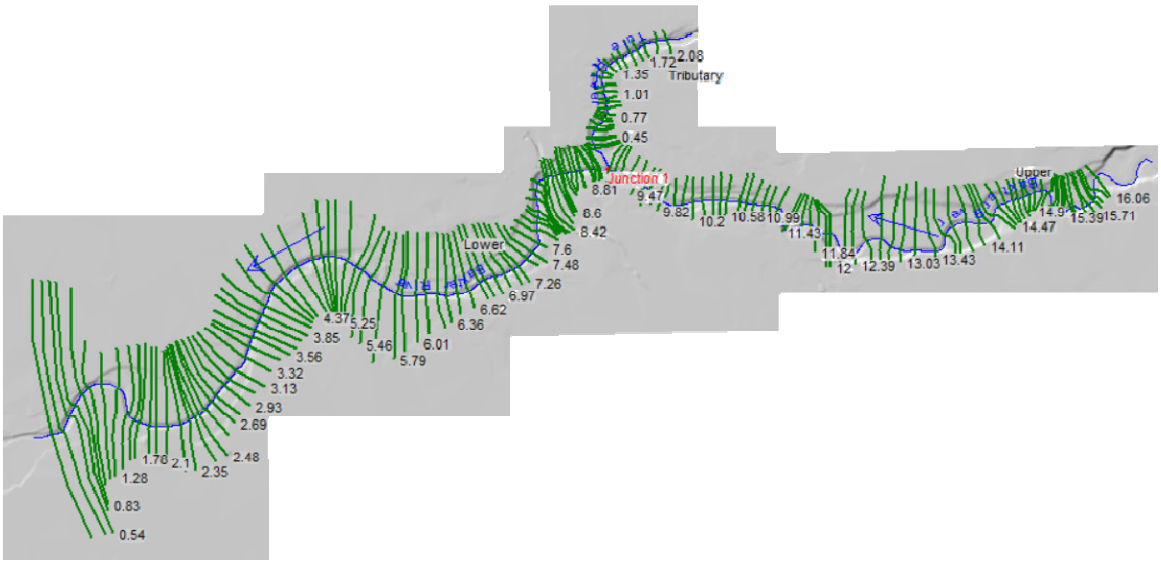
Developing Geometric Data with RAS Mapper
Workshop

1 Objective

In this workshop, you will use HEC-RAS to create a new RAS Terrain and RAS Layers necessary to create a 1D river hydraulics model.

2 Background

The workshop requires you to create geometry from scratch. The terrain models for the workshop are provided and you will start by importing them to a RAS Terrain. You will be working with the Baxter dataset to create a 3 reach model similar to that shown below (but you don't need so many cross sections!).

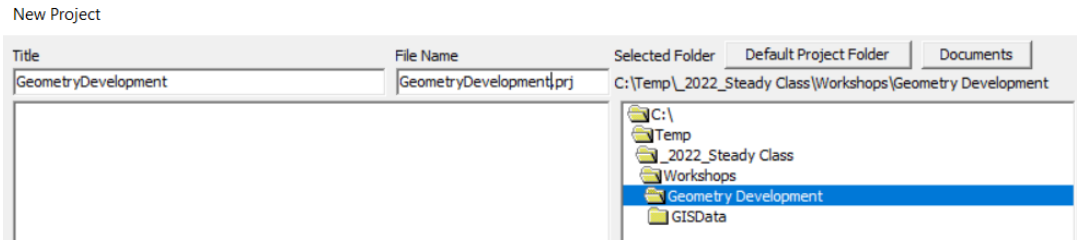


3 Geometry Development

You will be starting from scratch with a new HEC-RAS project.

