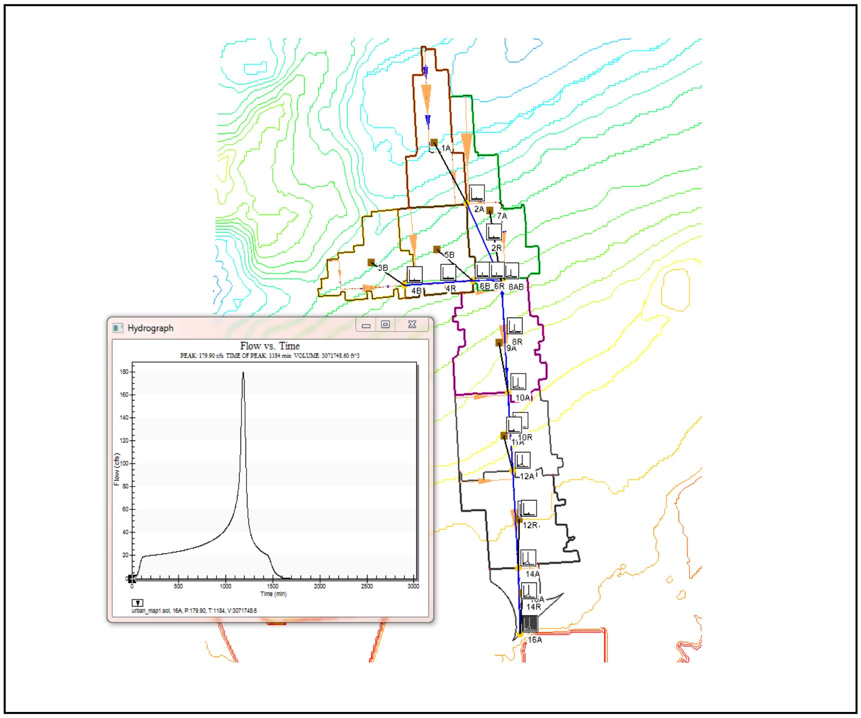
WMS

v. 10.1

WMS 10.1 Tutorial

Watershed Modeling – MODRAT Interface (Map-based)

Build a MODRAT model for an urban watershed using GIS data



Objectives

Learn how to define a map-based MODRAT model in WMS using pre-delineated watershed boundaries in GIS shapefile format. Learn how to correlate the imported boundaries with a DEM and to extract information needed to run the MODRAT model.

Prerequisite Tutorials

- Watershed Modeling – Advanced DEM Delineation Techniques

Required Components

- Data
- Drainage
- Map
- Hydrology
- Hydrologic Models

Time

- 30–45 minutes

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1 Introduction

The MODRAT interface in WMS is often used to perform modeling on watersheds that have been delineated in other CAD or GIS systems. The basin boundaries and stream networks to be used in the model must be imported into WMS and properly connected so that WMS can create the MODRAT model schematic.

This tutorial teaches how to import watershed data from shapefiles to create a watershed in the Map Module of WMS. It then demonstrates how to correlate this imported data with a DEM of the same area to allow WMS to extract additional information that will be needed to run the MODRAT model. A complete MODRAT simulation will be run on the watershed created in the Map Module.

2 Getting Started

Starting WMS new at the beginning of each tutorial is recommended. This resets the data, display options, and other WMS settings to their defaults. To do this:

1. If necessary, launch WMS.
2. If WMS is already running, press *Ctrl-N* or select *File* | **New…** to ensure that the program settings are restored to their default state.
3. A dialog may appear asking to save changes. Click **No** to clear all data.

The graphics window of WMS should refresh to show an empty space.

3 Importing Shapefile Data

An urban watershed delineated by hand in ArcGIS® will be opened into WMS from a series of shapefiles. Three shapefiles are required: basin boundary polygons, stream network arcs and, and outlet points.

1. Switch to the **GIS** module.
2. Select *Data* | **Add Shapefile Data…** to bring up the *Select shapefile* dialog.
3. Browse to the *MODRAT\MODRAT* folder and select "urban_poly.shp".
4. Click **Open** to import the shapefile and close the *Select shapefile* dialog.

The basin boundary polygons will be displayed (Figure 1).

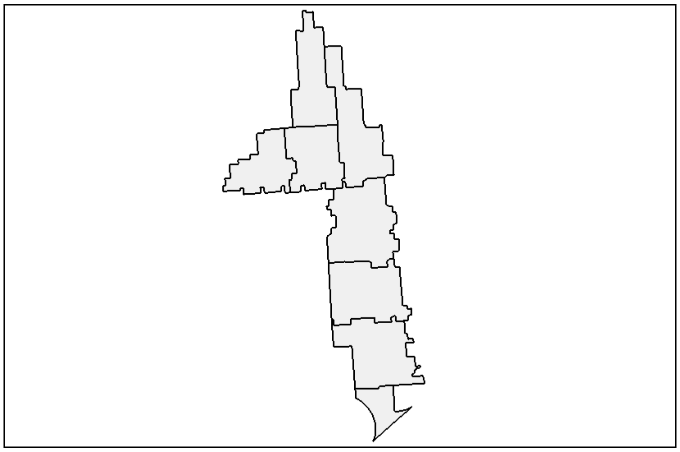

Figure 1 Initial shapefile

5. Select *Data* | **Add Shapefile Data…** to bring up the *Select shapefile* dialog.
6. Select "urban_arc.shp" and click **Open** to import the shapefile and close the *Select shapefile* dialog.

Notice that the stream network is displayed (Figure 2).

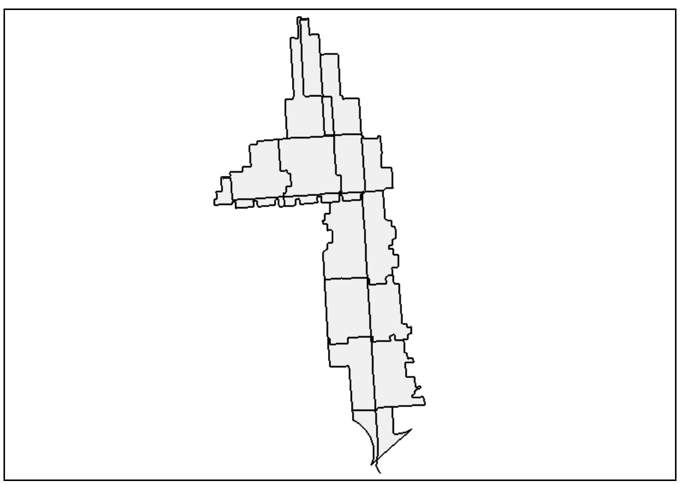

Figure 2 The stream network is now visible

7. Select *Data* | **Add Shapefile Data…** to bring up the *Select shapefile* dialog.
8. Select "urban_pt.shp" and click **Open** to import the shapefile and close the *Select shapefile* dialog.

