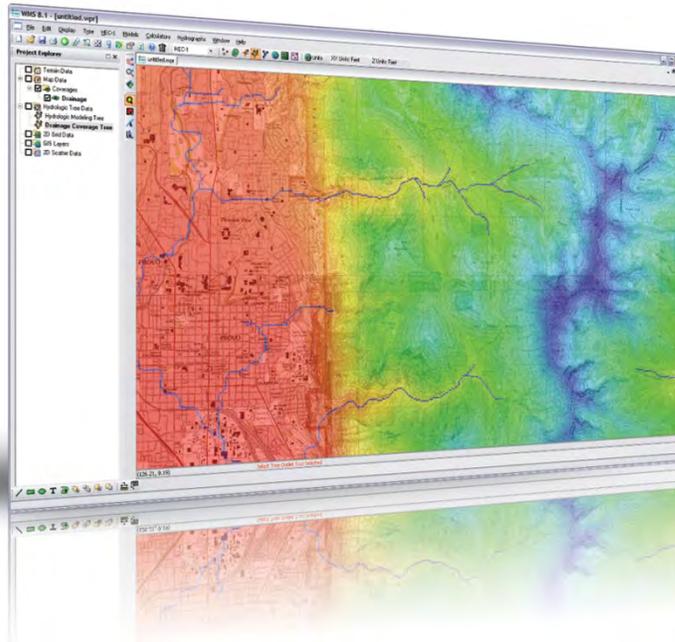




Introduction and Overview



1. Use digital terrain data to automate drainage basin delineation.
2. Compute drainage basin parameters commonly used in hydrologic models.
3. Use Land Use and Soils geographic data to compute runoff coefficients and curve numbers.
4. Set up input data files for industry standard models used to develop peak flow estimates and hydrographs.
5. Identify and use sources of electronic data such as web sites and proprietary data.
6. Set up input data for hydraulic models to run a floodplain delineation and determine hydraulic properties.
7. Basic overview of the GSSHA 2D hydrologic model



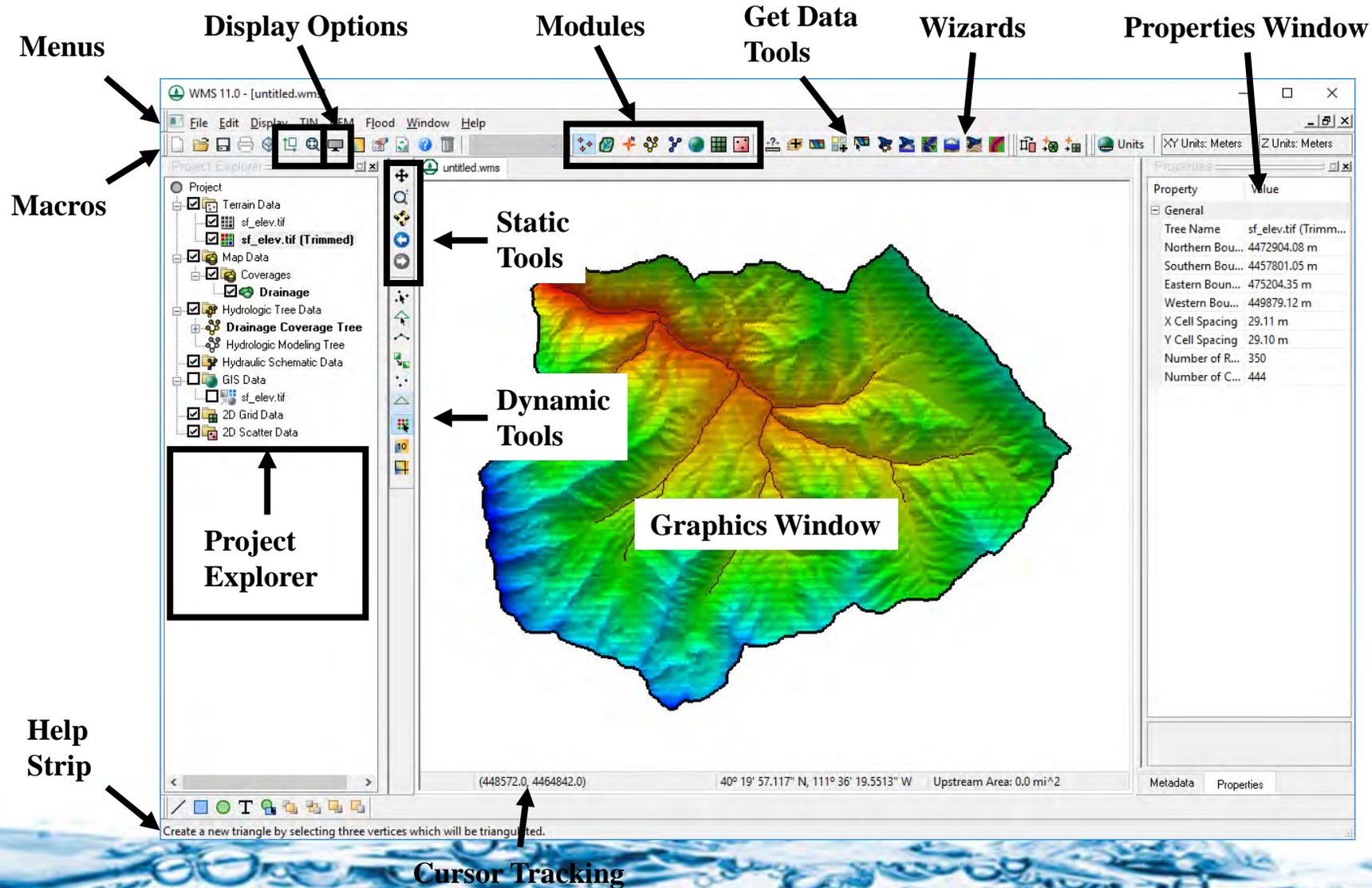
- Lecture
- Demonstration
- Workshop
- Review



