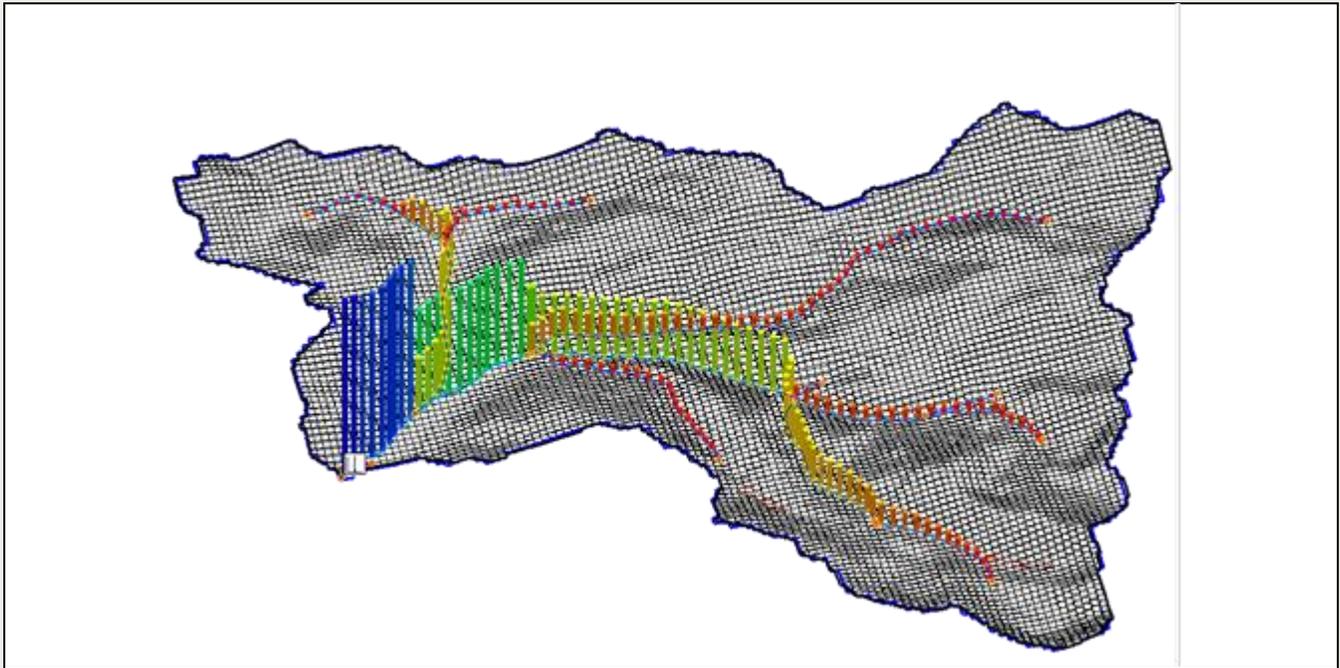*WMS 11.4 Tutorial*

GSSHA Land Use Change – Infiltration Basins

Include the effects of infiltration basin runoff abatement measures in GSSHA models

Objectives

Learn to add the effects of infiltration basins as a runoff abatement measure in a GSSHA model.

Prerequisite Tutorials

- Developing a GSSHA Model Using the Hydrologic Modeling Wizard

Required Components

- WMS Core
- GSSHA Model

Time

- 10–20 minutes

AQUAVEO™

1   Introduction

Changing the land use in a certain portion of the watershed can cause an increase in the peak flow at the watershed outlet. This situation is often undesirable as natural streams and various hydraulic structures—like culverts and channels downstream of the new development—become undersized.

This tutorial adds infiltration basin abatement measures to the project used in the "GSSHA Land Use Change – Industrial" tutorial.