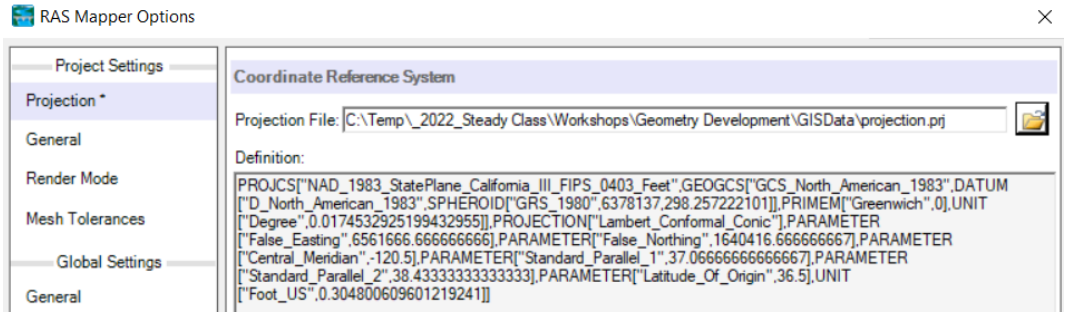
3.1 Create a new HEC-RAS Project

1. Create a **NEW** HEC-RAS project and give it a Name.



2. Open **RAS Mapper** and set the Projection for the project, using the **Tools | Set Projection for Project** menu item. Browse to the "**GISData**" folder in the workshop folder.

3. Select the "**projection.prj**" file



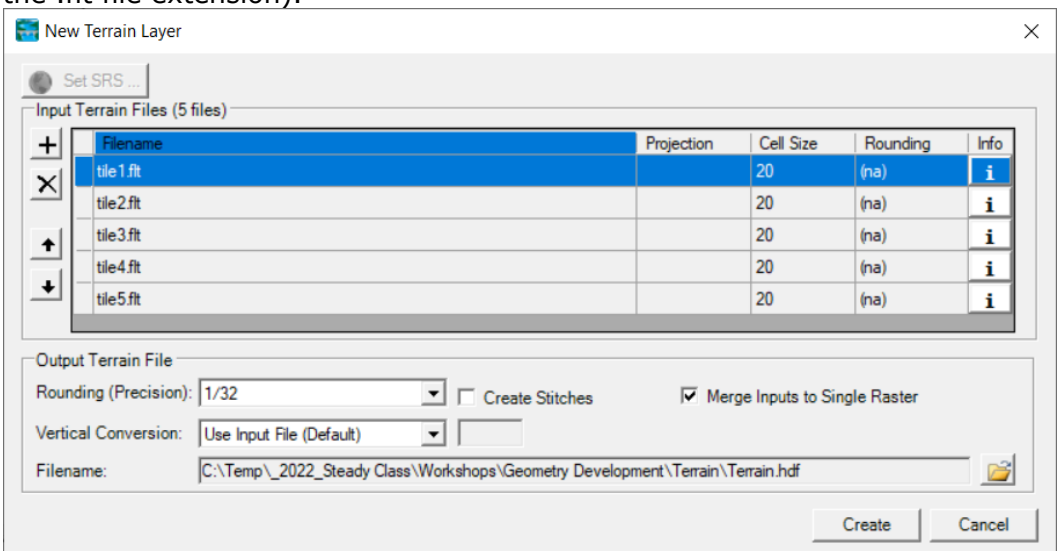
4. Press **OK** to close the Options window.

3.2 Import the Terrain Model

5. Create a new terrain model using the **Project | Create New RAS Terrain** menu item.

6. Click to **+** button to add the terrain files.

7. Navigate to the "\GISData\Terrain" folder and select the 5 terrain tiles (with the .flt file extension).



8. Press the **Create** button to import the terrain data.

9. After the data has imported, **double-click** on the Terrain layer that was just created and spend a few minutes exploring the display options. (Keep Layer Properties open.)

    a. Check on the "Update Legend with View" option.

    b. Turn on the "Plot Contour" option. Change the contour interval.

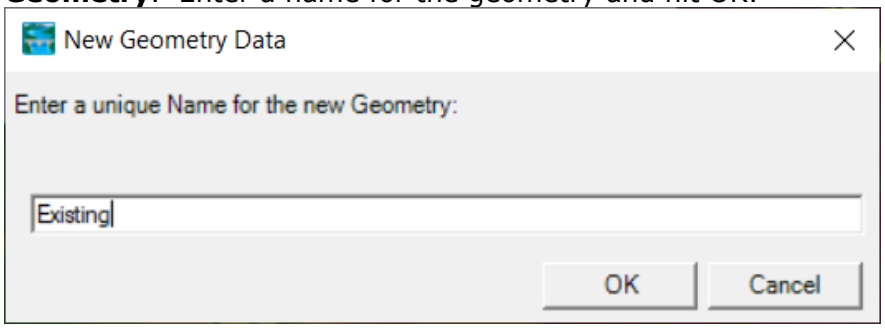
    c. Check on the "Plot raster file outlines" and "Plot raster file names" options.

    d. Toggle the "Plot Surface" option.

    e. Set the Terrain display options to your liking, and continue on.

