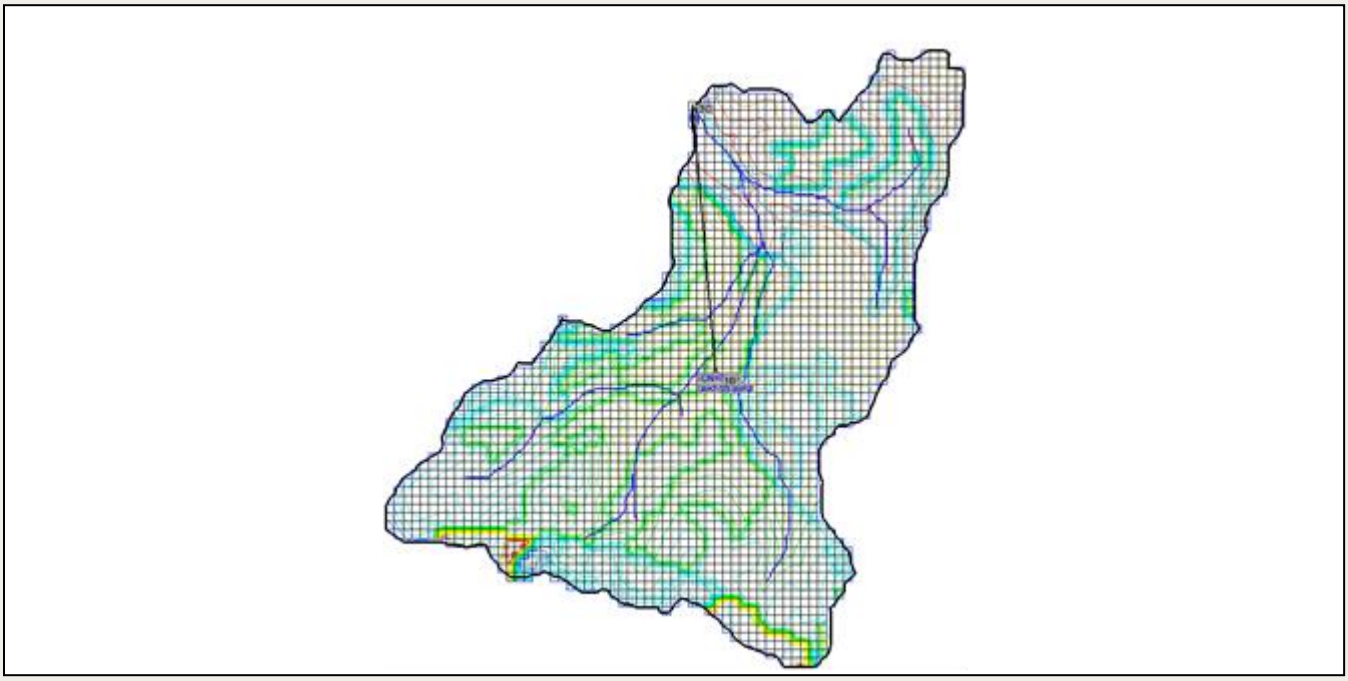
WMS 11.2 Tutorial

HEC-HMS Distributed Parameter Modeling

Setup a basic distributed MODClark model using the WMS interface



Objectives

Setup a MODClark model using the Hydrologic Modeling Wizard then run the MODClark model in HMS to obtain a hydrograph.

Prerequisite Tutorials

- DEM Delineation

Required Components

- WMS Core
- HEC-HMS Model
- ModClark Model

Time

- 20–30 minutes

1 Introduction

This tutorial shows how a HEC-HMS model with the MODClark transform can be developed using the WMS interface. MODClark is a distributed transform method based on dividing the watershed into small grid cells of equal size and determining runoff from each of the grid cells.

2 Getting Started

Start by importing an existing project. The project contains a watershed that has already been delineated.

1. Open WMS. If WMS is already open, select *File* **| New** then click **No** if asked to save changes.
2. Select *File* **| Open** to bring up the *Open* dialog.
3. Browse to *hms-modclark*\ and select "MODClark.wms".
4. Select **Open** to close the *Open* dialog.
5. In the Project Explorer, under the "Coverages" folder, right-click on "Drainage" and select **Zoom to Layer**.
6. In the Project Explorer, turn off "GIS Data".