1.1   Getting Started

Begin by opening an existing GSSHA model:

1. Open WMS, or click **New** to reset to the default settings and clear any existing data.

2. Switch to the **2-D Grid** module.

3. Select *GSSHA |* **Open Project File…** to bring up the *Open* dialog.

4. Browse to the *data files* folder for this tutorial and select "Industrial.prj".

5. Click **Open** to import the project and exit the *Open* dialog.

6. Select *GSSHA |* **Save Project File…** to bring up the *Save GSSHA Project File* dialog.

7. Select "GSSHA Project File (*.prj)" from the *Save as type* drop-down.

8. Enter "Infiltration.prj" as the *File name*.

9. Click **Save** to save the project under the new name and close the *Save GSSHA Project File* dialog.

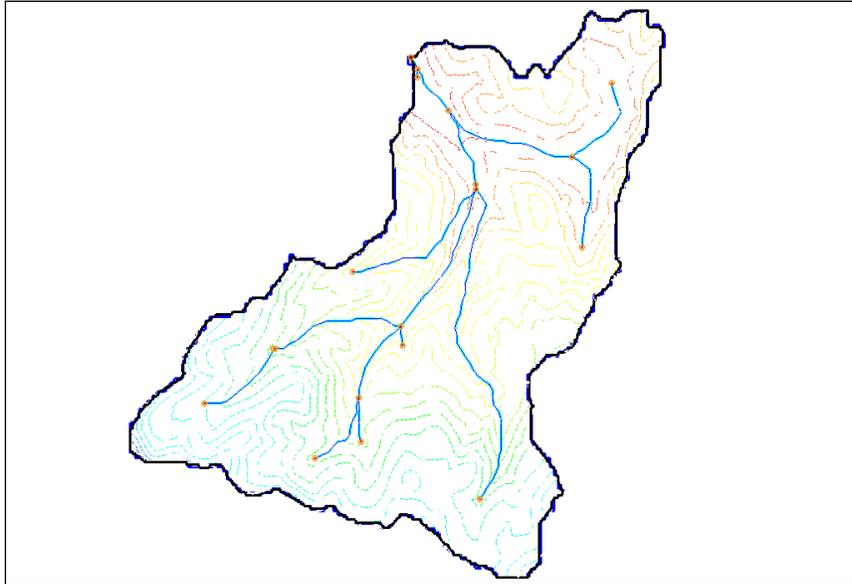The project should appear similar to Figure 1.

Figure 1   Initial project

2   Creating a Coverage

To mitigate the problems of flooding, introduce a detention basin in the watershed. Because the existing " GSSHAIndus" coverage already has most of the needed parameters set, duplicate it to create a new coverage to use for the detention basin.

1. Right-click on " GSSHAIndus" and select **Duplicate** to create a new " Copy of GSSHAIndus" coverage.

2. Right-click on " Copy of GSSHAIndus" and select **Rename**.

3. Enter "GSSHAIB" and press *Enter* to set the new name.

Now to assign the new " GSSHAIB" coverage to the " M Infiltration" project by doing the following:

4. Right-click on the " GSSHAIndus" link under " M Infiltration" and select *Assign Coverage* | **GSSHAIB**.

3   Renaming the Index Map

Instead of modifying the polygons in a coverage and creating an updated index map, directly modify an existing index map. In a WMS instance with multiple GSSHA models, it is preferred to modify a copy of the specific index map to add the infiltration basin. This prevents changes happening to existing models. In this case, there is only the one project, so a copy does not need to be made.

1. Right-click on " ComboIndustrial" in the " Index Maps" folder under " new grid" and select **Rename**.

2. Enter "ComboIB" and press *Enter* to set the new name.

4 Defining the Infiltration Basin Parameters

Creating an infiltration basin is another abatement measure that can be used as a flood control measure. An infiltration basin is a designated area in the watershed which has a very high infiltration rate.

4.1 Adjusting the Contour Options

First, adjust the display options so the background image guide will be visible:

1. Click **Contour options** to bring up the *ComboIB Contour Options* dialog.

2. In the *Transparency* section, enter "50" as the *Transparent %*.

3. Click **OK** to close the *ComboIB Contour Options* dialog.

4.2 Importing a Background Image

Background images can help with the placement of the infiltration basin. In this case, a background image has been created as a guide, showing the specific boundaries of the basin.

