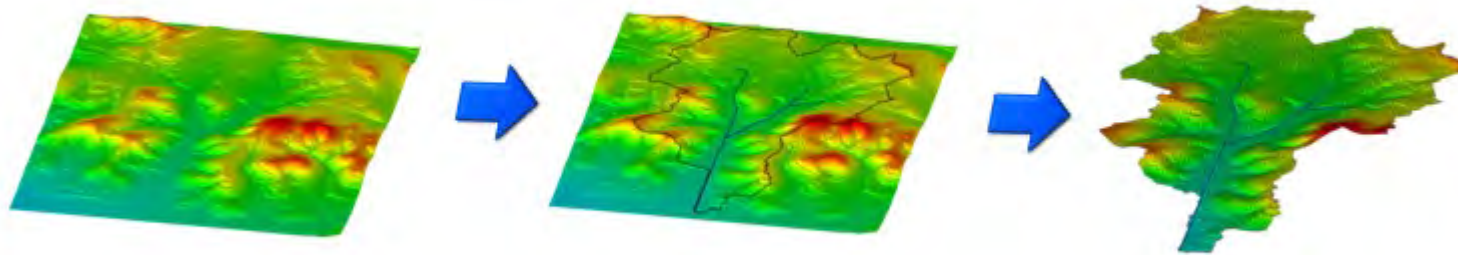


Watershed Modeling With DEMs

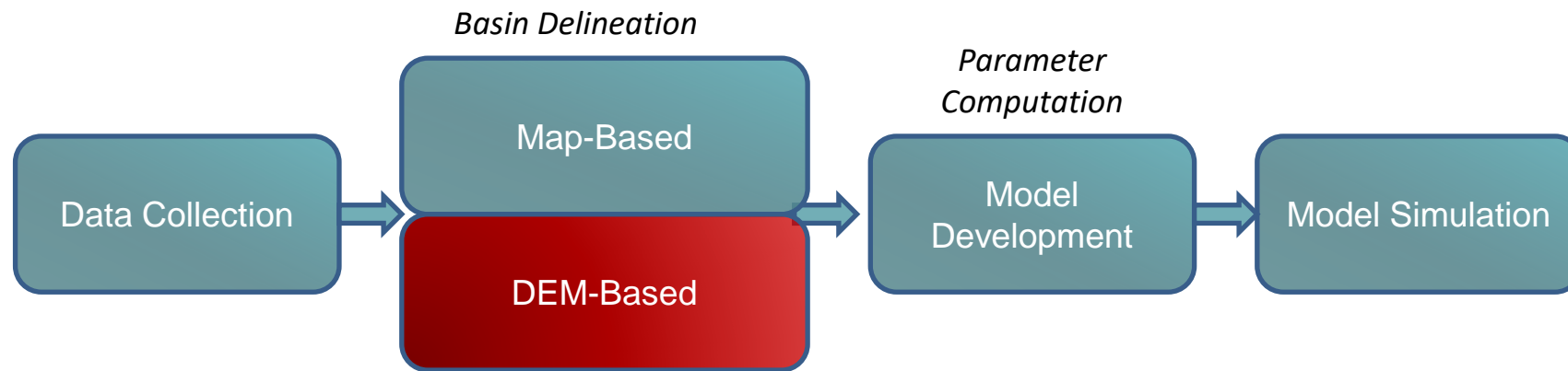


Lesson Learning Outcomes

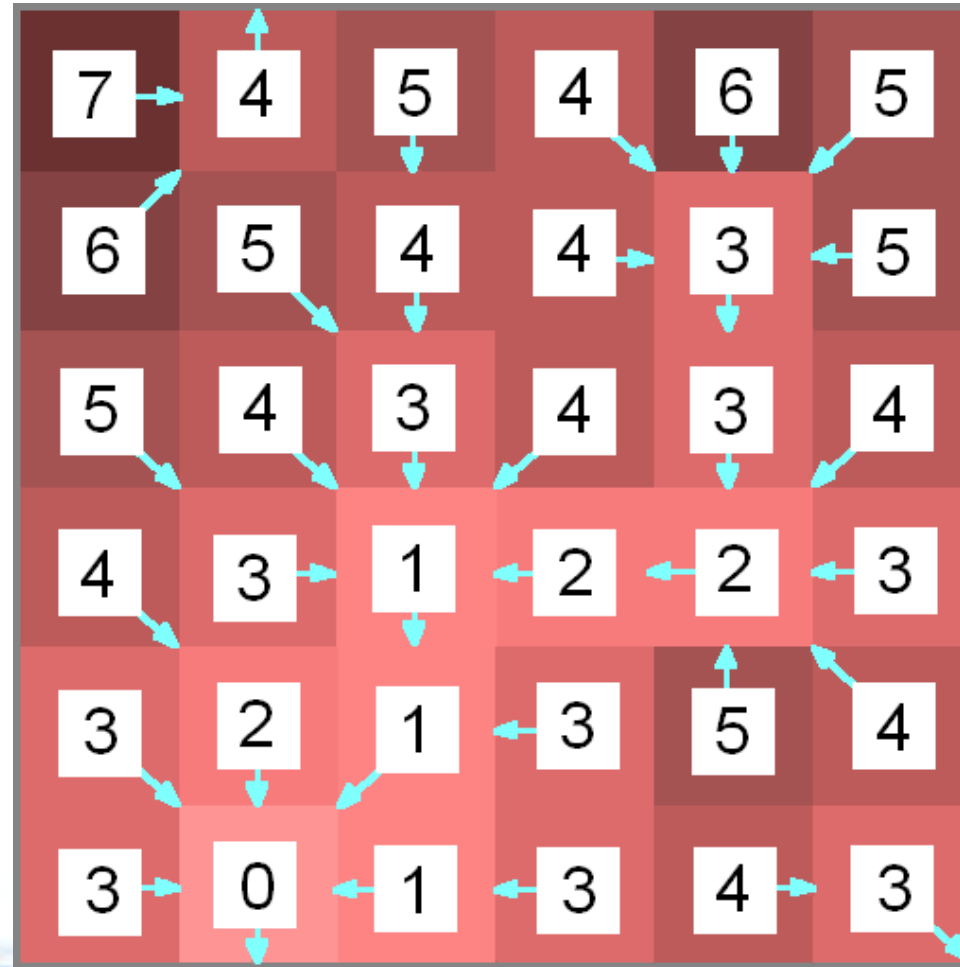
- Upon completion of this lesson, we will be able to:
 - Use DEMs for basin delineation.
 - Use WMS to compute geometric basin data from a delineated basin.