The outlet points are now visible (Figure 3).

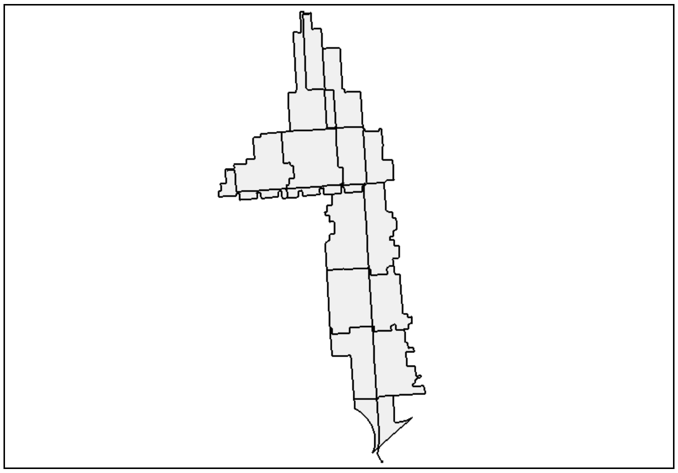

Figure 3 The outlet points have been imported

3.1 Map GIS Data to Feature Objects

1. Select *Mapping* | **Shapes** → **Feature Objects** to bring up the *GIS to Feature Objects Wizard* dialog.
2. Click **Yes** when prompted to use all visible shapes for mapping.
3. Click **Next** to go to the *Step 1 of 4* page of the *GIS to Feature Objects Wizard* dialog.

This page displays the *Point Attributes Mapping: Drainage*. These are the data fields from the point shapefile that will be transferred to feature objects.

4. Click **Next** to accept default mapping and go to the *Step 2 of 4* page of the *GIS to Feature Objects Wizard* dialog.

This page displays the *Arc Attribute Mapping: Drainage*. These are the data fields from the arc shapefile that will be transferred to feature objects.

5. Click **Next** to accept default mapping and go to the *Step 3 of 4* page of the *GIS to Feature Objects Wizard* dialog.

This page displays the *Polygon Attribute Mapping: Drainage*. These are the data fields from the polygon shapefile that will be transferred to feature objects.

6. Click **Next** to accept default mapping and go to the *Step 4 of 4* page of the *GIS to Feature Objects Wizard* dialog.
7. Click **Finish** to close the *GIS to Feature Objects Wizard* dialog.

The data has now been transferred to the " Drainage" coverage in the **Map** module. It is ready for review to make sure it is properly connected and attributed for MODRAT modeling.

8. Turn off " urban_poly.shp", " urban_arc.shp", and " urban_pt.shp" in the Project Explorer so the **Map** module data will be more visible.

The Graphics Window should appear similar to Figure 4.

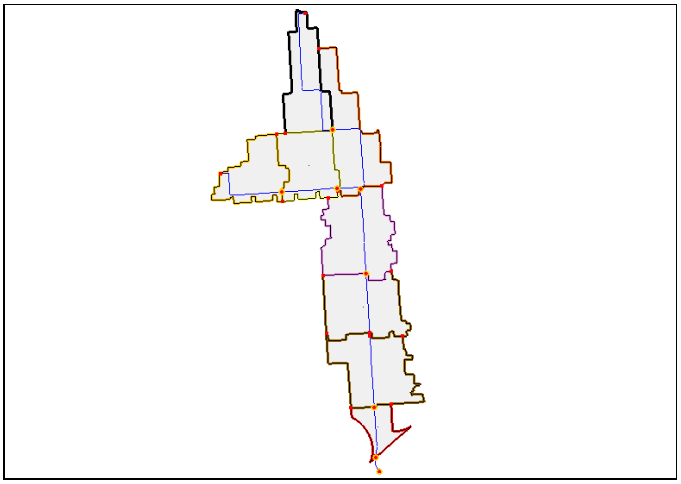

Figure 4 After mapping the shapefiles

4 Watershed Data Cleaning and DEM Matching

The watershed data now in the Drainage coverage is mostly correct, but there are a few errors to be fixed. Match the DEM for this watershed to the Drainage layer so that WMS can extract slopes for the watershed analysis.

4.1 Cleaning Streams

The stream network must be inspected to ensure all directions are correct and outlets are snapped to basin boundaries when using data from a shapefile. In this watershed, there is an extra stream segment at the bottom of the watershed and an outlet that is not snapped and set properly.

1. Switch to the **Map** module.
2. Click **Display Options** to bring up the *Display Options* dialog.
3. Select "Map Data" from the list on the left.
4. On the *Map* tab, scroll to the bottom of the list under the *Coverage type* drop-down and turn on *Stream Arrows*.
5. Click **OK** to close the *Display Options* dialog.

Note that the steam network displayed is shown in blue and there is an outlet point shown at the lower end of the streams. Note that all the stream arrows are pointing in the direction of the lower end outlet (Figure 5). This indicates that the attributes for the stream arc are properly set.

6. Repeat steps 2-4, but turn off *Stream Arrows*.
7. Turn on *Vertices*.
8. Click **OK** to close the *Display Options* dialog.