Lesson Learning Outcomes

- Upon completion of this lesson, we will be able to:
 - Describe the process for building a hydrologic model in WMS
 - List the primary functions and features of the WMS interface





The screenshot shows the WMS 11.0 software interface with the following components labeled:

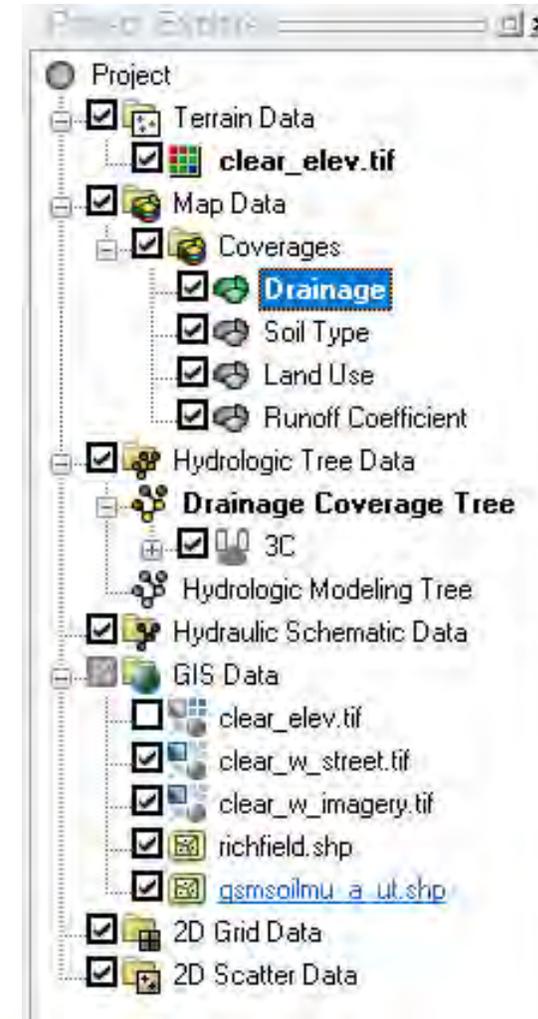
- Menus:** File, Edit, Display, TIN, DEM, Flood, Window, Help
- Macros:** A set of icons on the left side of the toolbar.
- Display Options:** A set of icons on the left side of the toolbar.
- Modules:** A set of icons in the middle of the toolbar.
- Get Data Tools:** A set of icons on the right side of the toolbar.
- Wizards:** A set of icons on the right side of the toolbar.
- Properties Window:** A window on the right side showing a table of properties.
- Project Explorer:** A tree view on the left side showing the project structure.
- Static Tools:** A set of icons on the left side of the graphics window.
- Dynamic Tools:** A set of icons on the left side of the graphics window.
- Graphics Window:** The central area displaying a topographic map with a drainage network.
- Help Strip:** A strip at the bottom left of the window.
- Cursor Tracking:** A status bar at the bottom showing coordinates and upstream area.

Property	Value
General	
Tree Name	sf_elev.tif (Trimmed)
Northern Boundary	4472904.08 m
Southern Boundary	4457801.05 m
Eastern Boundary	475204.35 m
Western Boundary	449879.12 m
X Cell Spacing	29.11 m
Y Cell Spacing	29.10 m
Number of Rows	350
Number of Columns	444

Help Strip: Create a new triangle by selecting three vertices which will be triangulated.

Cursor Tracking: (448572.0, 4464842.0) 40° 19' 57.117" N, 111° 36' 19.5513" W Upstream Area: 0.0 mi²

- Entries for Geometric Objects
 - DEM data
 - Map coverages
 - Hydrologic and hydraulic simulation data
 - Images, GIS and CAD data
- Turn on/off data objects
- Right-click to operate on items in Project Explorer



-  • Terrain Data – Edit elevation data.
-  • Drainage – Automate basin delineation.
-  • Map – Create points, arcs, and polygons.
-  • Hydrologic Modeling – Define and run hydrologic simulations.
-  • Hydraulic Modeling – Define and run hydraulic simulations.
-  • GIS – Import geospatial data
-  • 2D Grid – Distributed modeling and gridded data.
-  • Scatter – x, y, z data

Editing DEM data is done in which of the following modules?