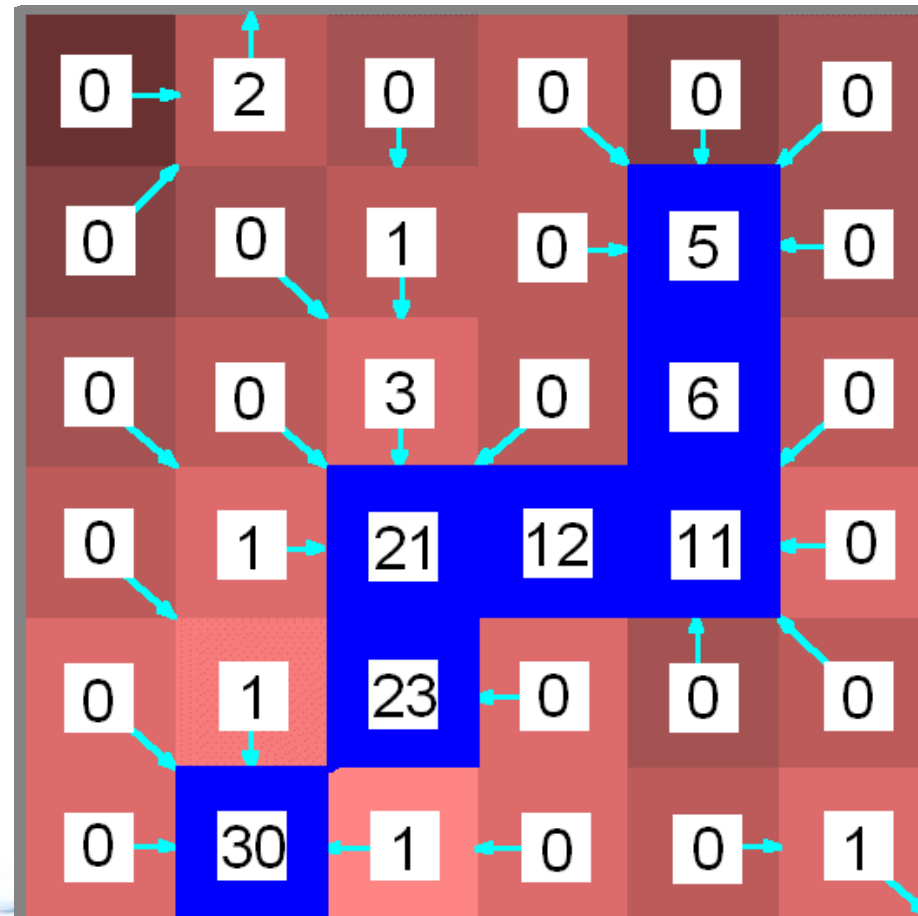
Hydrologic Modeling Workflow



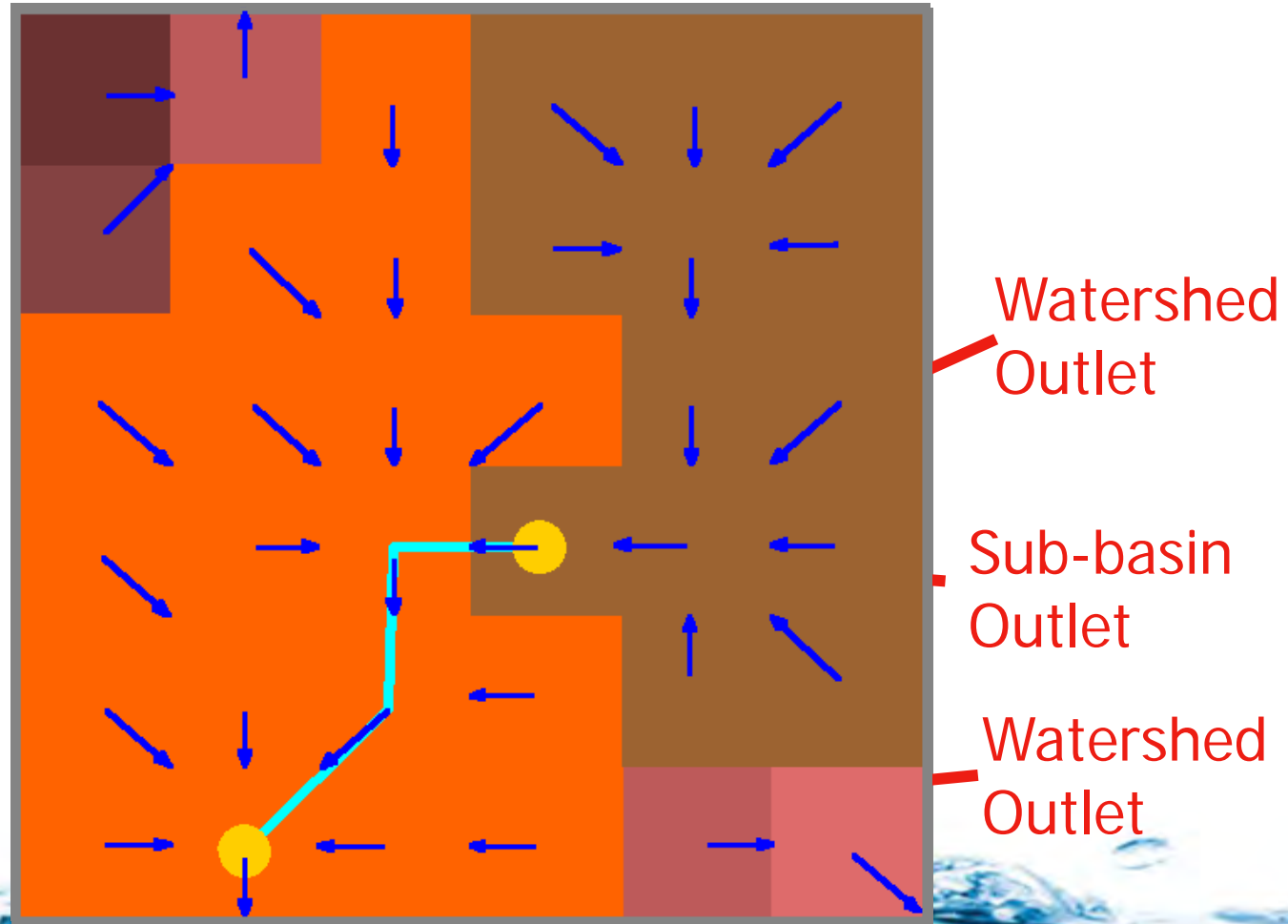
Flow Directions



Flow Accumulation



Basin Delineation

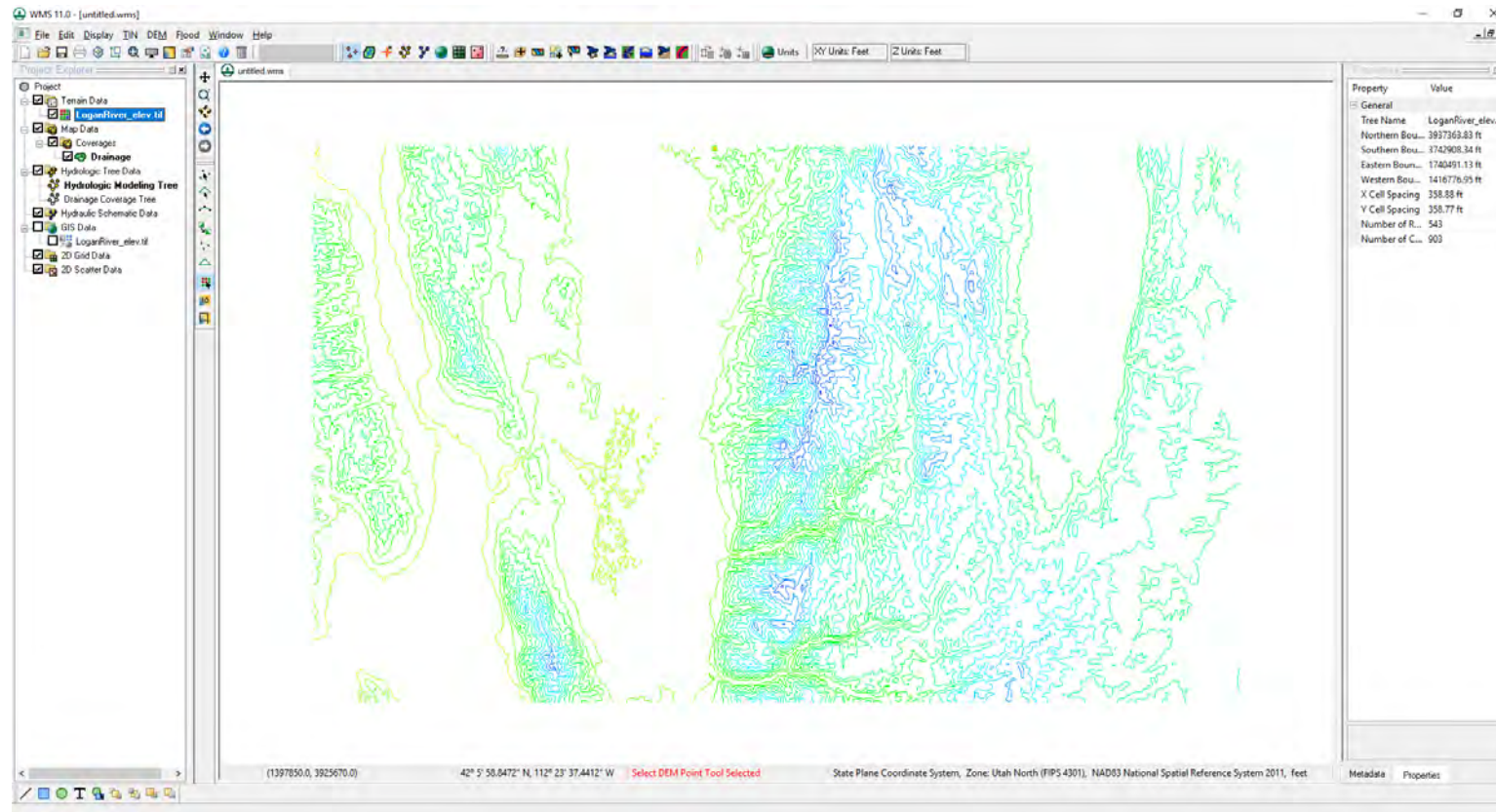


7 Steps in WMS for DEM Delineation