The Graphics Window should appear similar to Figure 1

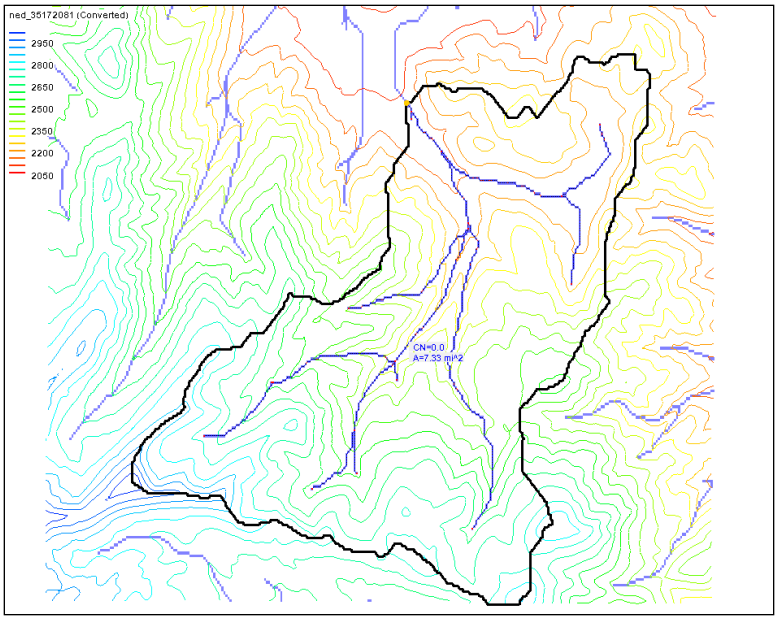


Figure 1 Initial Project

7. Click on the **Hydrologic Modeling Wizard** to open the *Project Filename* dialog at the start of the Hydrologic Modeling Wizard.
8. From the list on the left, click on *Select Model*.

3 Setup Gridded HEC-HMS Model

The following will go over setting up the grid for HEC-HMS.

3.1 Select Model

1. Use the drop-down menu under *Select the desired model* to select "HEC-HMS ModClark".
2. Click on the **Initialize Model Data** button.
3. Click **Next >** to advance to the next step, *Create 2D Grid.*

3.2 Create 2D Grid

1. Make sure that the *Enter cell size* option is selected.
2. For the *X-dimension* enter a cell size of "90" meters (the *Y-dimension* is automatically set to the same value as the *X-dimension*).
3. Click on the **Create 2D Grid** button to bring up the *Background Elev Interpolation* dialog.
4. Select **OK** to close the *Background Elev Interpolation* dialog and return to the *Create 2D Grid* dialog.
5. Click **Next >** to advance to the next step, *Job Control*.

3.3 Job Control

1. Set the *Starting date* to “01/01/2008”.
2. Set the *Starting time* to “12:00:00 PM”.
3. Set the *Ending date* to “01/03/2008”.
4. Set the *Ending time* to “12:00:00 PM”.
5. Set the *Time interval* to “15” min.
6. Click on the **Set Job Control Data** button.
7. Click **Next >** to advance to the next step, *Define Land Use and Soil Data*.

4 Hydrologic Input Parameters

The following will go over setting up the input parameters.

4.1 Define Land Use and Soil Data

Since land use and soil shapefiles have been imported already, it is possible to convert these to feature data that can be used for computing hydrologic model input parameters.

1. Verify that “salt_lake_city.shp” is set to “Land Use” under the *Type* column.
2. Make sure that “SSURGO_Soil.shp” is set to “Soil Type” under the *Type* column.
3. Click on the **Create Coverages…** button to open the *GIS to Feature Objects Wizard* dialog.
4. Select **Next >** to proceed to step 2 of 3 in the wizard.

Notice that WMS automatically set the LUCODE in the shapefile to be mapped to the land use parameter in WMS.

