Tables

Once the stochastic runs have been defined, GSSHA needs to be told for which parameters (Index ID's) to substitute these values. This is done in the mapping table.

1. Select *GSSHA* | **Map Tables…** to open the *GSSHA Map Table Editor* dialog.
2. Enter "-1" for the *Surface roughness* value for ID 1 (Pine 27%) which sets this roughness as a parameter and links it with the stochastic parameters for ID 1 created in the previous steps.
3. Switch to the *Infiltration* tab and move to the last column. Enter "-2" for *Hydraulic conductivity (cm/hr)* in column 9 (pasture-silt-loam 39%).
4. In the *Initial Moisture* tab, enter "-3" for *Initial moisture* in column 9 (pasture-silt-loam 39%).
5. Click **Done** to exit the *GSSHA Map Table Editor* dialog.

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

5 Save and Run the Model

1. Select *GSSHA* | **Run GSSHA** to open the *GSSHA Run Options* dialog.
2. Click **OK** to exit the *GSSHA Run Options* dialog and open the *Model Wrapper* dialog.

GSSHA will now run for ten times and thus will take a while (a couple of minutes).

3. When the simulation has completed, click **Close** to exit the *Model Wrapper* dialog and read in the solution.
4. In the Project Explorer, under "  2D Grid Data", double-click on the "  Outlet Hydrograph" to view the solution for each of the runs. This will bring up the *Hydrograph* dialog for each solution that is selected.

The peak flow of each of the runs can be compared to that of the observed flow for the site, and the correct solution containing optimized parameters can be used for further analysis.

6 Conclusion

This concludes the "Stochastic Simulations of GSSHA Models" tutorial. This tutorial covered how to perform a stochastic analysis of specified parameters in a GSSHA model. The correct parameters can then be used for further analysis and calibration efforts.