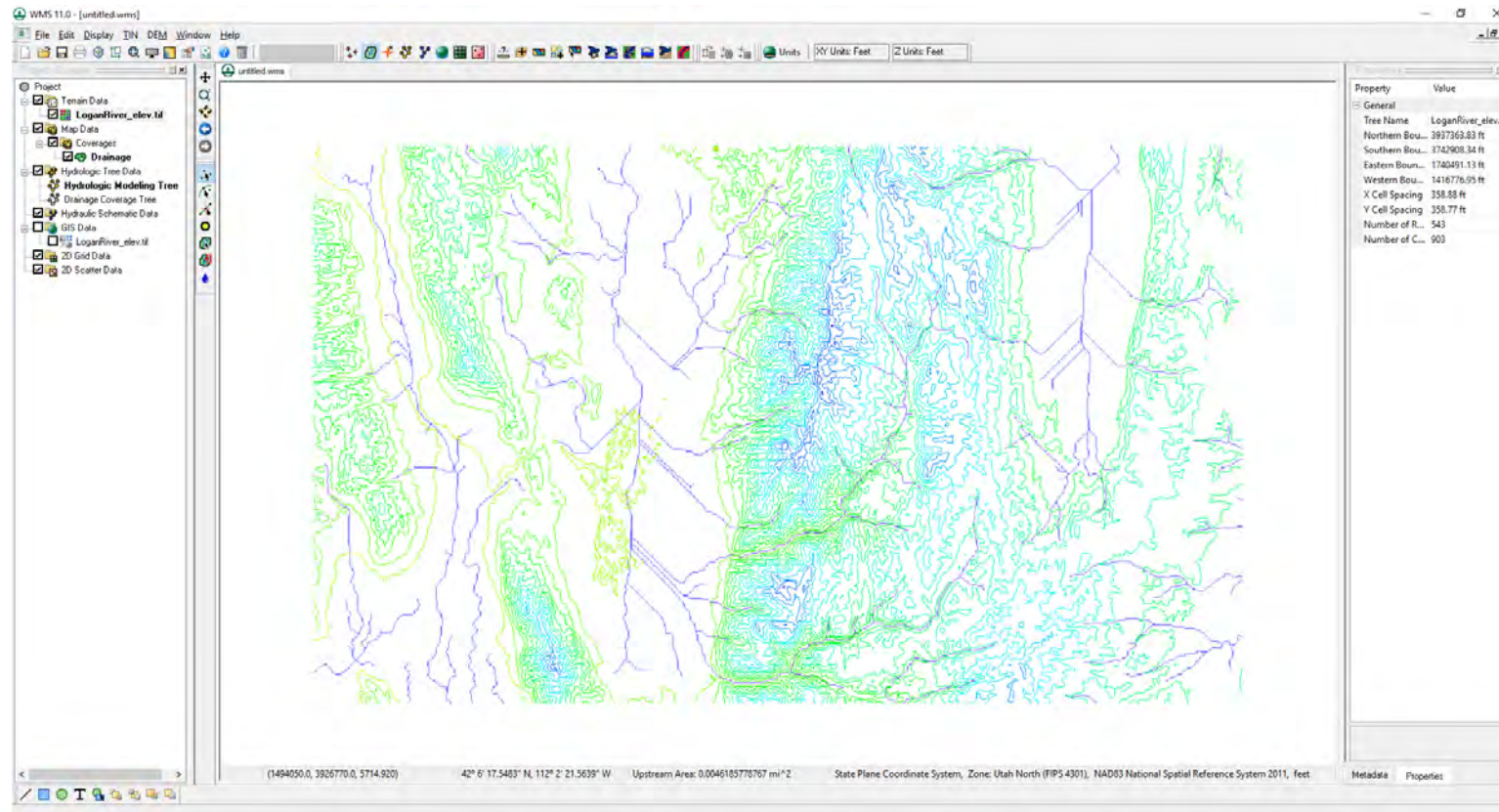
1. Read Elevations
2. Compute Flow Directions and Accumulations with TOPAZ
3. Define Basin Outlet(s)
4. Convert DEM Streams to Feature Objects
5. Define Basin(s)
6. Convert Boundaries to Polygons
7. Compute Basin Parameters