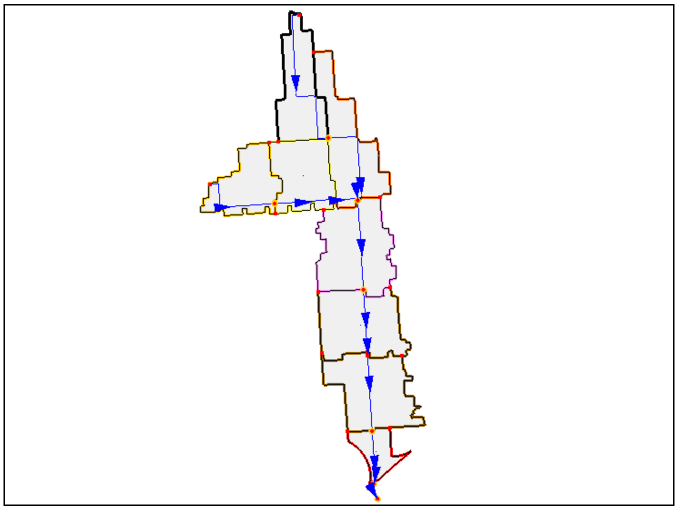

Figure 5 Stream flow direction arrows

9. Using the **Select Feature Arc** tool, select the stream arc that extends out of the lower end of the watershed (Figure 6) and press the *Delete* key.
10. Click **OK** if asked to confirm deletion of the arc.
11. **Frame**  the project.

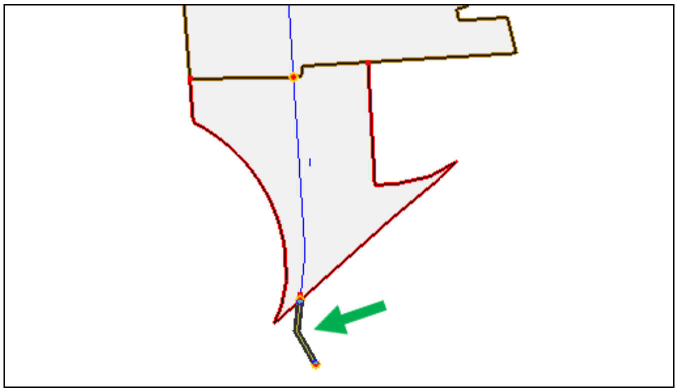

Figure 6 Select extra stream arc

12. Use the **Zoom**  tool to zoom to the area shown in Figure 7.

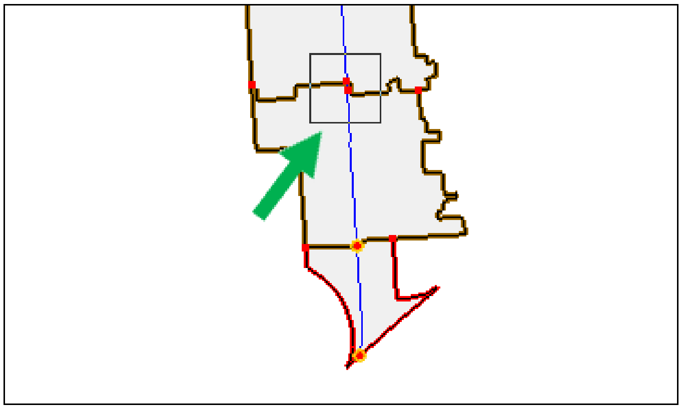

Figure 7 Zoom into this area

13. Using the **Select Feature Point/Node** tool, select the node just above the basin boundary (Figure 8).

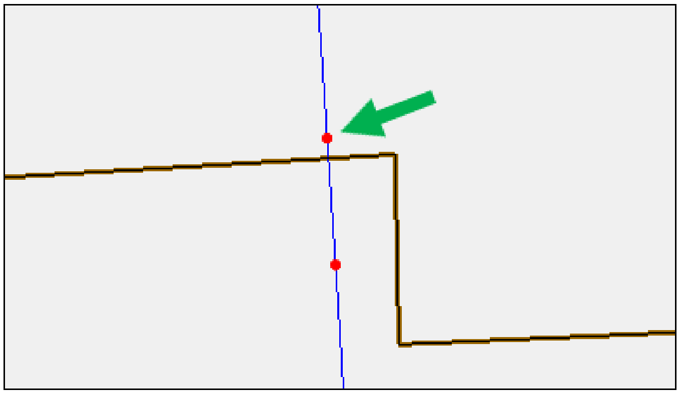

Figure 8 Select this node

14. Select *Feature Objects* | **Clean…** to bring up the *Clean Options* dialog.
15. Turn on *Snap selected nodes* and turn off all other options.
16. Click **OK** to close the *Clean Options* dialog.

Note that "Select a snapping point…" shows in the lower left corner of WMS.

17. Click on the vertex near the point where the stream crosses the basin boundary.
18. Double-click on the node that is now located at the intersection of the stream arc and the basin boundary to bring up the *Drainage Feature Point Type* dialog.
19. In the *Type* section, select *Drainage outlet* and click **OK** to close the *Drainage Feature Point Type* dialog.
20. Click **Display Options** to bring up the *Display Options* dialog.
21. Select "Map Data" from the list on the left.
22. Turn off *Vertices* and click **OK** to close the *Display Options* dialog.
23. **Frame** the project.

The errors in the GIS data have now been cleared. The extra stream arc is gone and all outlet points are now correctly snapped to basin boundaries (Figure 9). Now import the DEM for this area and correlate the watershed data to it.

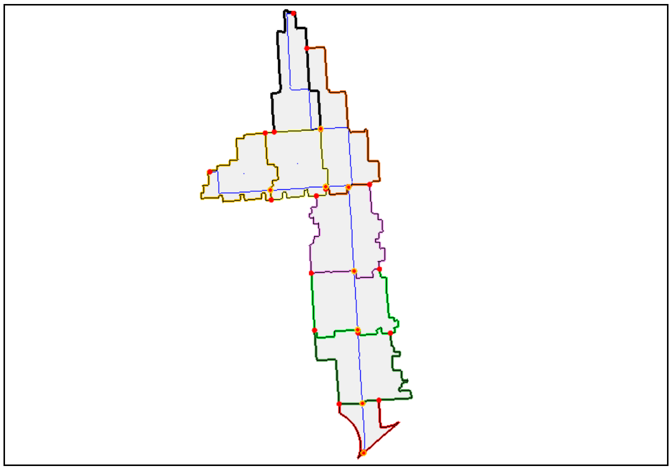

Figure 9 After cleaning

4.2 Matching DEM Data

The DEM for this watershed area will allow WMS to calculate slopes in the watershed.