5. Select **Next >** to proceed to step 3 of 3 in the wizard.
6. Select **Finish** to return to step 1 of 3 in the wizard.
7. Click **Next >** to proceed to step 2 of 3 in the wizard.
8. Click **Next >** to proceed to step 3 of 3 in the wizard.
9. Click **Finish** to close the *GIS to Feature Objects Wizard* and return to the *Define Land Use and Soil Data* dialog.

WMS maps “HYDGRP” to *SCS soil type*, “TEXTURE” to *Texture*, “KSAT” to *Hydraulic conductivity*, “MOISTURE” to *Initial moisture*, “FIELDCAP” to *Field capacity*, and “WILTINGPT” to *Wilting point*.

10. Click **Next >** to advance to the next step, *Hydrologic Computations*.

4.2 Hydrologic Computations

1. Click on the **Compute GIS Attributes…** button. The *Compute HMS Loss Method Attributes* dialog will appear.
2. For *Grid Computation* choose “SCS Curve Number”.
3. Click on the **Import** button to bring up the *Open* dialog.

4. In the *hms-modclark\hms-modclark\RawData* folder open "scsland.txt" to close the *Open* dialog and return to the *Compute HMS Loss Method Attributes* dialog.
5. Select **OK** to close the *Compute HMS Loss Method Attributes* dialog and return to the *Hydrologic Computations* dialog.

A curve number (CN) is computed for each grid cell by overlaying the 2D grid with the land use and soil polygons.

6. Click on the **Edit Parameters…** button to open the *HMS Properties* dialog.
7. In the *Display options* portion of the dialog, turn on the following (scroll down to see all these options):
    - *Display*: Loss Rate Method
        - *Show*: Gridded SCS Curve Number
    - *Display*: Transform
        - *Show*: ModClark

Turning on these options adds the appropriate fields to the *Properties* section of the dialog. Some of the properties have already been calculated by WMS.

8. Set/enter the following values for the properties (columns):
    - *Loss Rate Method*: "Gridded SCS Curve Number"
    - *Initial abstraction ratio*: "0.2"
    - *Potential Retention Scale Factor*: "1.0"
    - *Transform Method*: "ModClark"
9. In the *Basin Data* column click on the **Compute…** button to open the *Basin Time Computation* dialog.
10. Change *Computation type* to "Compute Lag Time".
11. Set the *Method* to "SCS Method".
12. In the *Variables* window at the bottom of the dialog highlight the "CN SCS curve number 0.000" line of text as shown in Figure 2.

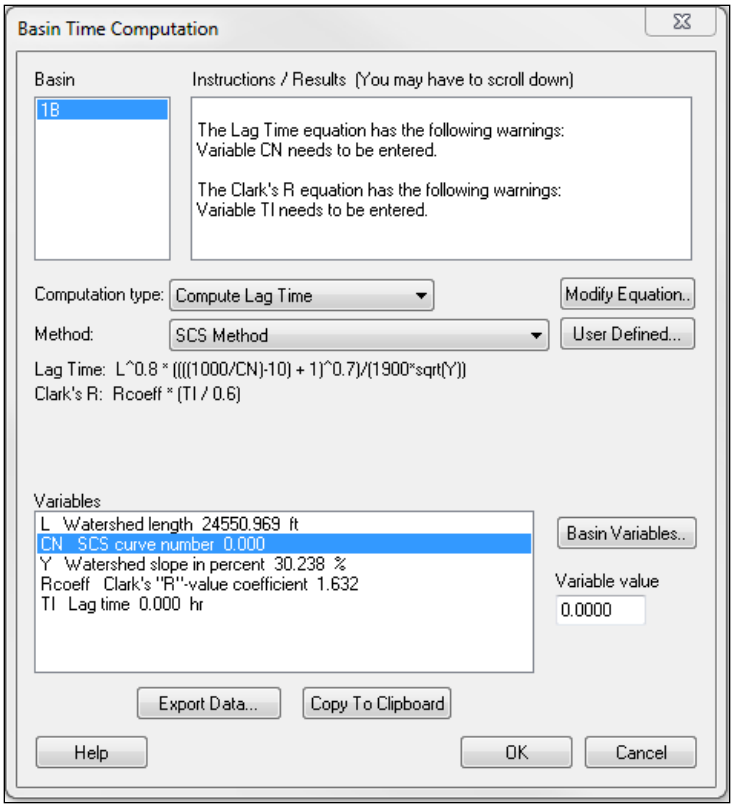


Figure 2 Lag Time Computation

13. For the *Variable value* enter “72.49”.
14. Click on another line of text to see the CN value and lag time values updated in the list.
15. Select **OK** to close the *Basin Time Computation* dialog and return to the *HMS Properties* dialog.