1. Read Elevations

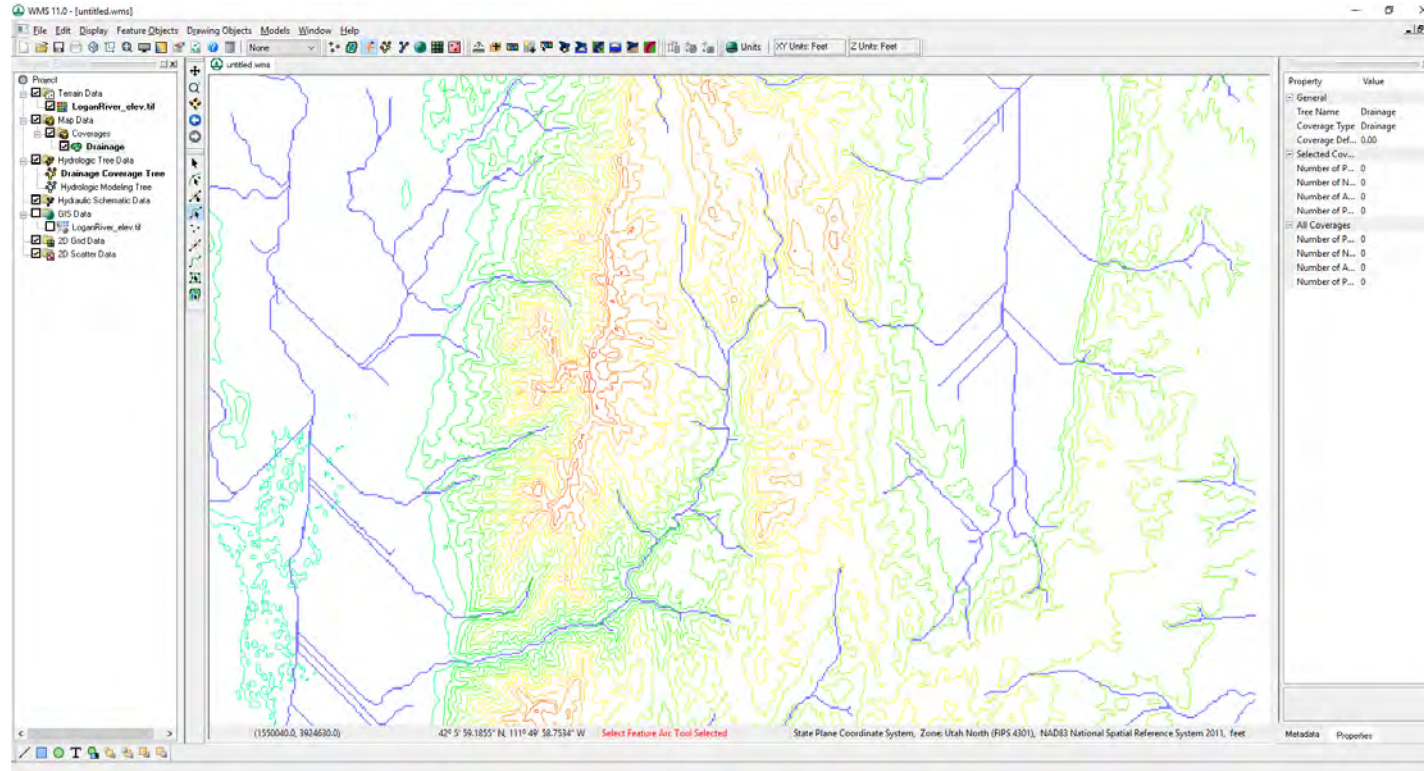


2. Compute Flow Data – Flow Directions and Accumulations (TOPAZ or TauDEM)





2. Compute Flow Data – Accumulation Threshold



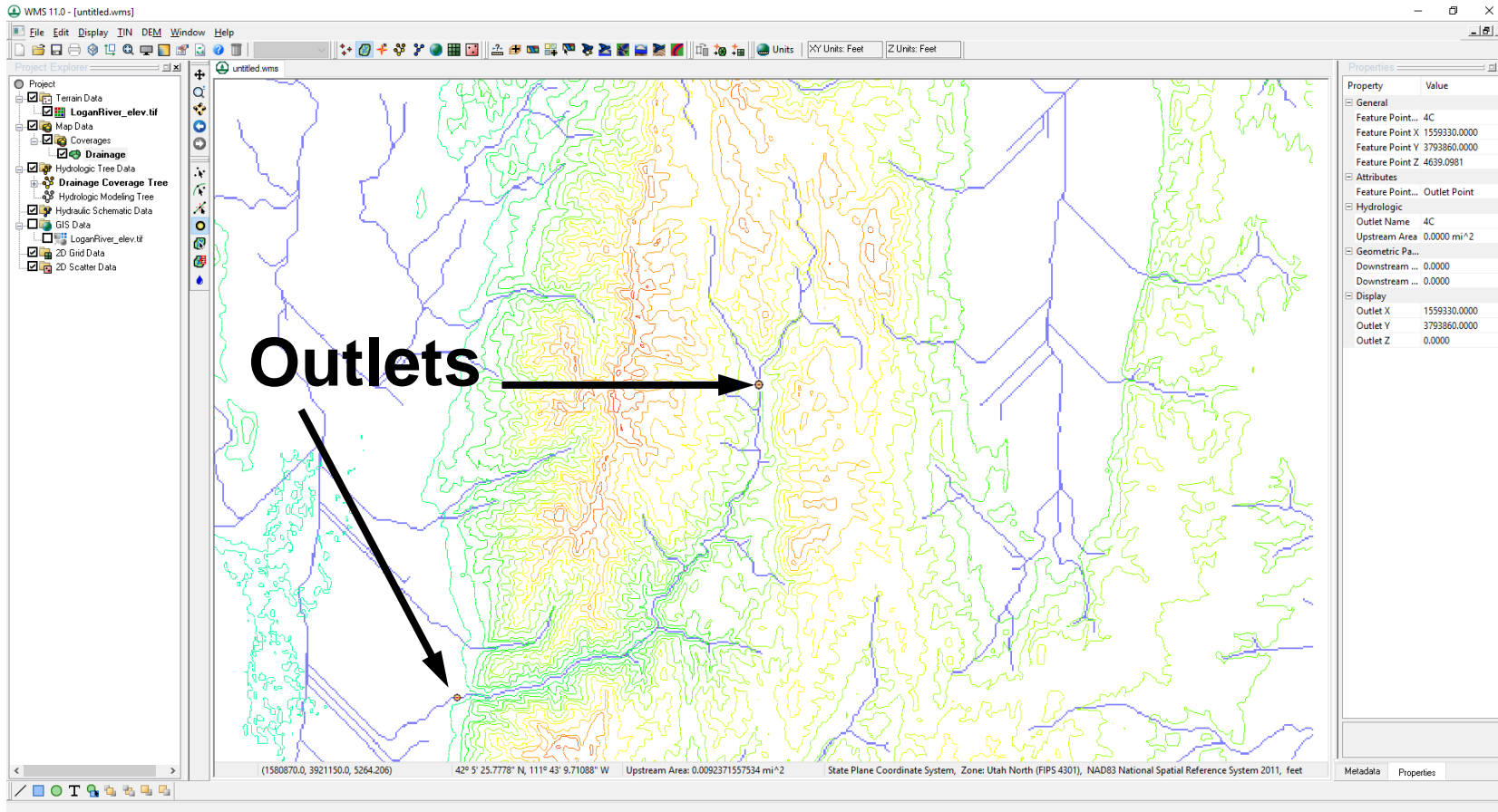
1.0

2.0

5.0



3. Define Basin Outlet(s)

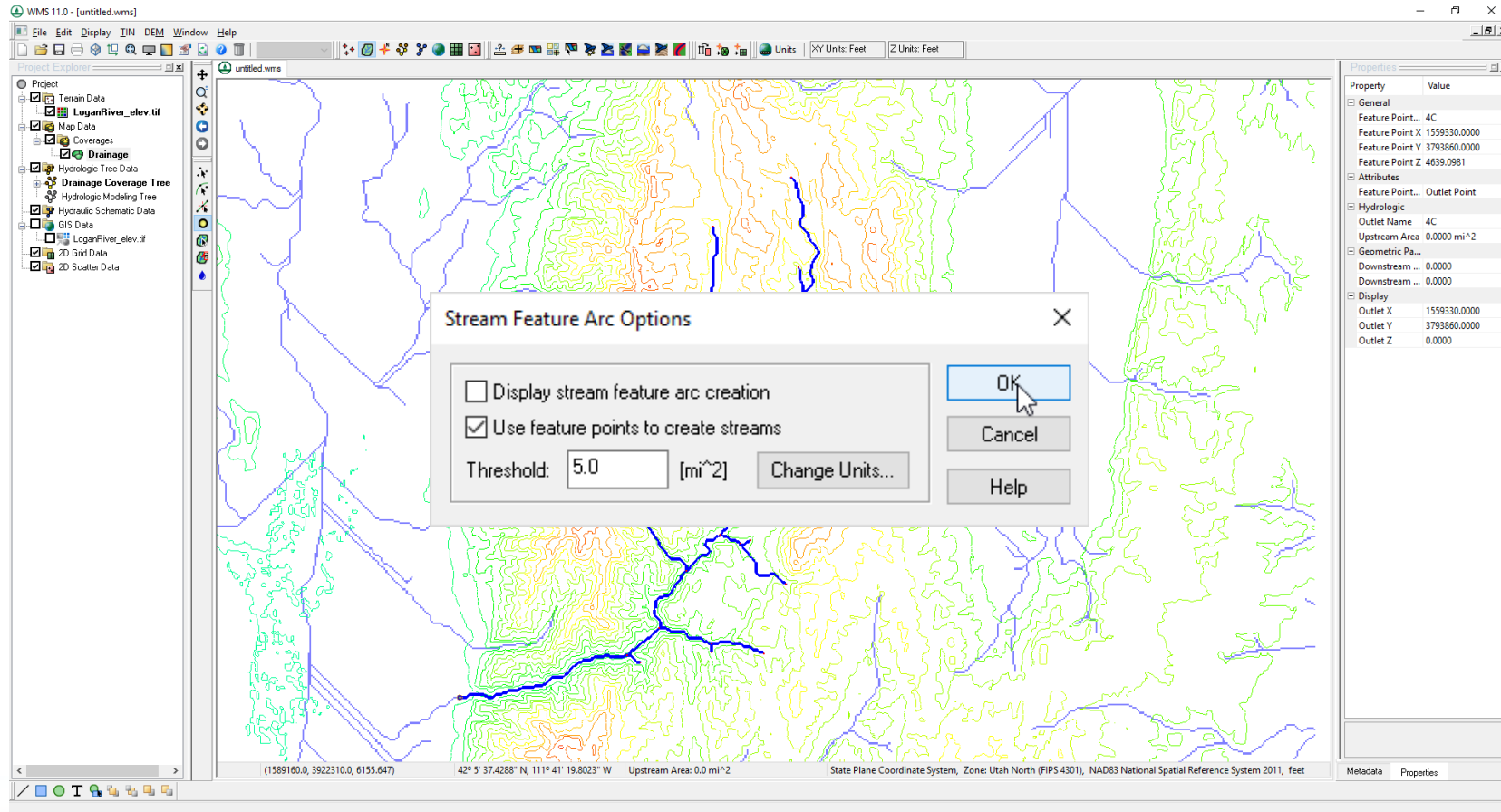


The screenshot displays the WMS 11.0 software interface. The main map area shows a watershed with a color-coded elevation model and a network of stream channels. Two red dots mark the locations of outlets, with black arrows pointing to them from the word "Outlets" written in large black text. The Project Explorer on the left lists various data layers, including Terrain Data, Map Data, Drainage, and Hydrologic Modeling Tree. The Properties window on the right shows the details for the selected outlet point, including its name, coordinates, and upstream area.

Property	Value
General	
Feature Point...	4C
Feature Point X	1559330.0000
Feature Point Y	3793860.0000
Feature Point Z	4639.0981
Attributes	
Feature Point...	Outlet Point
Hydrologic	
Outlet Name	4C
Upstream Area	0.0000 mi ²
Geometric Pa...	
Downstream ...	0.0000
Downstream ...	0.0000
Display	
Outlet X	1559330.0000
Outlet Y	3793860.0000
Outlet Z	0.0000

State Plane Coordinate System, Zone: Utah North (FIPS 4301), NAD83 National Spatial Reference System 2011, feet

4. Convert DEM Streams to Feature Objects