1. Select *File* | **Open…** to bring up the *Open* dialog.
2. Select "torrance_clipped.asc" and click **OK** to exit the *Open* dialog and bring up the *Importing ArcInfo Grid* dialog.
3. Click **OK** to accept the defaults and close the *Importing Arc/Info Grid* dialog.

DEM contours should now be visible (Figure 10).

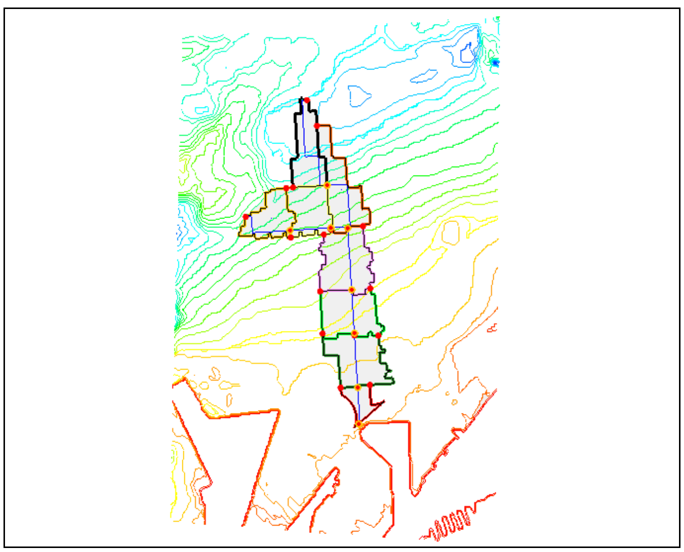

Figure 10 DEM contours after importing

4. Switch to the **Drainage** module.
5. Select *DEM* | **Polygon Basin IDs → DEM**.
6. Select *DEM* | **Compute Basin Data** to bring up the *Units* dialog.
7. If asked to compute flow directions and accumulations, click **No**.

8. In the *Model units* section, click **Current Projection…** to bring up the *Display Projection* dialog.
9. In the *Horizontal* section, select *Global projection* and click **Set Projection…** to bring up the *Select Projection* dialog.
10. On the *Projection* tab, select "State Plane Coordinate System" from the *Projection* drop-down.
11. Select "California Zone 5 (FIPS 405)" from the *Zone* drop-down.
12. Select "NAD83" from the *Datum* drop-down.
13. Select "Feet (U.S. Survey)" from the *Planar Units* drop-down and click **OK** to close the *Select Projection* dialog.
14. In the *Vertical* section, select "Local" from the *Projection* drop-down.
15. Select "Feet (U.S. Survey)" from the *Units* drop-down and click **OK** to close the *Display Projection* dialog.
16. In the *Parameter units* section, select "Acres" from the *Basin Areas* drop-down.
17. Select "Feet" from the *Distances* drop-down and click **OK** to close the *Units* dialog.

The basin areas should now be displayed. To make the display less cluttered, do the following:

18. Click **Display Options** to open the *Display Options* dialog.
19. Select "DEM Data" from the list on the left.
20. On the *DEM* tab, click **All off** and turn on *DEM Contours*.
21. Select "Drainage Data" from the list on the left.
22. On the *Drainage Data* tab, turn off *Basin Areas* and click **OK** to close the *Display Options* dialog.

The basin areas have been computed and stream lengths and slopes have been computed. The watershed is now ready for modeling. Before proceeding, save the project as a WMS project file:

23. Click **Save** to bring up the *Save As* dialog.
24. Enter "Urban_map.wms" as the *File name* and click **Save** to close the *Save As* dialog.

WMS saves the project to a set of WMS Project files. The WMS file is an index file that instructs WMS to load all the files associated with the project when opening the project.

5 MODRAT Global Setup

The MODRAT analysis setup requires entering job control data, basin data for each subarea, reach data for each channel, and elevation-storage-discharge relationships for each storage facility. The following sections will demonstrate entering data and using GIS data layers to acquire input data for MODRAT.

5.1 Job Control

Most of the parameters required for a MODRAT model are defined for basins, outlets, and reaches. However, there are a few global parameters not specific to any basin or reach that control the overall simulation. These parameters are defined in the WMS interface using the MODRAT Job Control dialog.

1. Switch to the **Hydrologic Modeling** module.
2. Select “MODRAT” from the Model drop-down (Figure 11).

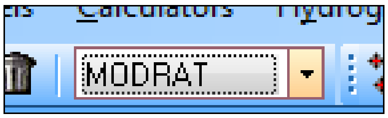

Figure 11 Model drop-down

3. Select *MODRAT* | **Job Control…** to bring up the *MODRAT Job Control* dialog.
4. Select *MODRAT 2.0* at the top of the left section.
5. Select “2” from the *Run time* drop-down.
6. Select “25 year” from the *Frequency* drop-down.
7. In the *Filenames* section, enter “urban_map1” as the *Prefix* and click **Update**.

Note that the *Output files prefix* field updated to match.

8. In the *Input* section, enter “urban_rain1.dat” in the *Rain* field.
9. Click **Browse** to the right of *Soil* to bring up the *Open* dialog.
10. Select “lasoilx_100.dat” and click **Open** to exit the *Open* dialog.
11. Click **OK** to close the *MODRAT Job Control* dialog.

5.2 Tree Numbering

Each basin or reach is assigned a default name when it is created by WMS. However, these must be named and numbered in sequential order from upstream to downstream using a MODRAT naming convention so that MODRAT analyzes the model in the proper order.

1. Using the **Select basin** tool, select the basin icon for the northernmost sub-basin.
2. Select *MODRAT* | **Number Tree…** to bring up the *MODRAT Renumber* dialog.
3. Click **OK** to start numbering with default location/lateral of “1A” and bring up the *Select a lateral* dialog.

As the numbering process proceeds, there will be a prompt to "Select a lateral" for each of the basins at a confluence. Notice that WMS first zooms into the basin labeled “4B” and its surrounding outlet points. The lateral is determined by reviewing the upstream outlets. In this case, they end with both "A" and "B". Since the outlet points upstream from basin “4B” could be located on either the "A" or "B" lateral, either lateral can be assigned.

4. Select the default "A" lateral from the wide drop-down and click **OK** to close the *Select a lateral* dialog.
5. Right-click “Drainage” in the Project Explorer and select **Zoom To Layer**.
6. Switch to the **Hydrologic Modeling** module.