When working on a project, it is important to scroll all the way to the right in the *HMS Properties* dialog to make sure that the time of concentration and storage coefficient were calculated and entered appropriately.

16. Select **OK** to close the *HMS Properties* dialog and return to the *Hydrologic Computations* dialog.
17. Click **Next >** to advance to the next step, *Define Precipitation*.

5 Define Precipitation

Now to define precipitation by doing the following:

1. Click on the **Define Precipitation…** button to open the *HMS Meteorological Model* dialog.
2. Set the *Precipitation Method* to “User Hyetograph”.
3. Click on the **XY Series…** button to define the temporal distribution of the rainfall. The *XY Series Editor* dialog will appear.
4. Set the *Selected Curve* to “typeI-24hour” as shown in Figure 3.

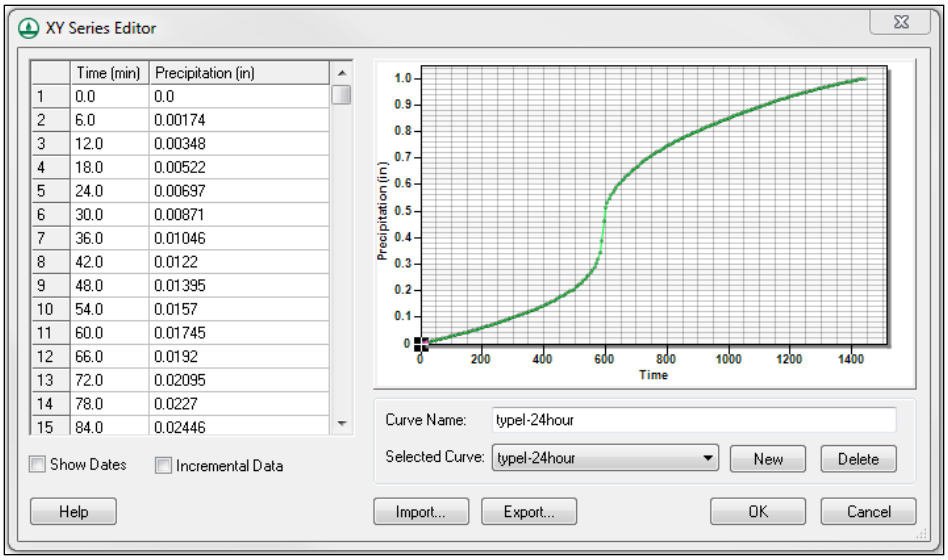


Figure 3 XY Series Editor for Precipitation

5. Select **OK** to close the *XY Series Editor* and return to the *HMS Meteorological Model* dialog.
6. In the *Total Depth (in)* column enter "3.5" inches.
7. Select **OK** to close the *HMS Meteorological Model* dialog and return to the *Define Precipitation* dialog.
8. Click **Next >** to advance to the next step, *Clean Up Model*.

6 Clean Up Model

Now to clean up and save the model by doing the following:

1. Click on the **Clean up Model** button to open the *Redistribute Vertices* dialog.
2. Enter an *Average spacing* of "80" meters.
3. Turn on the option to *Use Cubic Spline*.
4. Select **OK** to close the *Redistribute Vertices* dialog and open the *HEC-HMS Model Check* dialog.
5. Select **Done** to close the *HEC-HMS Model Check* dialog and return to the *Clean Up Model* dialog.
6. Click the **Save** button to save the WMS project file.
7. Select **Close** to close the *Clean Up Model* dialog.
8. In the WMS window, switch to the **Hydrologic Modeling Module**.
9. Select *HEC-HMS* **| Save HMS File…** to open the *Save HMS File* dialog.
10. Locate the folder *hms-modclark\hms-modclark\HMS*.
11. For *File name* enter "MODClark.hms" and click **Save** to close the *Save HMS File* dialog.