The screenshot shows the WMS 11.0 software interface. The main window displays a topographic map with stream features. A dialog box titled "Stream Feature Arc Options" is open, allowing users to configure stream creation parameters. The dialog includes checkboxes for "Display stream feature arc creation" (unchecked) and "Use feature points to create streams" (checked). A "Threshold" field is set to 5.0 [mi²], with a "Change Units..." button. The "OK" button is highlighted by a mouse cursor. The Properties window on the right shows the following data:

Property	Value
Feature Point...	4C
Feature Point X	1559330.0000
Feature Point Y	3793860.0000
Feature Point Z	4639.0981
Outlet Point	
Outlet Name	4C
Upstream Area	0.0000 mi ²
Downstream Pa...	0.0000
Downstream ...	0.0000
Outlet X	1559330.0000
Outlet Y	3793860.0000
Outlet Z	0.0000

Which two delineation functions are performed by

TOPAZ?

- A) Flow direction computation and basin delineation
- B) Basin delineation and computing geometric parameters
- C) Flow direction computation and computing geometric parameters
- D) Flow direction and flow accumulation computation



Which two delineation functions are performed by

TOPAZ?

- The correct answer is:
 - A) Flow direction computation and basin delineation
 - B) Basin delineation and computing geometric parameters
 - C) Flow direction computation and computing geometric parameters
 - D) Flow direction and flow accumulation computation



If we have a larger value for the flow accumulation threshold, we would expect ...