3.3 Create RAS Geometry File and Layers

10. In RAS Mapper, right-click on the **Geometries** node and choose **Add New Geometry**. Enter a name for the geometry and hit OK.



11. **Edit** the Geometry. The pencil icon is a shortcut.

3.4 Create the River Network

12. Click on the **Rivers** node.

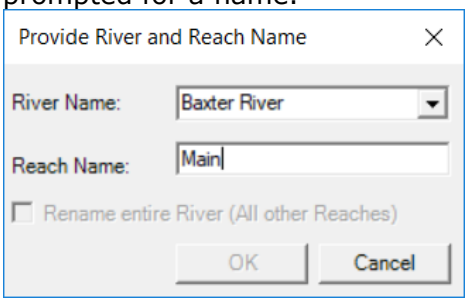
13. Draw the river network (as shown above) with the Baxter River and Tule River coming together.

    a. Left-click to add a point to a line, double-click to end a line.

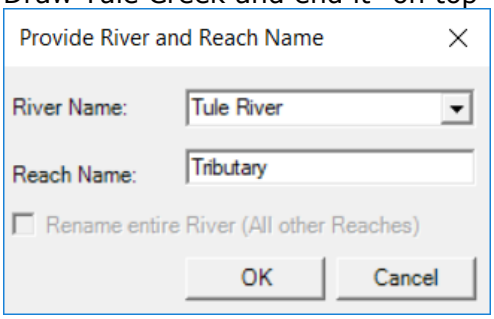
    b. Right-click to re-center the map display.

    c. Use the Shift key to Pan, use the Mouse Wheel to Zoom in and out.

14. Draw the Baxter River first. When finished drawing a river reach you will be prompted for a name.

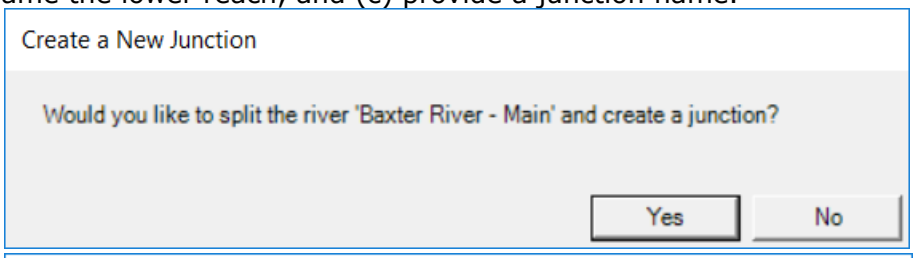


15. Draw Tule Creek and end it "on top" of the Baxter River.

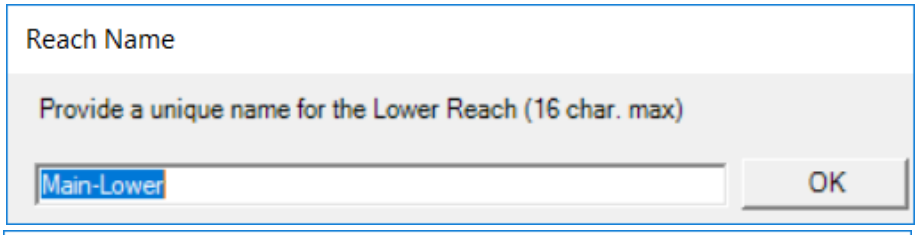


16. A junction will be formed when you end a river reach segment on an existing river reach. Multiple dialogs will prompt you to (a) split the river reach, (b) rename the lower reach, and (c) provide a junction name.