1. Click **Open** to bring up the *Open* dialog.

2. Browse to the *data files* folder for this tutorial.

3. Select "Wetland.jpg" and click **Open** to exit the *Open* dialog and import the image.

4. **Zoom** in on the most downstream section of the watershed (top left corner).

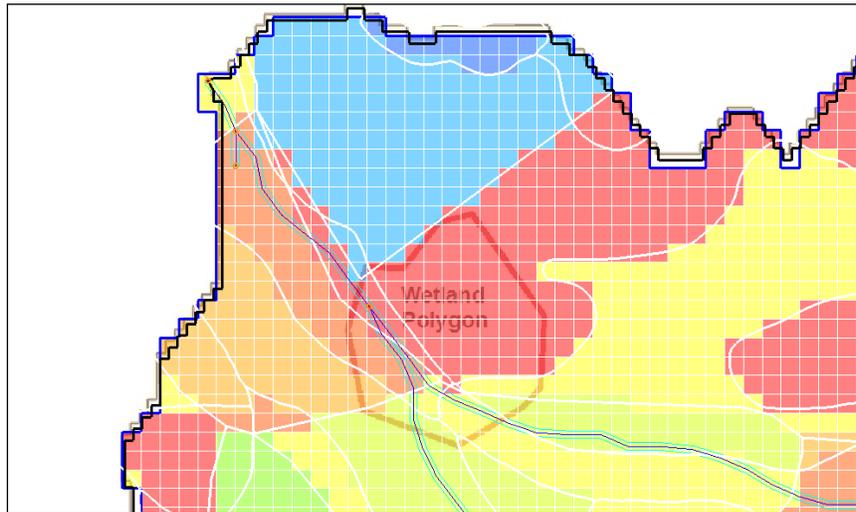The project should appear similar to Figure 2.

Figure 2 The background image template is visible through the contoured cells

4.3 Changing the Index Map IDs

1. Select " GSSHAIB" to make it active.

2. Select " ⊞ ComboIB" under " 📁 Index Maps" under " ⊞ new grid" to make it active.

3. Click **Display Options** 🖥 to bring up the *Display Options* dialog.

4. Select "2D Grid Data" from the list on the left.

5. Turn off *Contours* and click **OK** to close the *Display Options* dialog.

6. Switch to the **2-D Grid** ⊞ module.

7. Select the **Select grid cell** ⊞ tool.

8. Select *Edit* | **Select With Polygon…** to bring up the *Polygon Selection Options* dialog.

9. Click **OK** to close the *Polygon Selection Options* dialog.

10. Using the Wetland Polygon as a template, click out the polygon, double-clicking to end the selection.

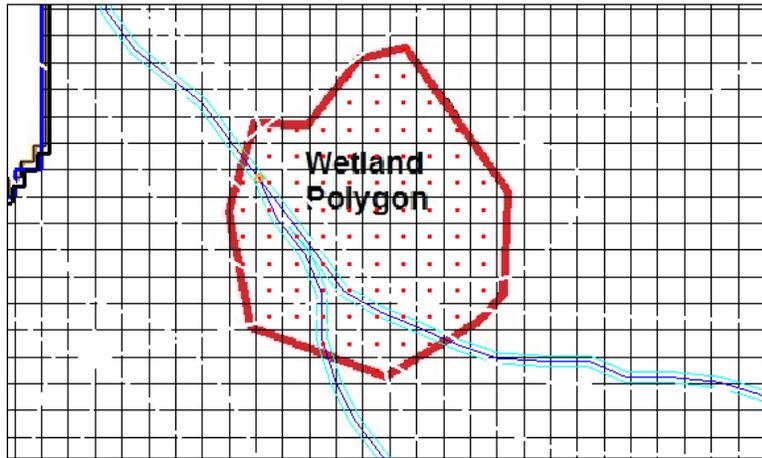The new polygon should appear similar to Figure 3.