- A) The streams created from the DEM accumulation cells to be relatively shorter
- B) The streams created from the DEM accumulation cells to be relatively longer
- C) The streams created from the DEM accumulation cells are not affected by the flow accumulation threshold

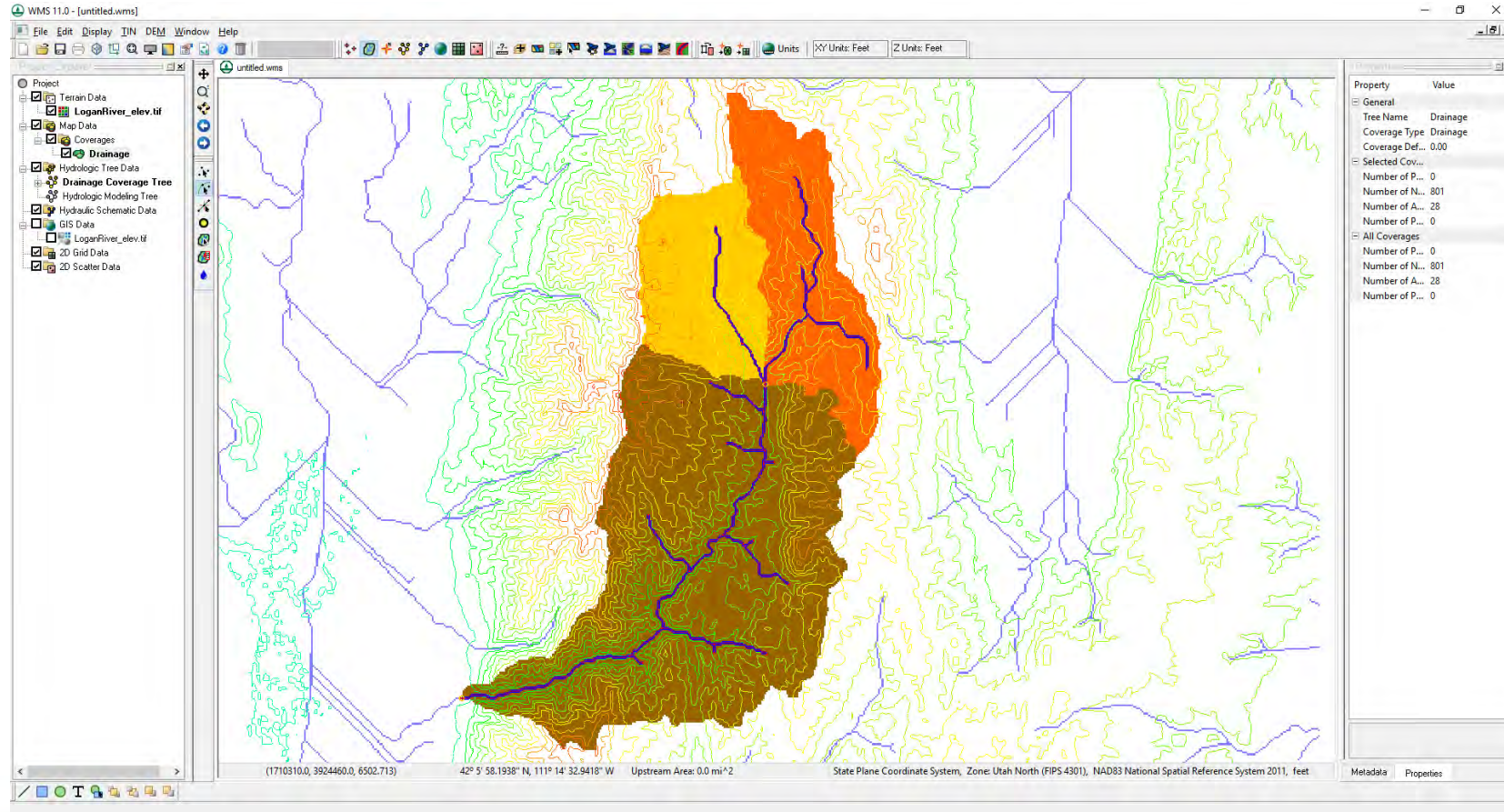


If we have a larger value for the flow accumulation threshold, we would expect ...

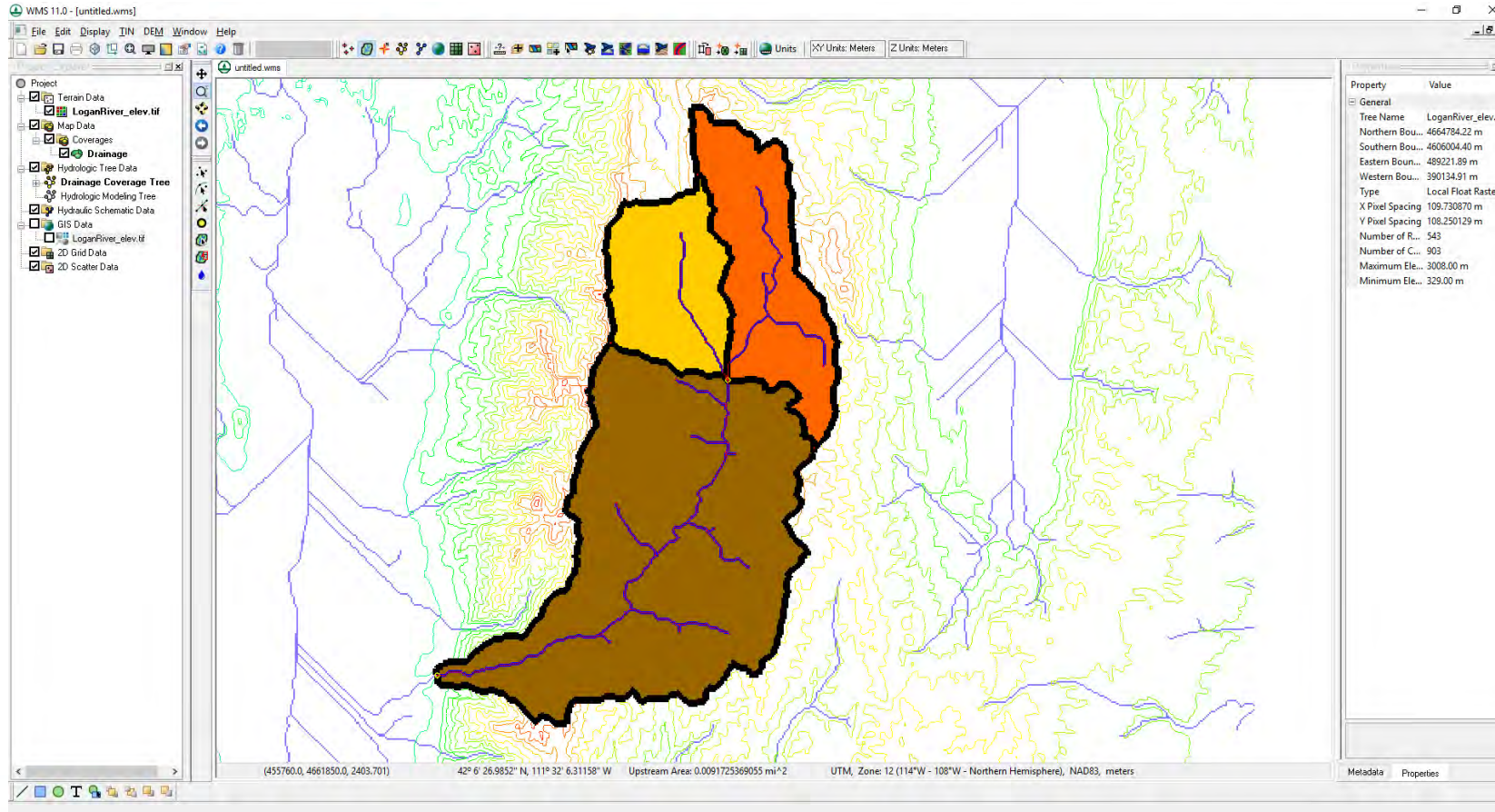
- The correct answer is:
 - A) The streams created from the DEM accumulation cells to be relatively shorter
 - B) The streams created from the DEM accumulation cells to be relatively longer
 - C) The streams created from the DEM accumulation cells are not affected by the flow accumulation threshold