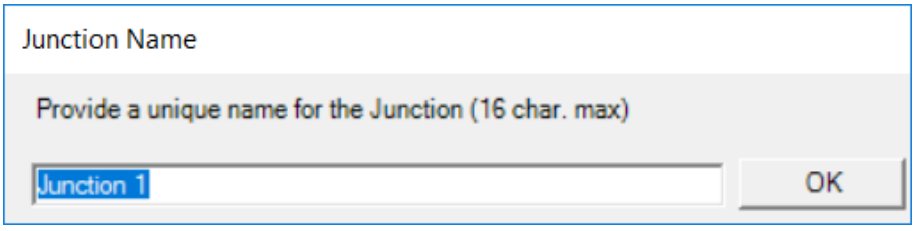
a)



b)



c)



17. Note that by default the name of the river and reach is automattically drawn at the start of each river reach. Open the River Layer Properties.

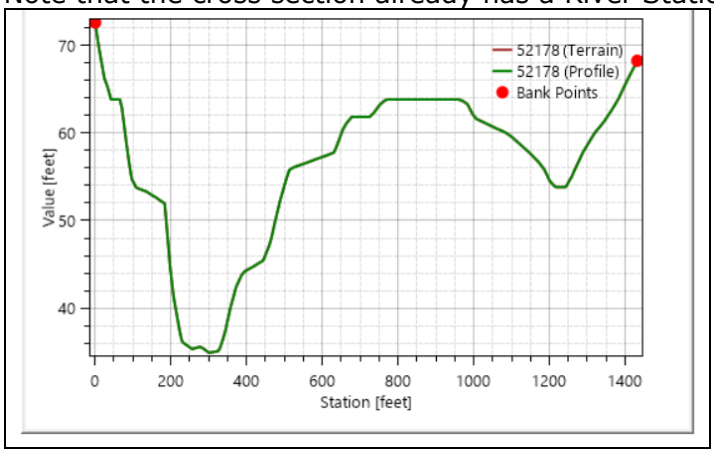
What other drawing options are available and what do they do?

3.5 Layout Cross Sections

For this workshop we are going to ignore laying out bank lines and flow path lines and skip straight to the cross sections.

18. Select the **Tools | Options** menu item.
19. Change the "XS River Stations" Units to **Miles** and press the **OK** button.
20. Click on the **Cross Sections** node.
21. Create a dozen (or so) cross sections on each river reach to resonably represent 1D river/floodplain flow.
    Cross sections should be created left to right when looking downstream!
22. After you have created a cross section, **Plot the elevation profile**.

Note that the cross section already has a River Station assigned to it.



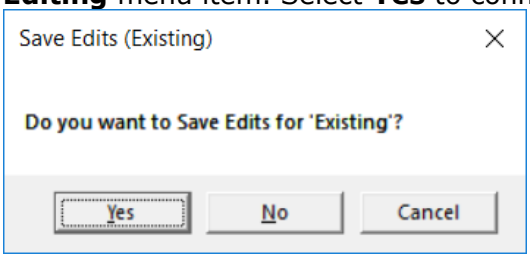
What is the River Station for the cross section?

What units are being used?

Where are the Banks Stations?

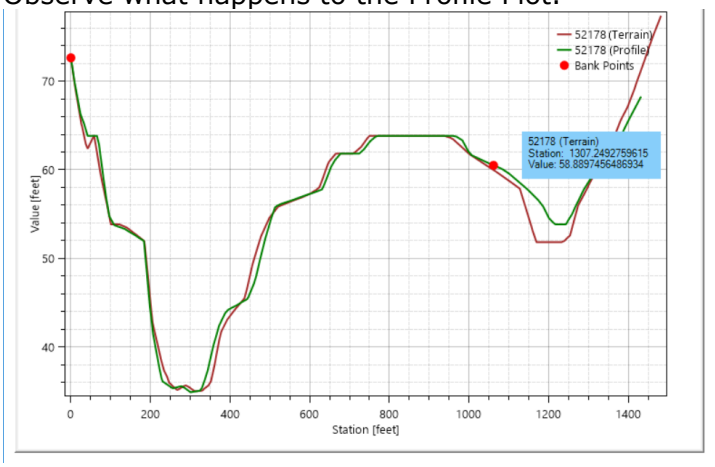
23. Create another cross section. Note that the Profile Plot automatically updates!

24. When **FINISHED** created features, select the **Geometries Node | Stop Editing** menu item. Select **Yes** to confirm the edits.