The numbering is now complete. Note that the basin selected when the numbering started is now labeled “1A” (Figure 12). The main line is met by Line B at the confluence (outlet) point labeled “8AB”. The numbers indicate the order in which the units will be processed by MODRAT.

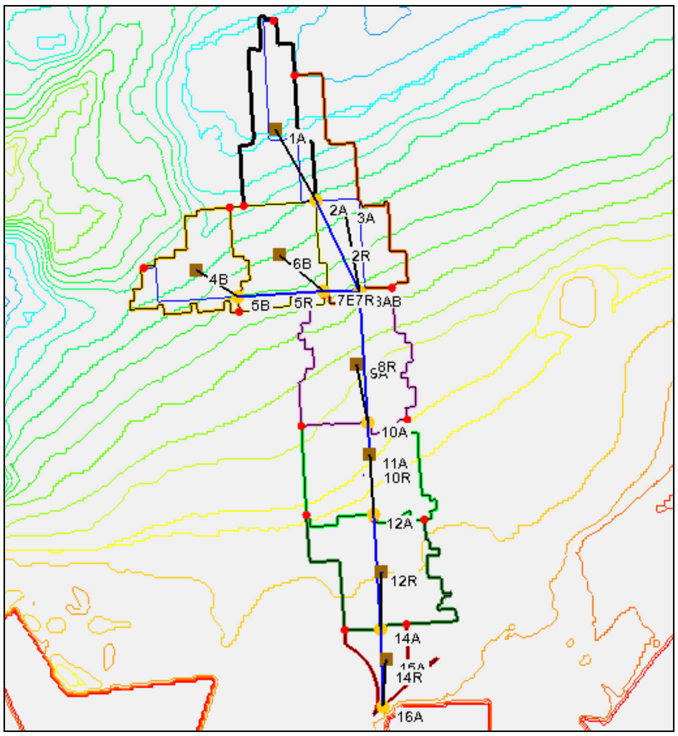

Figure 12 Basins numbered from upstream to downstream

6 MODRAT Basin Data Setup

Each basin in the watershed requires a number of input parameters. Many of the parameters can be computed by WMS using GIS data layers. The following sections will compute soil number, percent impervious, and rainfall depth for each basin.

6.1 Soil Number Computation

Load soil data for Los Angeles County and let WMS compute the dominant soil type for each basin.

1. Right-click “ Coverages” in the “ Map Data” section of the Project Explorer and select **New Coverage** to bring up the *Properties* dialog.
2. Select “Soil Type” as the *Coverage type* and click **OK** to close the *Properties* dialog.

3. Switch to the **GIS** module.
4. Select *Data* | **Add Shapefile Data…** to bring up the *Select shapefile* dialog.
5. Browse to the *MODRAT\MODRAT\SoilType* folder and select "soils_2004.shp".
6. Click **Open** to import the shape file and close the *Select shapefile* dialog.

This imports the soil map for all of Los Angeles County (Figure 13). This project is located near the bottom the county.

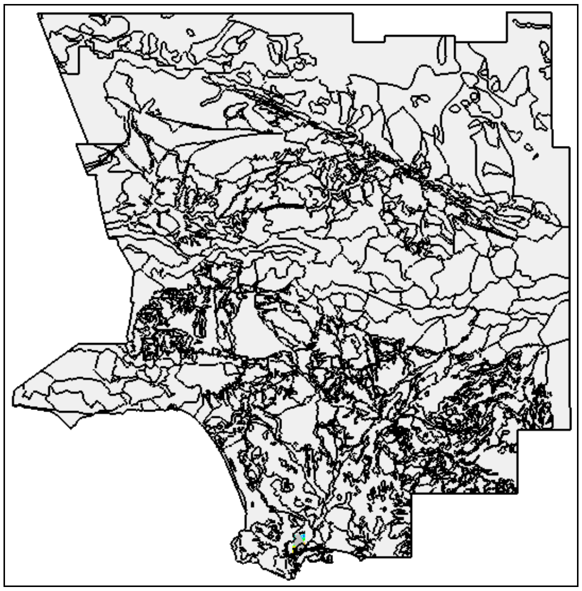

Figure 13 Soil map of Los Angeles County

7. Right-click " Drainage" in the Project Explorer and select **Zoom To Layer**.
8. Select " Soil Type" to make it active.
9. Switch to the **GIS** module.
10. Using the **Select shapes** tool, drag a selection box around the watershed extents.

This selects the soil polygons covering the watershed.

11. Select *Mapping* | **Shapes → Feature Objects** to bring up the *GIS to Feature Objects Wizard* dialog.
12. Click **Next** to go to the *Step 1 of 2* page of the *GIS to Feature Objects Wizard* dialog.
13. On the *Mapping* row in the *CLASS* column, select "LA County soil type" from the drop-down.
14. Click **Next** to go to the *Step 2 of 2* page of the *GIS to Feature Objects Wizard* dialog.
15. Click **Finish** to close the *GIS to Feature Objects Wizard* dialog.
16. Turn off " soils_2004.shp" in the Project Explorer.

Now that the soil data is loaded, do the following to compute and assign the soil numbers to MODRAT.

17. Select " Drainage" in the Project Explorer to make it active.
18. Switch to the **Hydrologic Modeling** module.
19. Select *MODRAT* | **Map Attributes…** to bring up the *Map MODRAT Attributes* dialog.
20. Select "LA County soil numbers" from the *Computation type* drop-down and click **OK** to close the *Map MODRAT Attributes* dialog.
21. Using the **Select basin** tool, double-click on the basin "1A" icon to bring up the *MODRAT Parameters* dialog.
22. Select "All" from the *Show* drop-down and review the *Soil type* column.
23. Once done reviewing the data, click **OK** to exit the *MODRAT Parameters* dialog.

6.2 Percent Impervious Computation

Next, load land use data for Los Angeles County and let WMS compute the average percent impervious for each basin.