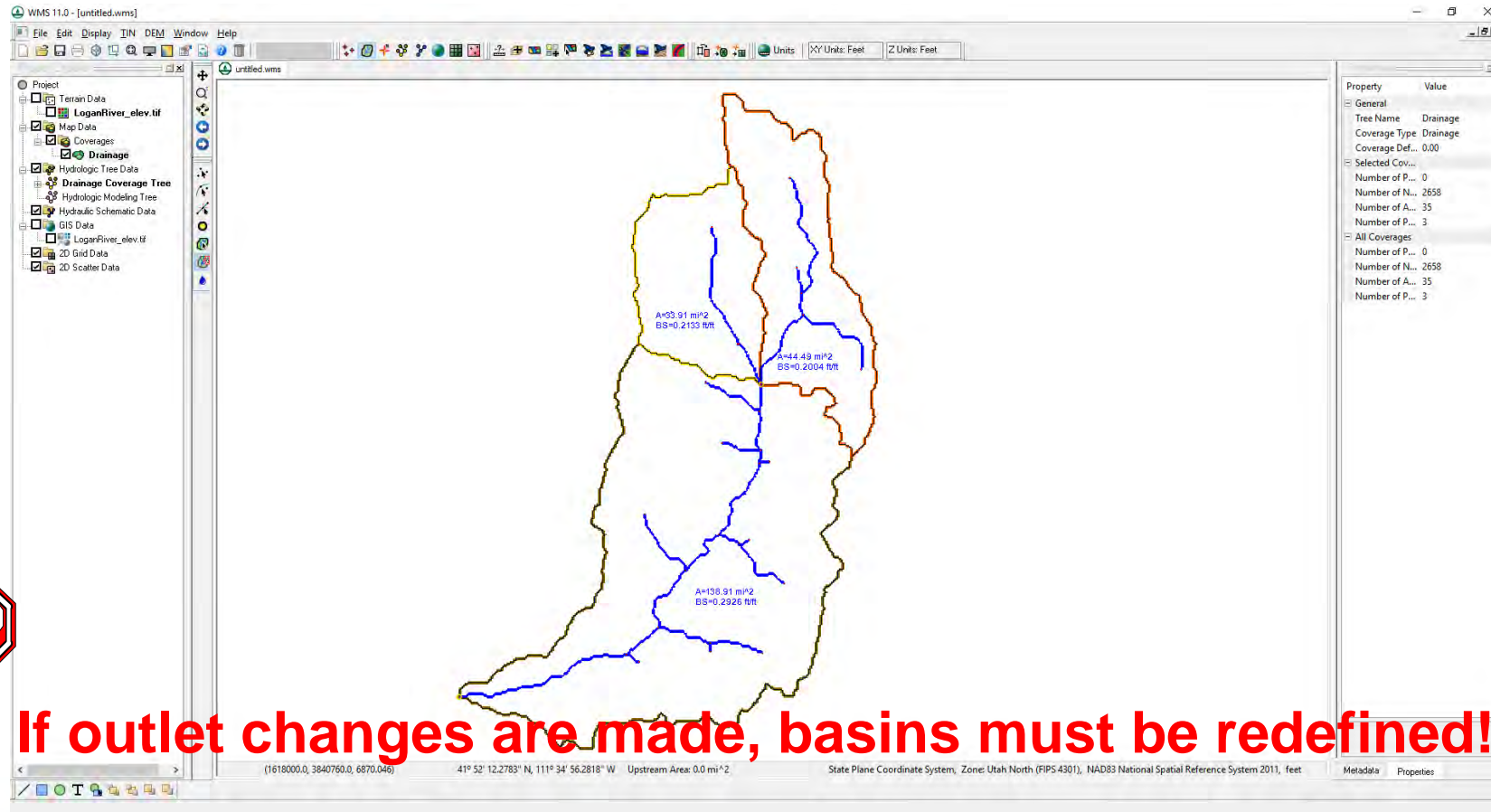
5. Define Basin(s)



6. Convert Boundaries to Polygons



7. Compute Basin Parameters



If outlet changes are made, basins must be redefined!

7. Geometric Computations

Display Options

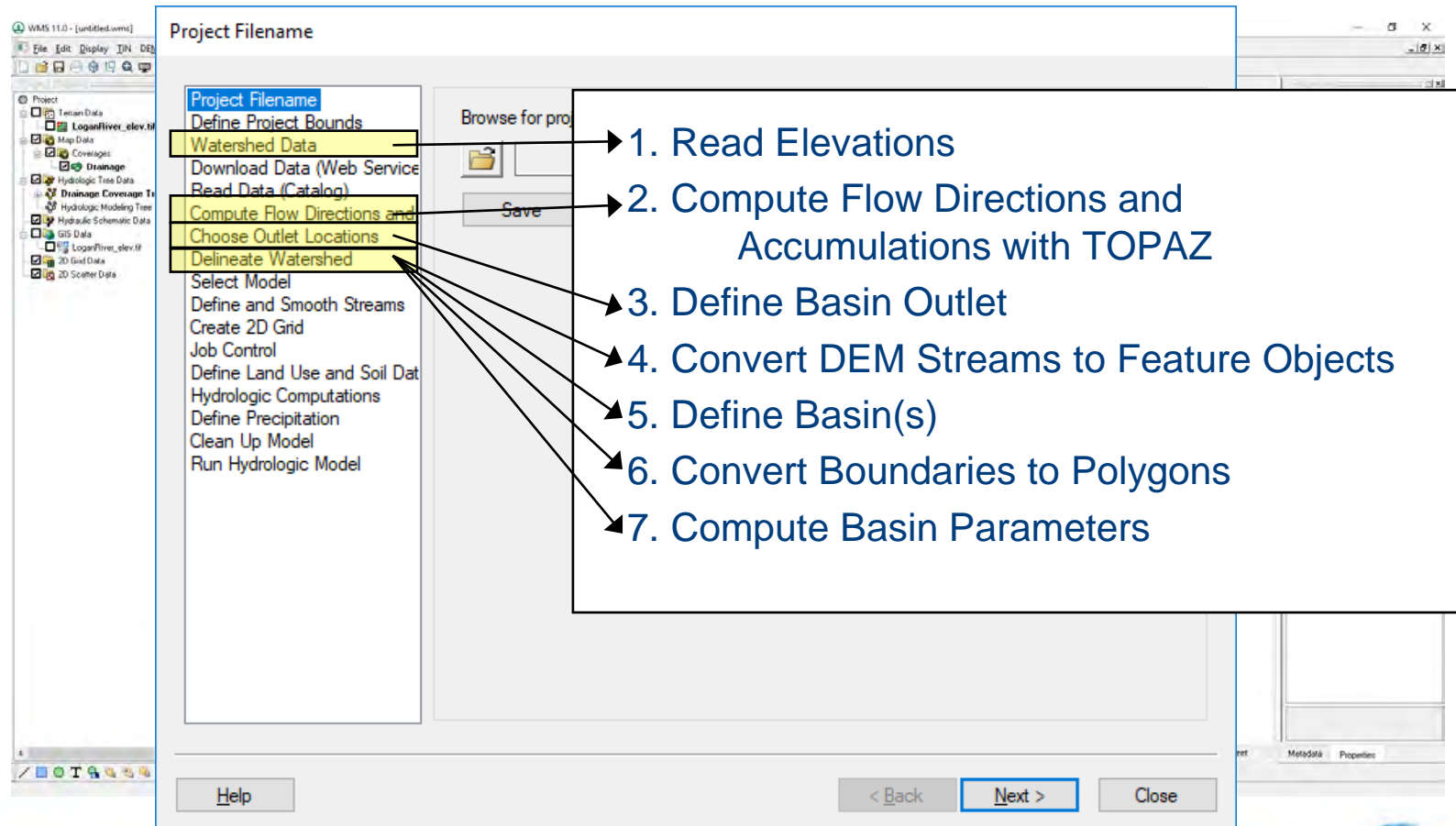
<input type="checkbox"/> Basin ID's	<input type="checkbox"/> Average Overland Flow	<input type="checkbox"/> Max Flow Slope
<input type="checkbox"/> Basin Names	<input type="checkbox"/> North/South Aspects	<input type="checkbox"/> Max Stream Length
<input type="checkbox"/> Basin CN's (curve numbers)	<input type="checkbox"/> Basin Lengths	<input type="checkbox"/> Max Stream Slope
<input type="checkbox"/> Basin Average Precipitation	<input type="checkbox"/> Perimeter	<input type="checkbox"/> Distance From Centroid To Stream
<input type="checkbox"/> Basin RC's (runoff coefficients)	<input type="checkbox"/> Shape Factor	<input type="checkbox"/> Centroid Stream Distance
<input checked="" type="checkbox"/> Show Units	<input type="checkbox"/> Sinuosity Factor	<input type="checkbox"/> Centroid Stream Slope
<input checked="" type="checkbox"/> Basin Areas	<input type="checkbox"/> Mean Basin Elevation	<input type="checkbox"/> Stream Segment Length
<input checked="" type="checkbox"/> Basin Slopes	<input type="checkbox"/> Max Flow Distance	<input type="checkbox"/> Stream Segment Slope