WMS will then create the HEC-HMS input files. The progress of writing these files is displayed in the status bar of WMS. It may take a few minutes for the files to be created.

7 Run HEC-HMS

The HEC-HMS input files are now ready to run a MODClark simulation on the Park City watershed. The next step is to run HEC-HMS software outside of WMS.

1. Start HEC-HMS on the computer.
2. Select *File* **| Open…** to access the *Open an Existing Project* dialog.
3. Click **Browse** to open the *Select Project File* dialog.
4. Browse to *hms-modclark\hms-modclark\HMS* and select “MODClark.hms”.
5. Click **Select** to open the project and close the *Select Project File* and *Open an Existing Project* dialogs.
6. Switch to the *Compute* tab in the Project Explorer and expand “Simulation Runs” under the “MODClark” folder.
7. Select “Run 1”.
8. Select the *Compute* **| Compute Run [Run 1]** menu command to bring up the *Finished “Run 1”* dialog.
9. Select **Close** when HEC-HMS is finished computing to close the *Finished “Run 1”* dialog.
10. Click on the *Results* tab in the Project Explorer.
11. Expand the “Simulation Runs” folder.
12. Select “Run 1” to view results.
13. Select “1B” under “Run 1” in the Project Explorer.
14. Select “Graph” to open the *Graph for Subbasin “1B”* dialog.
15. The outflow hydrograph should look similar to Figure 4.

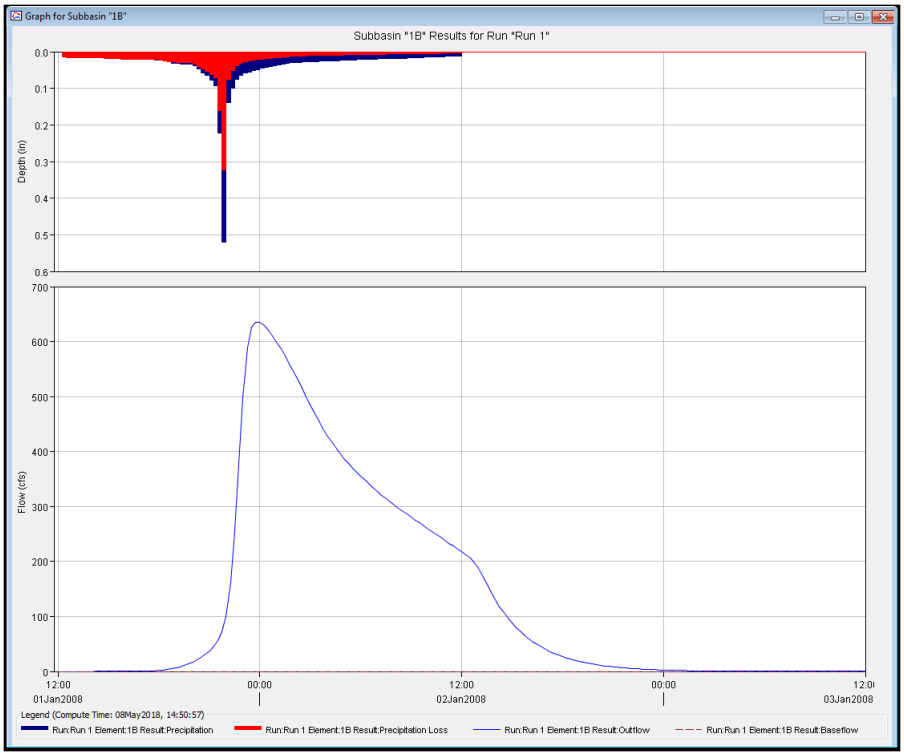


Figure 4 HMS Output Window

8 Conclusion

This exercise showed how to compute gridded hydrologic model parameters required for a HEC-HMS model with the MODClark transform.