1. Right-click on " Coverages" in the Project Explorer and select **New Coverage** to bring up the *Properties* dialog.
2. Select "Land Use" as the *Coverage Type* and click **OK** to close the *Properties* dialog.
3. Switch to the **GIS** module.
4. Select *Data* | **Add Shapefile Data…** to bring up the *Select shapefile* dialog.
5. Browse to the *MODRAT\MODRAT\LandUse* folder and select "ladpw_landuse_2005.shp".
6. Click **Open** to exit the *Select shapefile* dialog.

This loads the land use map for all of L.A. County (Figure 14).

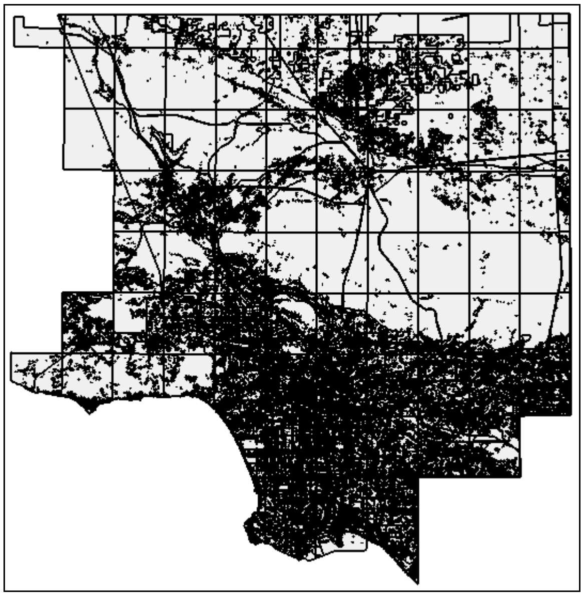

Figure 14 Los Angeles County land use map

7. Right-click " Drainage" in the Project Explorer and select **Zoom To Layer**.
8. Select " Land Use" to make it active.
9. Switch to the **GIS** module.
10. Using the **Select shapes** tool, drag a selection box around the watershed extents.

This selects all of the land use polygons covering the watershed (Figure 15).

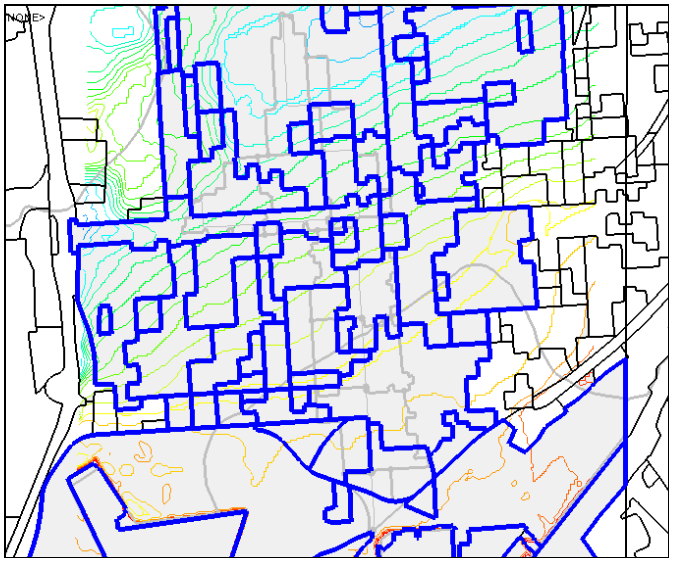

Figure 15 Land use polygons selected

11. Select *Mapping* | **Shapes → Feature Objects** to bring up the *GIS to Feature Objects Wizard* dialog.
12. Click **Next** to go to the *Step 1 of 2* page of the *GIS to Feature Objects Wizard* dialog.
13. On the *Mapping* row in the *IMPERV* column, select "Percent impervious" from the drop-down. Scroll to the right to view this field.
14. Click **Next** to go to the *Step 2 of 2* page of the *GIS to Feature Objects Wizard* dialog.
15. Click **Finish** to close the *GIS to Feature Objects Wizard* dialog.
16. Turn off " ladpw_landuse_2005.shp" in the Project Explorer.

With the land use data loaded, do the following to compute and assign the percent impervious to MODRAT.

17. Select " Drainage" in the Project Explorer to make it active.
18. Switch to the **Hydrologic Modeling** module.
19. Select *MODRAT* | **Map Attributes…** to bring up the *Map MODRAT Attributes* dialog.
20. Select "LA County land use" from the *Computation type* drop-down and click **OK** to close the *Map MODRAT Attributes* dialog.

21. Using the **Select basin** tool, double-click on the basin “1A” icon to bring up the *MODRAT Parameters* dialog.
22. Select “All” from the *Show* drop-down and review the content in the *Impervious %* column.
23. Once done reviewing the data, click **OK** to exit the *MODRAT Parameters* dialog.

6.3 Rainfall Depth and Distribution Assignment

Now load a rainfall depth grid for the 25-year storm frequency for Los Angeles County and let WMS compute the average rainfall depth for each basin. Then assign a rainfall mass curve to the model to provide the temporal distribution of the storm depth.

1. Switch to the **Drainage** module.
2. Click **Open** to bring up the *Open* dialog.
3. Select “Rainfall Depth Grid (*.*)” from the *Files of type* drop-down.
4. Browse to the *MODRAT\MODRAT* folder and select “lac25yr24hr.asc”.
5. Click **Open** to import the files and exit the *Open* dialog.

This opens and displays the rainfall grid (Figure 16).

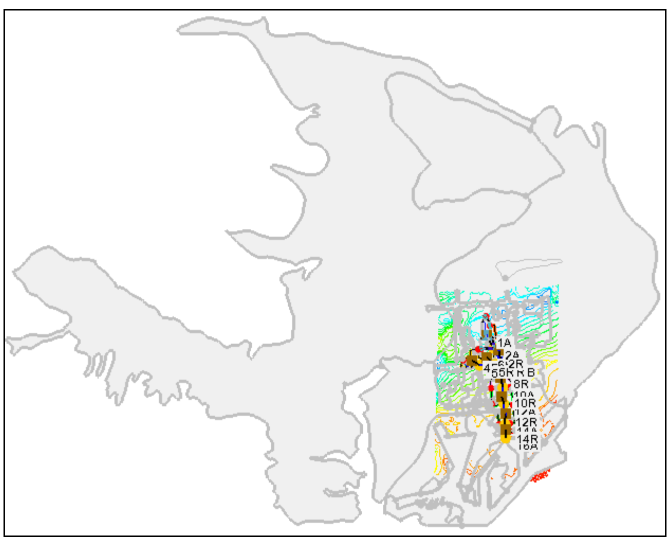

Figure 16 Rainfall depth grid

6. Right-click “ Drainage” in the Project Explorer and select **Zoom To Layer**.
7. Switch to the **Hydrologic Modeling** module.
8. Select *Calculators* | **Compute GIS Attributes…** to bring up the *Compute GIS Attributes* dialog.
9. In the *Computation* section, select “Rainfall Depth” from the drop-down and click **OK** to close the *Compute GIS Attributes* dialog.
10. Using the **Select basin** tool, double-click on the basin “1A” icon to bring up the *MODRAT Parameters* dialog.