Coverage Color:

Show option pages for existing data only

Help... OK Cancel

Hydrologic Modeling Wizard



Project Filename

Project Filename
Define Project Bounds
Watershed Data
Download Data (Web Service)
Read Data (Catalog)
Compute Flow Directions and
Choose Outlet Locations
Delineate Watershed
Select Model
Define and Smooth Streams
Create 2D Grid
Job Control
Define Land Use and Soil Data
Hydrologic Computations
Define Precipitation
Clean Up Model
Run Hydrologic Model

Browse for project file
Save

1. Read Elevations
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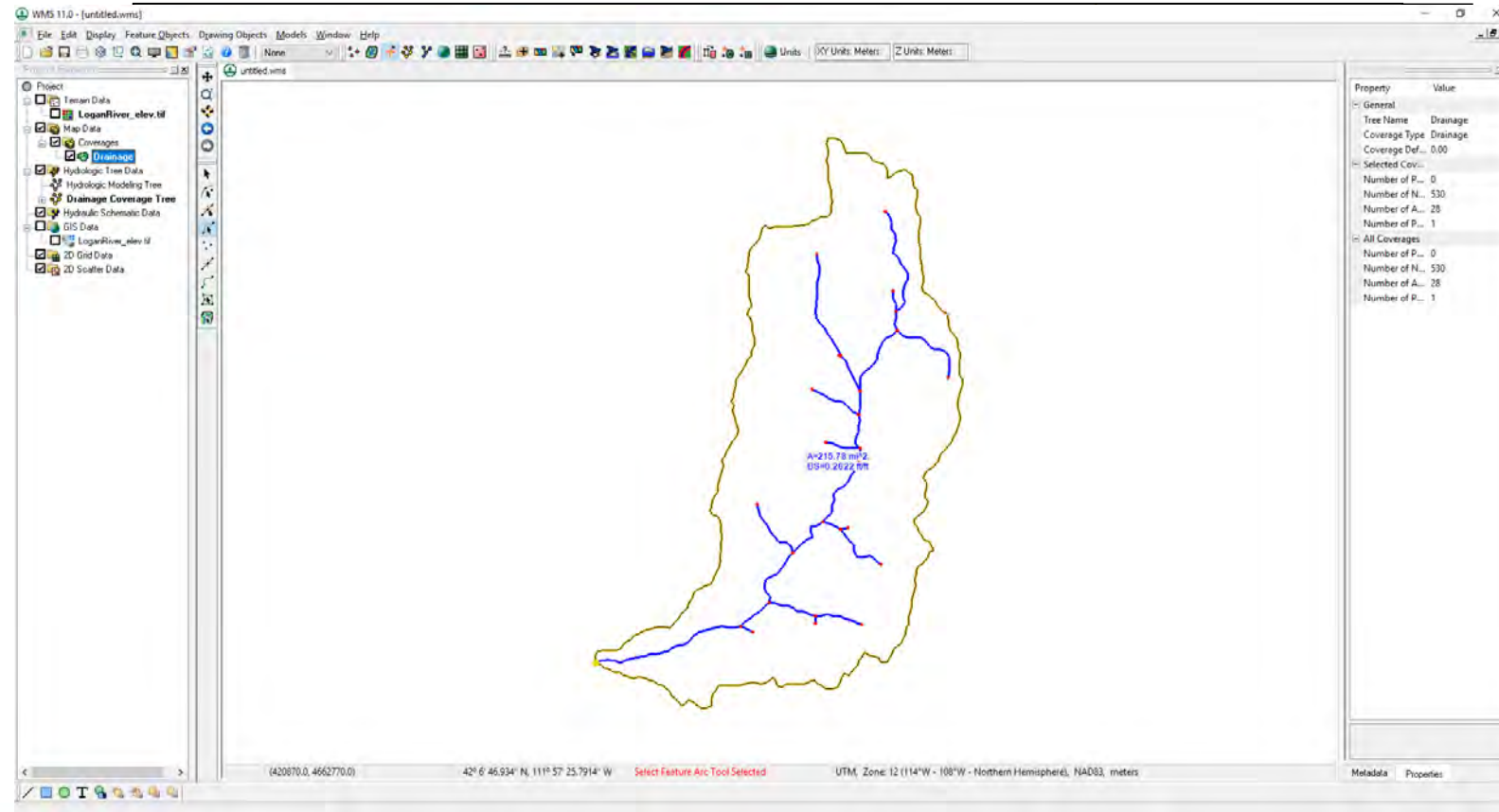
Help < Back Next > Close

Additional DEM Delineation Topics

- Smoothing streams and boundaries
- Representing roads, railroads, canals, etc.



Smoothing Streams and Boundaries



Features such as roads, canals, ditches, and embankments may be represented by:

- A) Selecting a node or vertex and converting it to a stream
- B) Digitizing a stream arc from upstream to downstream
- C) Digitizing a stream arc from downstream to upstream
- D) None of the above



Features such as roads, canals, ditches, and embankments may be represented by:

- The correct answer is:
 - A) Selecting a node or vertex and converting it to a stream
 - B) Digitizing a stream arc from upstream to downstream
 - C) Digitizing a stream arc from downstream to upstream
 - D) None of the above





Demonstration



- We are now able to:
 - Use DEMs for basin delineation.
 - Use WMS to compute geometric basin data from a delineated basin.



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