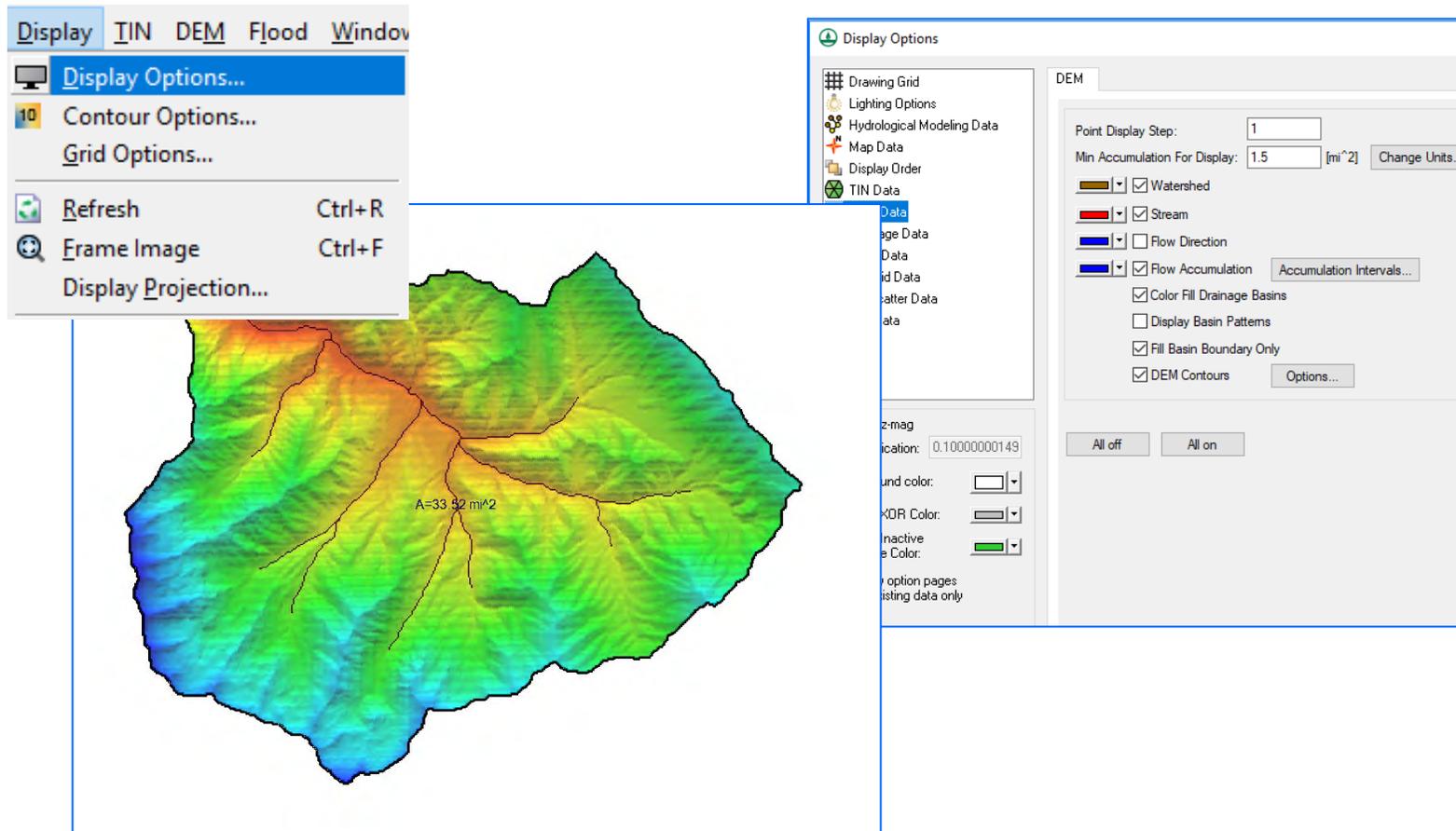
- A) The GIS module
- B) The Terrain module
- C) The 2D Grid module
- D) The Scatter module



Editing DEM data is done in which of the following modules?

- The correct answer is:
 - A) The GIS module
 - B) The Terrain module
 - C) The 2D Grid module
 - D) The Scatter module





The screenshot displays a software interface for watershed management. At the top, a menu bar includes 'Display', 'TIN', 'DEM', 'Flood', and 'Window'. The 'Display' menu is open, showing options: 'Display Options...', 'Contour Options...', 'Grid Options...', 'Refresh' (Ctrl+R), 'Frame Image' (Ctrl+F), and 'Display Projection...'. The main window shows a 3D topographic map of a watershed with a drainage network. A text label on the map reads 'A=33.82 mi^2'. To the right, a 'Display Options' dialog box is open, with the 'DEM' tab selected. The dialog includes a tree view on the left with 'TIN Data' selected. The 'DEM' tab contains the following settings:

- Point Display Step: 1
- Min Accumulation For Display: 1.5 [mi^2] (Change Units...)
- Watershed:
- Stream:
- Flow Direction:
- Flow Accumulation: (Accumulation Intervals...)
- Color Fill Drainage Basins:
- Display Basin Patterns:
- Fill Basin Boundary Only:
- DEM Contours: (Options...)