11. Select “All” from the *Show* drop-down and review the content in the *Rainfall depth (in)* column.
12. In the *Temporal distribution* column click **Define…** in the *All* row to bring up the *XY Series Editor* dialog.

This dialog allows specifying the rainfall temporal distribution (time vs. cumulative rainfall percentage).

13. Click **Import** to bring up the *Open File* dialog.
14. Select “LACDPWStorm-4thday.xys” and click **Open** to exit the *Open File* dialog.

The *Selected Curve* drop-down should now have “LACDPWStorm-4thday” selected, with the rainfall mass curve displayed in the chart above that.

15. Click **OK** to close the *XY Series Editor* dialog.
16. Click **OK** to close the *MODRAT Parameters* dialog.

The process above assigned a rainfall depth to each basin and assigned the LACDPW storm distribution curve to all basins.

Now clean up the display of the model by turning off several layers are not needed any longer:

17. Turn off “ Soil Type, “ Land Use”, and “ Rain Fall” in the Project Explorer.
18. **Frame** the project.

6.4 Time of Concentration

The final parameter needed for each basin in the model is the time of concentration (T_C). Specify the longest flow path in each basin and then let WMS compute the T_C using the LACDPW regression equation. Do the following to compute T_C for all basins:

1. Right-click on “ Coverages” in the Project Explorer and select **New Coverage** to bring up the *Properties* dialog.
2. Select “Time Computation” from the *Coverage type* drop-down and click **OK** to close the *Properties* dialog.
3. Click **Display Options** to open the *Display Options* dialog.
4. Select “Drainage Data” from the list on the left.
5. On the *Drainage Data* tab, turn off *Basin Areas* and click **OK** to close the *Display Options* dialog.
6. Select the **Create Feature Arc** tool,
7. Digitize the longest flow paths from downstream to upstream (Figure 17) by clicking near the outlet in each basin, clicking upstream along the path shown, and double-clicking at the upstream end to complete the arc.

It is very important to not cross any basin boundary with these flow path arcs. Each is a separate arc contained within each basin. **Zoom** in, if necessary, to make sure none of the arcs touch or cross basin boundaries.

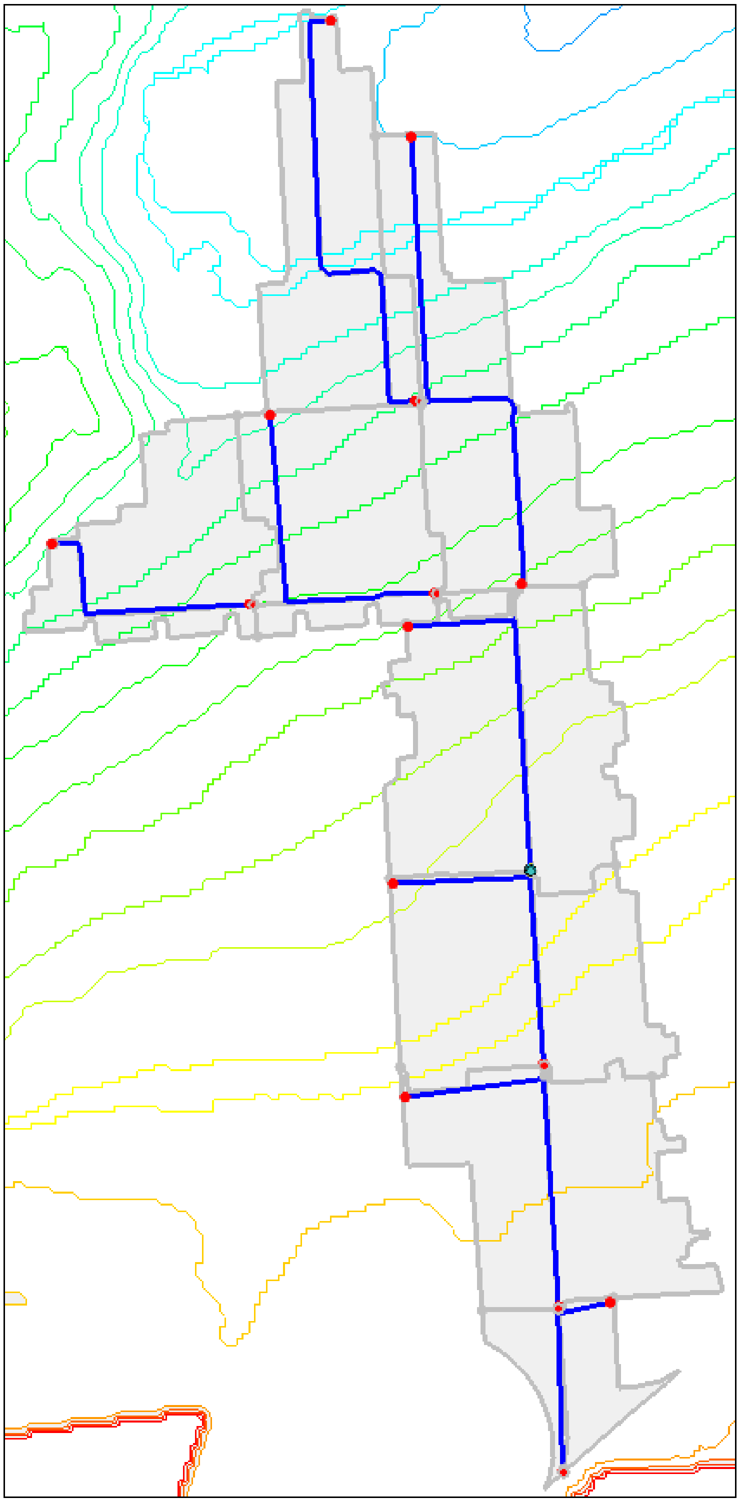

Figure 17 Time of concentration arcs

8. Select "Drainage" in the Project Explorer to make it active.
9. Switch to the **Hydrologic Modeling** module.
10. Select *MODRAT* | **Compute Tc…** to bring up the *Step 1 of 2* page of the *Compute MODRAT Time of Concentration Wizard* dialog.