3.6 Modify the Cross Section Data

25. **Start Editing** the Geometry in RAS Mapper.
26. **Select** the Cross Sections layer.
27. **Select** a cross section.
28. **Plot** the Elevation Profile.
29. **Start editing** the cross section (with a **double-click)**.
30. Grab one of the end points and move it to make the cross section wider and/or change how it crosses the floodplain.
31. Observe what happens to the Profile Plot.

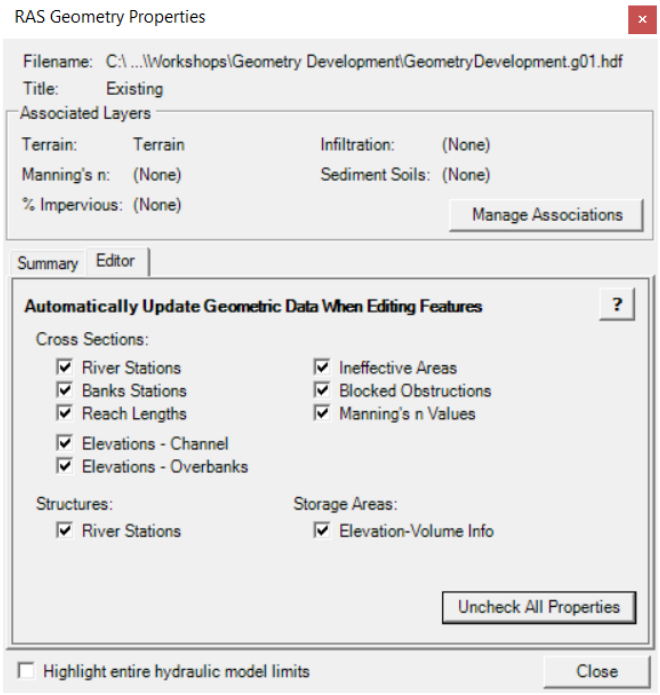


Note that the Terrain no longer matches the cross section Profile. This is because the crosss section is considered an "existing cross section" and we don't RAS Mapper to unintentially overrite data.

32. **Double-click** to finish the cross section.
33. Update the cross section by right-clicking on the cross section and selecting **Compute | Elevation Profile** from Terrain.
34. **Plot** the cross section to see if the terrain matches the profile plot.

3.7 Auto Update Geometry

35. Make sure you are **Editing** the Geometry in RAS Mapper.
36. **Select** the Geometry layer, right-click and choose the "**Auto Update Geometry**" option.
37. Click the "Check All Properties" button to turn on updating for each property.



38. **Plot** a cross section.
39. **Edit a cross section** by moving it around and note the behavior.

    What happens to the elevation profile?

40. **Edit the stream centerline** to change the length of the river between cross sections.

    What happens to the cross section's river station?

41. **Right-click** on the Geometry and choose the "**RAS Geometry Properties**" menu item.

    What options are available for automatically updating the geometry?

3.8 Creak Bank Lines

42. Click on the **Bank Lines** node.

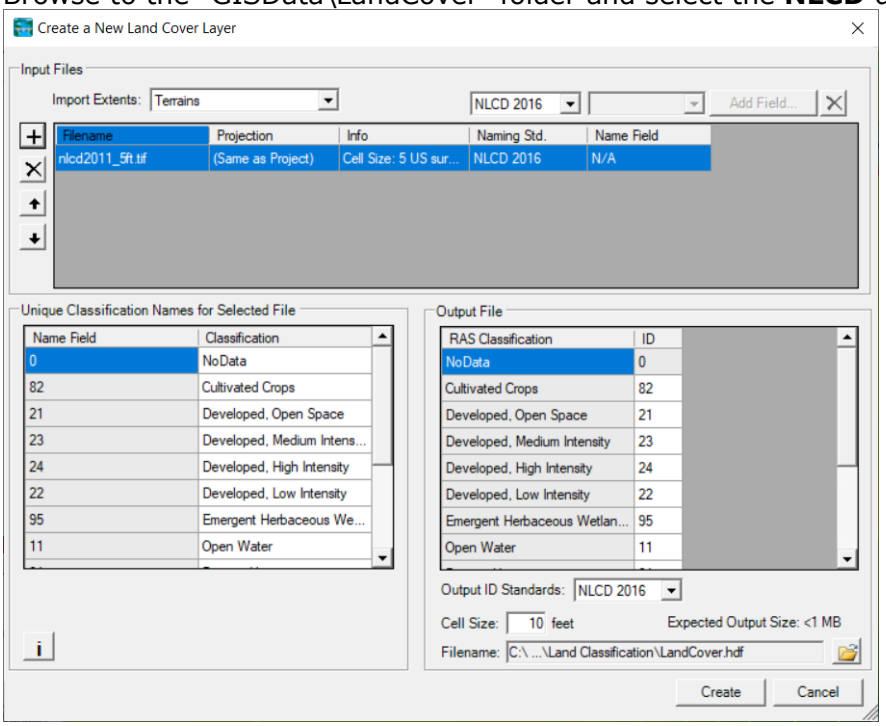
43. Create a line for the Left Bank and Right Bank for each River.