Buttons for 'All off' and 'All on' are located at the bottom of the dialog. Below the dialog, there are color selection options for 'Background color', 'Color', 'Inactive Color', and 'Active Color'.



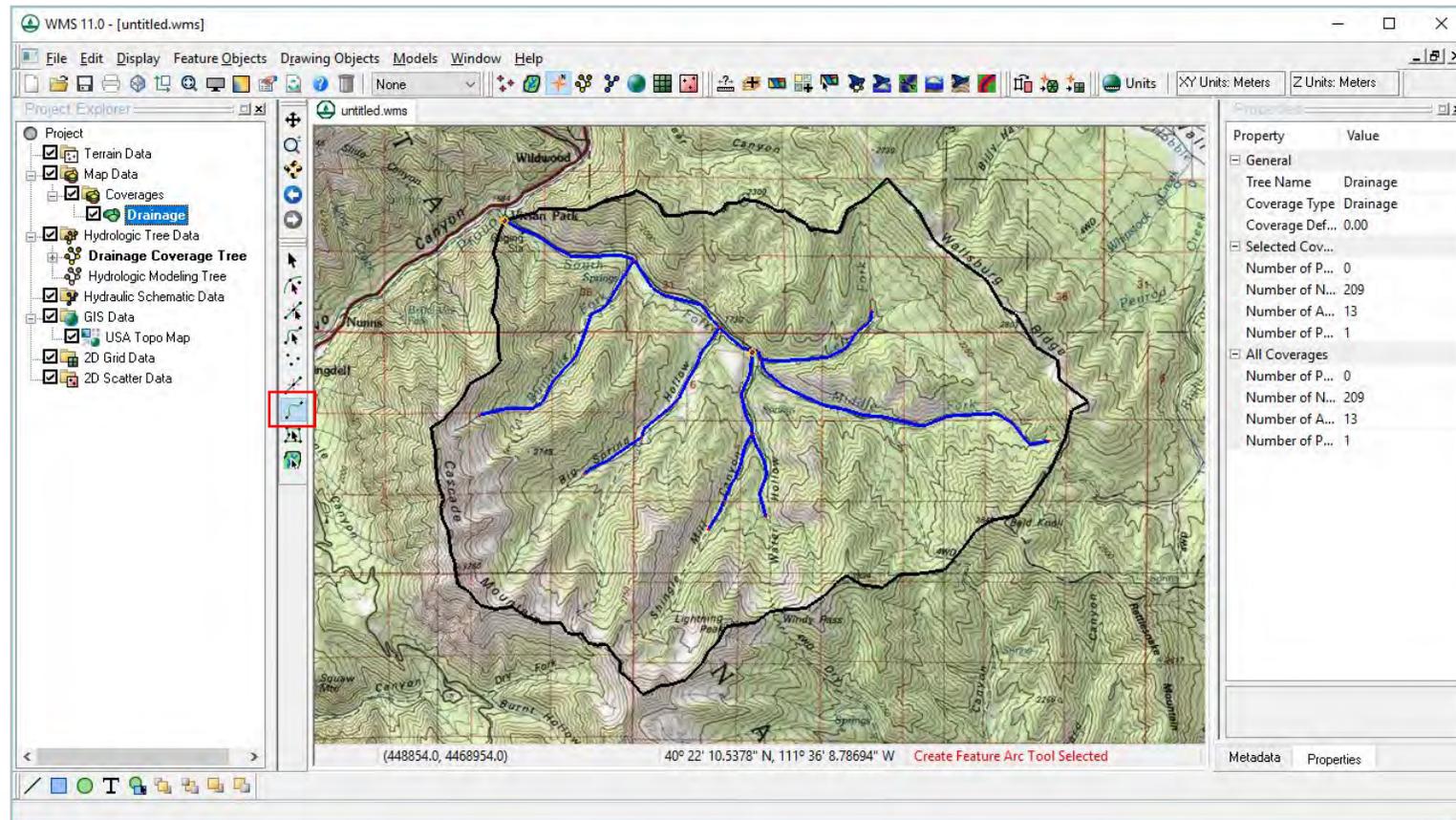
- Zoom Option 
 - Draw a box
 - Click to zoom in
 - Shift-click to zoom out
 - Mouse wheel
- Pan 
 - Hold down mouse wheel
- Rotate 
 - 3D view
 - Click rotate around center
- Plan view and frame



- Base Map Data
 - Images
 - Geographic Information Systems (GIS) data
 - Computer-Aided Design (CAD) data
- Elevation Data
 - Digital Elevation Models (DEMs)
 - Triangulated Irregular Networks (TINs)
 - Light Detection and Ranging (LiDAR)