Figure 3   Grid cells selected using a polygon

11. In the *Properties* section of the WMS window, enter "100" in the *Value* column on the *Index Map ID* row and press *Enter* to set the value.

To see the change, turn the contours back on:

12. Click **Display Options** 🖥 to bring up the *Display Options* dialog.

13. Select "2D Grid Data" from the list on the left.

14. Turn on *Contours* and click **OK** to close the *Display Options* dialog.

15. Click anywhere outside the watershed to deselect all cells.

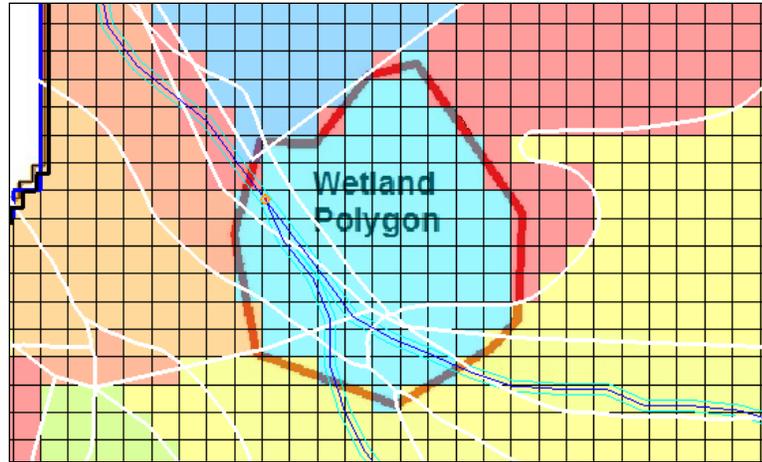The project should appear similar to Figure 4.

Figure 4   Wetland area with Index Map ID of 100

4.4   Changing the Infiltration Rate

Now change the infiltration rate for the cells:

1. Right-click on "M Infiltration" and select **Map Tables…** to bring up the *GSSHA Map Table Editor* dialog.

2. On the *Infiltration* tab, select "ComboIB" from the *Using index map* drop-down.

3. Click **Generate IDs**, clicking **No** when asked to delete existing IDs.

4. Find column "100". You may have to scroll to the right.

5. Use the following table to enter the values in the spreadsheet in column "100":

Hydraulic Conductivity	23.56
Capillary Head	4.95
Porosity	0.437
Pore Distribution Index	0.694
Residual Saturation	0.02
Field Capacity	0.091
Wilting Point	0.1

6. Click **Done** to close the *GSSHA Map Table Editor* dialog.

5   Saving and Running GSSHA

Before proceeding, it is recommended to save the project.

1. Right-click on "M Infiltration" and select **Save Project File…** to bring up the *Save GSSHA Project File* dialog.

2. Select "GSSHA Project File (*.prj)" from the *Save as type* drop-down.

3. Enter "Infiltration_run.prj" as the *File name*.

4. Click **Save** to save the project under the new name and exit the *Save GSSHA Project File* dialog.

5. Right-click on "M Infiltration_run" and select **Run GSSHA** to bring up the *GSSHA Run Options* dialog.

6. Click **OK** to exit the *GSSHA Run Options* dialog and open the *Model Wrapper* dialog.

7. When GSSHA finishes, turn on *Read solution on exit* and click **Close** to exit the *Model Wrapper* dialog.

8. If one or more warnings appear regarding the number of points on the arc, click **OK**.

6   Visualizing the Solution

There are a variety of methods for visualizing the solution datasets. The "Post - Processing and Visualization of GSSHA Model Results" tutorial discusses various methods of visualization. Feel free to experiment with them.

7   Conclusion

This concludes the "GSSHA Land Use Change – Infiltration Basins" tutorial for WMS. Feel free to continue to experiment, or exit the program.