3.9 Create Flow Path Lines

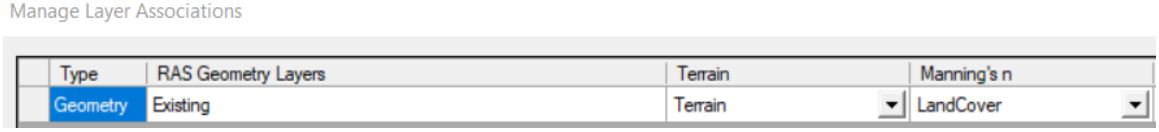
44. Click on the **Flow Path Lines** node.
45. Create a line for the Left Overbank and Right Overbank flow for each River.

3.10 Add Manning n value Information

46. Select the **Project | Create New RAS Layer | Land Cover** Layer menu item
47. Browse to the "GISData\LandCover" folder and select the **NLCD** data.



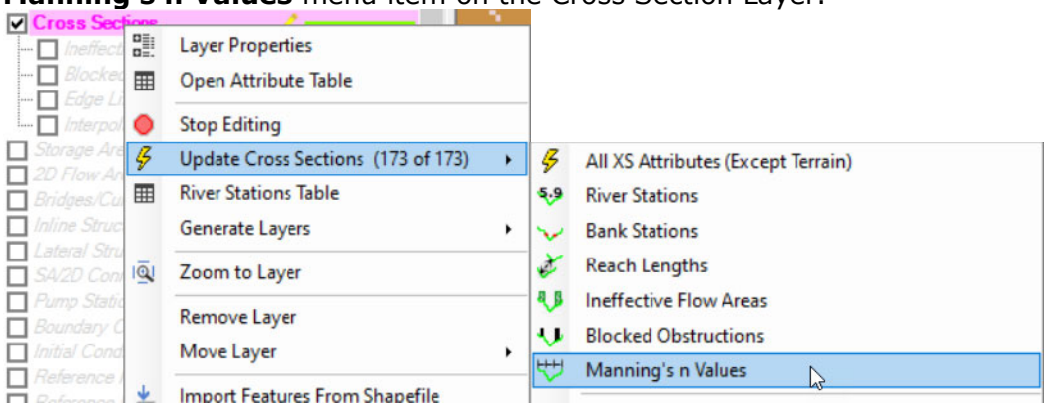
48. Press **Create**.
49. Right-click on the **LandCover** layer and select the **Edit Land Cover Data Table** menu item
50. Provide **Manning's n value** data in the table provided.
51. Verify the LandCover layer is associated with the Geometry using the **Project | Manage Geometry Associations** menu item.



3.11 Extract Manning's n Values

52. Start Editing the Geometry

53. Update the Manning's n values using the **Update Cross Sections | Manning's n Values** menu item on the Cross Section Layer.



54. **Stop Editing**.

4 Geometry Evaluation

55. Close RAS Mapper

56. Open the Geometric Data Editor

57. Open the Geometry file you just created.

58. Investigate each cross section.

5 Geometry Improvement

59. As time allows, improve your geometry. You can do this cross section by cross section from the Geometric Data Editor or from RAS Mapper.

60. Suggestions include:

    a. Improved Manning's n Values

    b. Ineffective Flow Area