Basins From Digital Maps

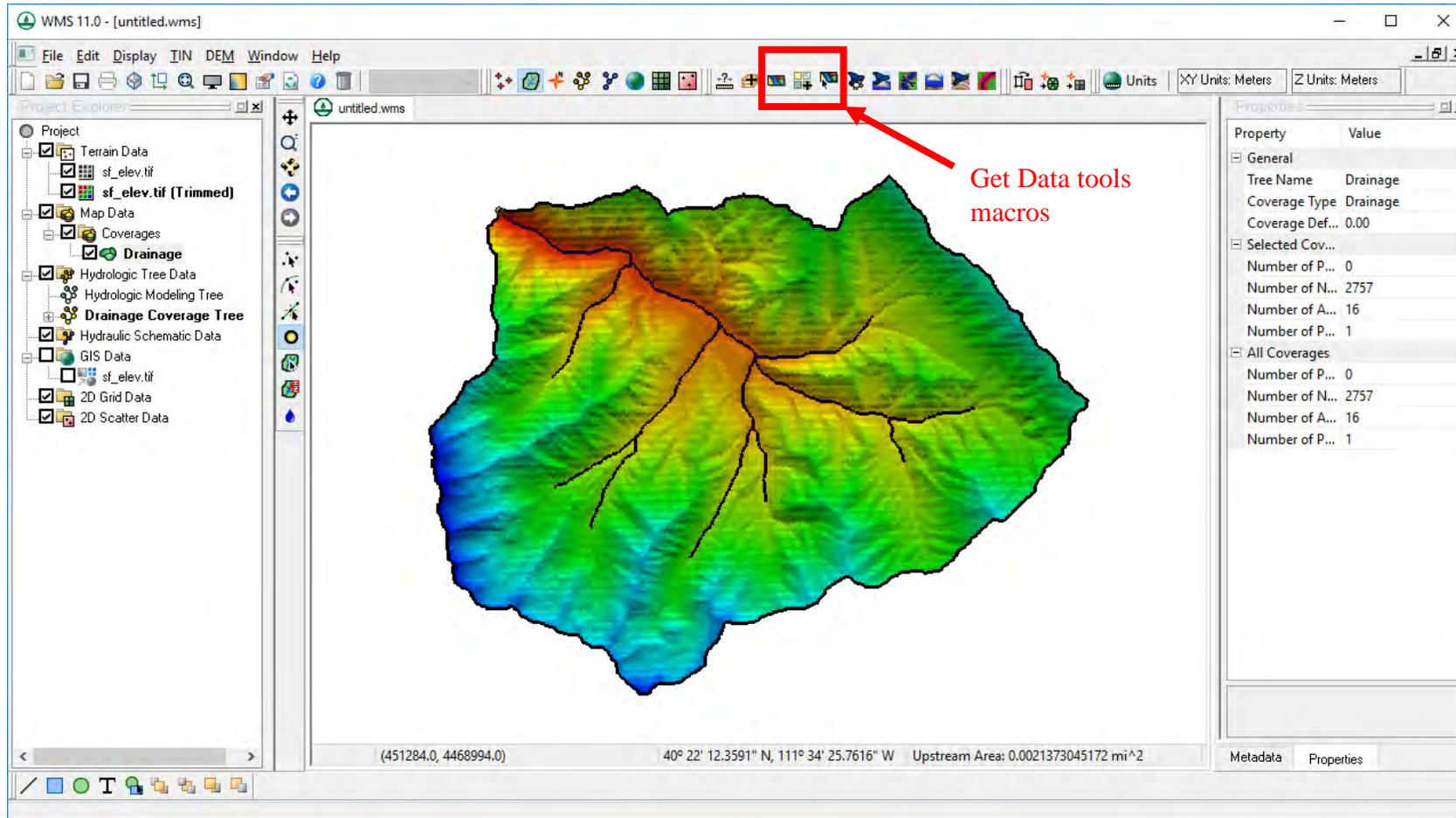


The screenshot displays the WMS 11.0 software interface. The main window shows a topographic map with a drainage basin boundary outlined in black and a network of stream channels in blue. The Project Explorer on the left lists various data layers, with 'Drainage' selected. The Properties window on the right shows the following details:

Property	Value
General	
Tree Name	Drainage
Coverage Type	Drainage
Coverage Def...	0.00
Selected Cov...	
Number of P...	0
Number of N...	209
Number of A...	13
Number of P...	1
All Coverages	
Number of P...	0
Number of N...	209
Number of A...	13
Number of P...	1

At the bottom of the map window, the status bar indicates the coordinates (448854.0, 4468954.0) and the text "Create Feature Arc Tool Selected".