Note that a check of required input for T_C computations has been performed.

11. Click **Next** to go to the *Step 2 of 2* page of the *Compute MODRAT Time of Concentration Wizard* dialog.
12. Review the T_C computed for each basin in the *Tc (min)* column.
13. When finished reviewing, click **Done** to close the *Compute MODRAT Time of Concentration Wizard* dialog.
14. Using the **Select basin** tool, double-click on the basin "1A" icon to bring up the *MODRAT Parameters* dialog.
15. Select "All" from the *Show* drop-down and review the content in the *Tc (min)* column.
16. Click **OK** to close the *MODRAT Parameters* dialog.

The input parameters for all basins should now be entered for the simulation.

17. **Save** the project.

7 MODRAT Reach and Outlet Data Setup

Each reach must have data associated with it to be successfully simulated by MODRAT. Reaches are selected in WMS by clicking on an outlet (confluence) point. The parameters for that point and the channel downstream from that point to the next can be edited.

1. Using the **Select outlet** tool, double-click outlet "2A" to bring up the *MODRAT Parameters* dialog.

Note that the values in the *Length* and *Slope* columns have already been computed.

2. On the *2A* row in the *Routing type* column, select "Street" from the drop-down.
3. Select "40 ft" from the *Size* drop-down.
4. Select "6 in" from the *Curb height* drop-down.
5. Scroll all the way to the right and select "Hydrograph (*.hyf) and WMS plot file (*.sol)" from the *Hydrograph output* drop-down.

This completes the input for one of the reaches in the watershed. Now define data for all reaches in a similar fashion:

6. Select "All" from the *Show* drop-down.
7. Repeat steps 2-5, using the data in the table below for the remaining reaches:

Name	Routing type	Manning's n	Size	Curb height	Hydrograph output
5B	Street	0.014	30 ft	6 in	HYF/SOL
7B	Street	0.014	30 ft	6 in	HYF/SOL
8AB	Street	0.014	40 ft	6 in	HYF/SOL
10A	Street	0.014	40 ft	6 in	HYF/SOL
12A	Street	0.014	64 ft	6 in	HYF/SOL
14A	Street	0.014	64 ft	6 in	HYF/SOL
16A	Variable	0.0			HYF/SOL

8. When finished, click **OK** to close the *MODRAT Parameters* dialog.

The input parameters for all reaches should now be entered for the simulation.

9. **Save** the project with the updated data.

8 Running a MODRAT Simulation

All the data required to run a MODRAT simulation is now ready.

1. Select *MODRAT* | **Run Simulation…** to bring up the *MODRAT Run Options* dialog.
2. Click **Browse** to bring up the *Select MODRAT Input File Name* dialog.
3. Enter "urban_map1.lac" as the *File name* and click **Save** to close the *Select MODRAT Input File Name* dialog.
4. Turn on *Save file before run* and click **OK** to close the *MODRAT Run Options* dialog and open the *Model Wrapper* dialog.
5. Once MODRAT finishes, turn on *Read solution on exit* and click **Close** to exit the *Model Wrapper* dialog and import the solutions.

The resulting hydrographs will be read in and a small hydrograph plot will appear next to each basin and outlet.

6. Using the **Select hydrograph** tool, double-click on the hydrograph icon for outlet "16A" to bring up the *Hydrograph* dialog (Figure 18).

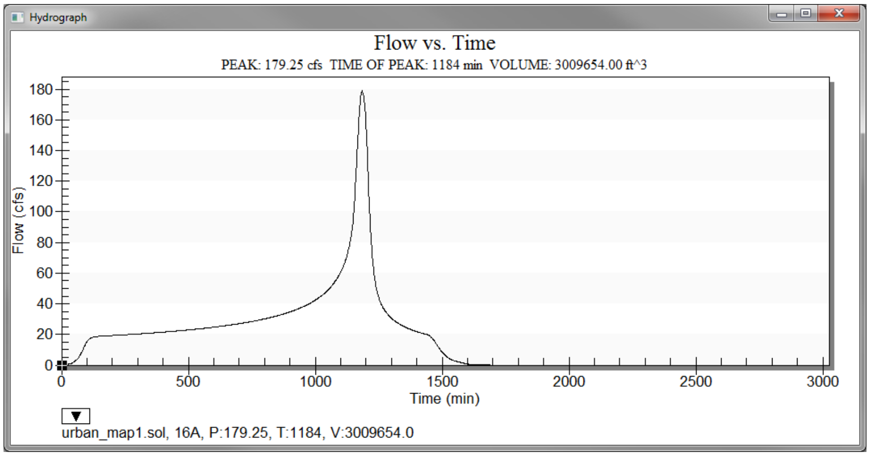

Figure 18 Hydrograph for outlet 16A

7. When done reviewing the hydrograph, click the in the top right corner to close the *Hydrograph* dialog.
8. Select *File* | **Edit File…** to bring up the *Open* dialog.
9. Select "urban_map1.out" and click **Open** to exit the *Open* dialog and bring up the *View Data File* dialog. If the *Never ask this again* option was previously turned on, this dialog will not appear. If this is the case, skip to step 11.
10. Select the desired text editor from the *Open with* drop-down and click **OK** to close the *View Data File* dialog and open the output file in the selected text editor.

11. When done reviewing the text summary output of the simulation, click the in the top right corner to close the text editor and return to WMS.

9 Conclusion

This concludes the "Watershed Modeling – MODRAT Interface (Map-based)" tutorial. The following key topics were discussed and demonstrated:

- Importing watershed data from shapefiles in order to create a watershed in the **Map** module in WMS.
- Correlating imported data with a DEM of the same area.
- Completing a MODRAT simulation on a watershed created in the **Map** module.