Basins From Elevation Maps

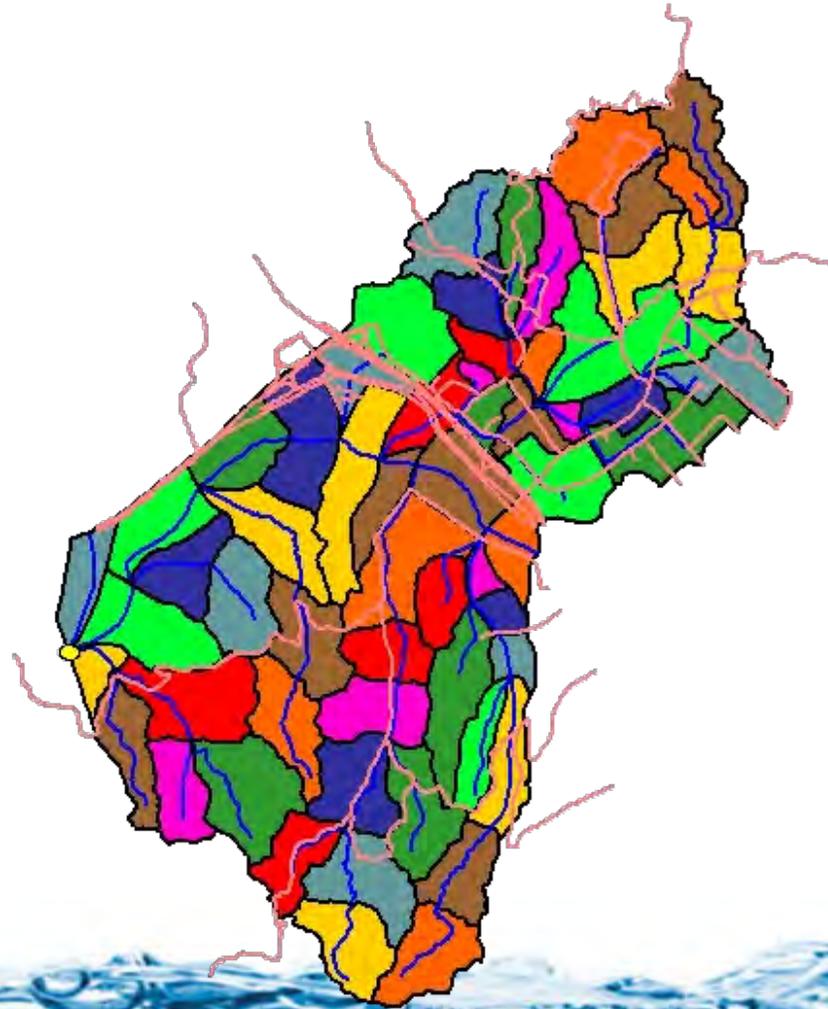


The screenshot shows the WMS 11.0 software interface. The main window displays a topographic map of a watershed with a drainage network overlaid. The map is color-coded by elevation, with higher elevations in red and orange, and lower elevations in green and blue. A red box highlights a button in the toolbar labeled "Get Data tools macros". A red arrow points from this text to the button. The interface includes a menu bar (File, Edit, Display, TIN, DEM, Window, Help), a Project Explorer on the left, and a Properties panel on the right. The Properties panel shows details for the selected coverage, including the tree name "Drainage", coverage type "Drainage", and various statistics like "Number of P...", "Number of N...", "Number of A...", and "Number of P...". The status bar at the bottom provides coordinates and the upstream area: (451284.0, 4468994.0), 40° 22' 12.3591" N, 111° 34' 25.7616" W, Upstream Area: 0.0021373045172 mi^2.

Get Data tools macros

Property	Value
General	
Tree Name	Drainage
Coverage Type	Drainage
Coverage Def...	0.00
Selected Cov...	
Number of P...	0
Number of N...	2757
Number of A...	16
Number of P...	1
All Coverages	
Number of P...	0
Number of N...	2757
Number of A...	16
Number of P...	1

Basins From CAD and GIS



How are basins delineated in WMS?

- A) Importing GIS or CAD files
- B) Manually digitizing boundaries and streams using scanned base maps
- C) Using digital elevation data to automate the procedure
- D) All of the above

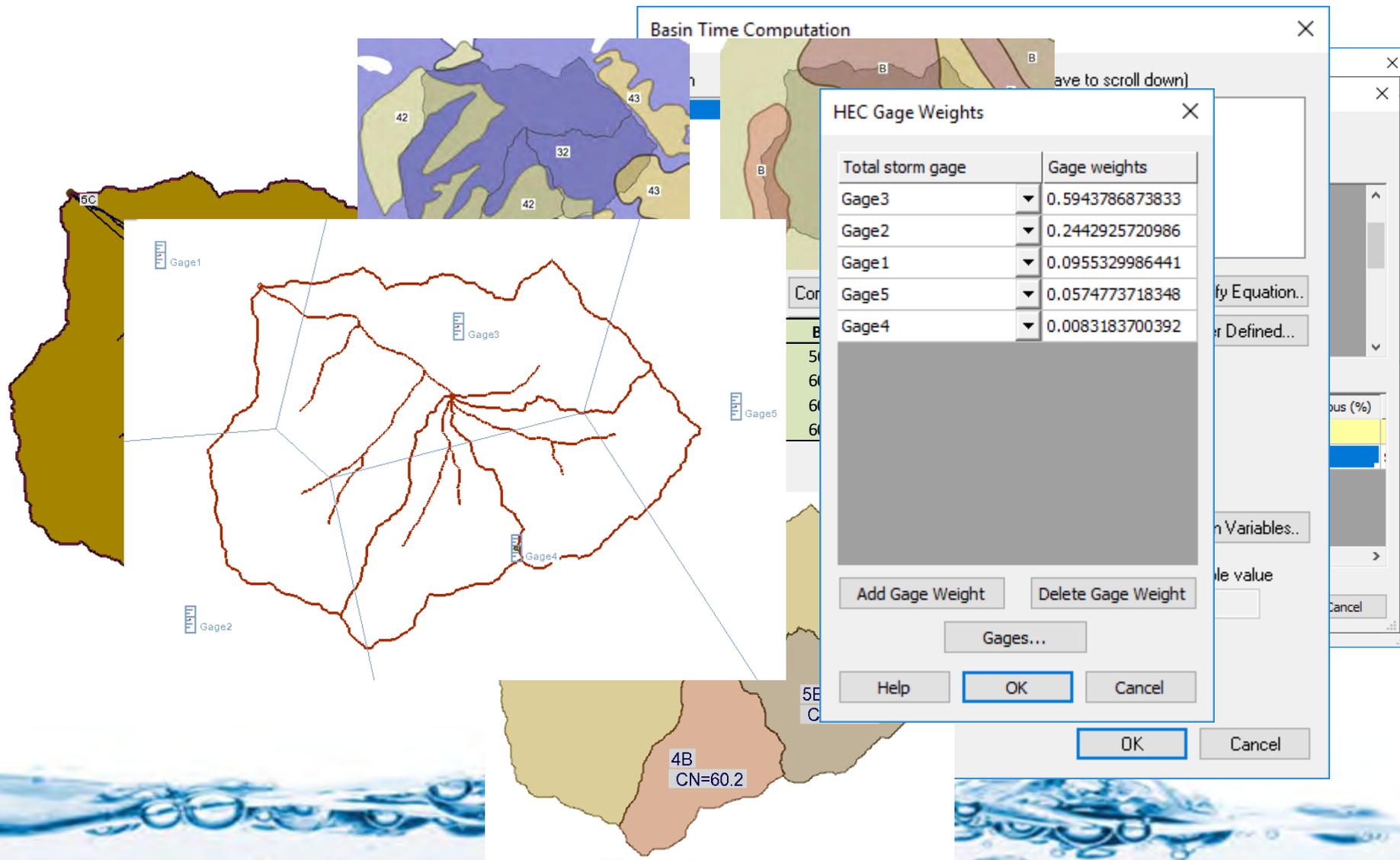


How are basins delineated in WMS?

The correct answer is:

- A) Importing GIS or CAD files.
- B) Manually digitizing boundaries and streams using scanned base maps.
- C) Using digital elevation data to automate the procedure.
- D) All of the above.

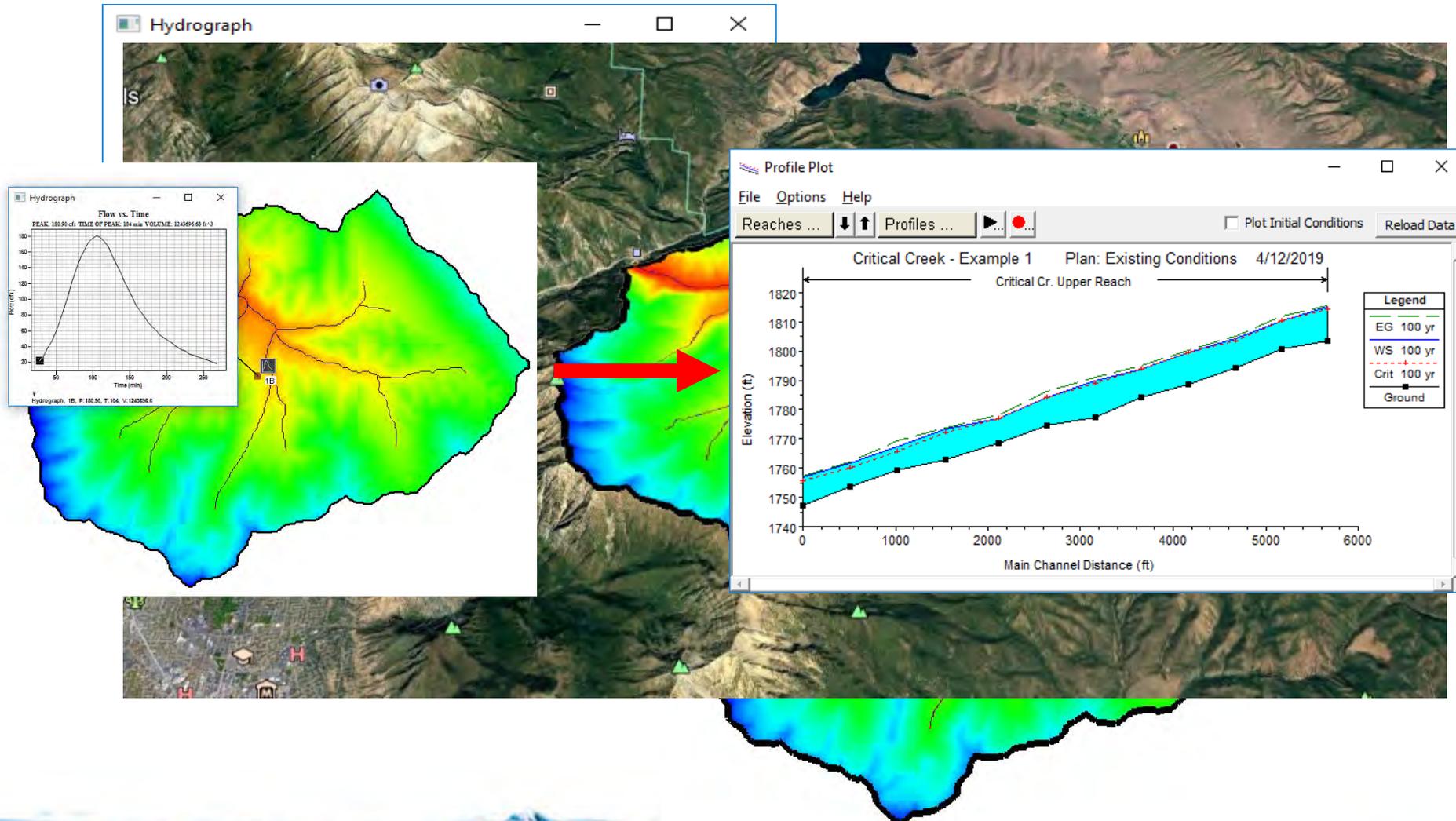


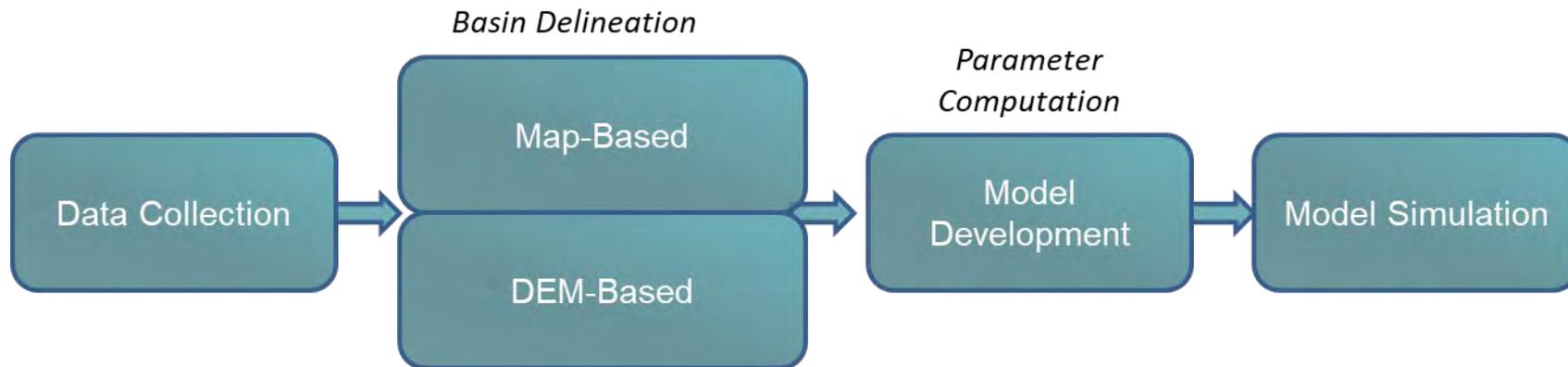


The screenshot displays the Basin Time Computation software interface. A central map shows a watershed with a network of stream channels and six gage locations labeled Gage1 through Gage6. The map is overlaid on a background of colored watershed sub-catchments. A dialog box titled "Basin Time Computation" is open, and within it, a sub-dialog box titled "HEC Gage Weights" is active. This dialog box contains a table with the following data:

Total storm gage	Gage weights
Gage3	0.5943786873833
Gage2	0.2442925720986
Gage1	0.0955329986441
Gage5	0.0574773718348
Gage4	0.0083183700392

Below the table are buttons for "Add Gage Weight", "Delete Gage Weight", "Gages...", "Help", "OK", and "Cancel". The "OK" button is highlighted. In the background, another dialog box shows a sub-catchment labeled "4B" with a value of "CN=60.2".







Demonstration



- We are now able to:
 - Describe the process for building a hydrologic model in WMS
 - List the primary functions and features of the WMS interface



- Let's practice ...
- **Exercises** folder for instructions
- **Intro** folder contains the data files required for the exercise.

