

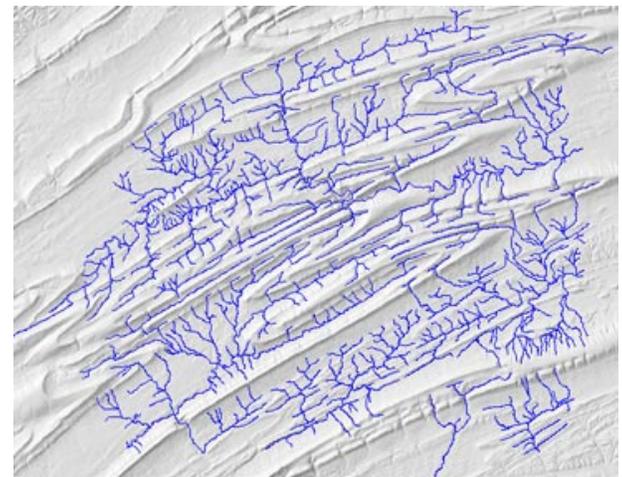
Vector Analysis

Stream Order for Stream Line Networks

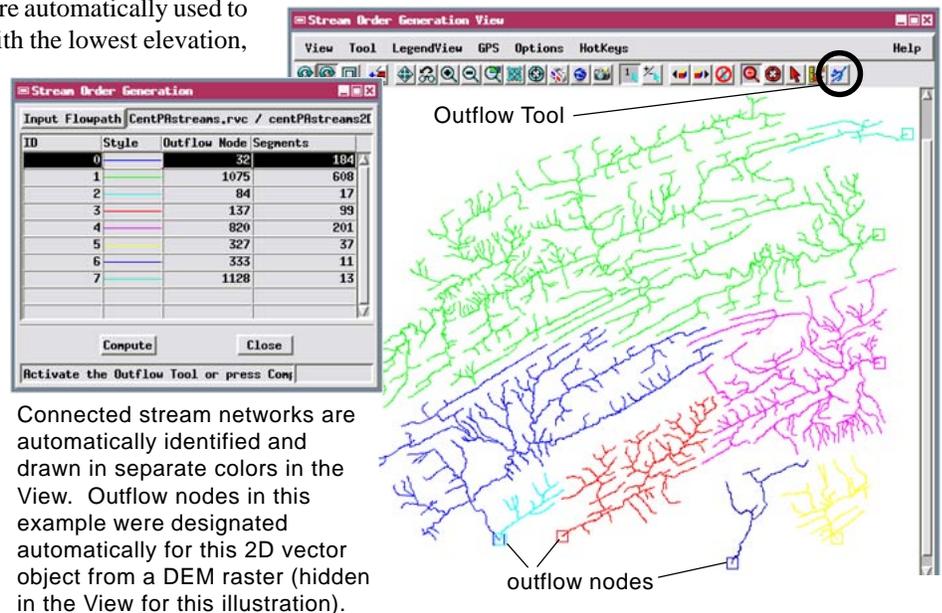
Stream systems are characterized by numerous tributaries that merge downstream, and thus can be represented as networks of segments with a hierarchical structure. Geomorphologists rank the relative importance of stream segments in the network by assigning a numerical *order* value to each segment using one of four ordering systems (Strahler, Horton, Shreve, and Scheidegger). The TNTmips Stream Order Generation process (Geometric / Compute / Stream Orders) automatically determines stream order values for networks of connected lines in a vector object and records these values in a Stream Order table with records attached to the lines. (An explanation of stream order systems can be found in the TNT tutorial entitled *Modeling Watershed Geomorphology*; the Watershed process automatically computes stream orders for the standard flowpaths.)

The Stream Order process automatically analyzes the selected vector object to identify each connected line network. The assigned ID number of each network and the number of lines (segments) it contains are listed in the Stream Order Generation window, and each network is drawn with a separate color in the View window. If you have selected a 3D vector object, which has elevation values for its elements, these values are automatically used to identify for each network the dangling node with the lowest elevation, which is designated the outflow node and indicated by a point symbol in the View. If you have selected a 2D vector object, you are asked whether you want to use an elevation raster object (DEM) to automatically identify outflow nodes. If no DEM is available, you can use the interactive Outflow Tool in the View window to identify the most downstream line-segment in each network to set the outflow nodes. (You can also use this tool to indicate any outlets left unidentified by the elevation-based methods). When an outflow node has been set for each stream network, you can press the Compute button to compute the stream orders.

The stream lines in the input vector must form complete connected networks that trace flow throughout the various watersheds. Wider rivers must be represented by stream centerlines rather than separate lines for each bank, and water bodies represented by polygons (ponds, lakes, and reservoirs) within watersheds must be removed and flow lines connected across their locations to provide continuity in the stream ordering. To ensure their removal, the vector object must contain no polygons, but must have polygonal topology to allow the process to check for their absence. In addition, the process checks that no more than three stream lines join together at a single node (value in the NumLines field of the Internal table for nodes). Before using the Stream Order process you can use the TNTmips Editor to correct the stream line vector object for any of these defects. You can use selection procedures and selection queries to identify problem areas, then automatically step through the selected set to perform any needed edits.



Sample stream networks overlaid on a shaded-relief image of the terrain.



Stream Order Generation

ID	Style	Outflow Node	Segments	184
0		32		
1		1075		608
2		84		17
3		137		99
4		820		201
5		327		37
6		333		11
7		1128		13

Stream Order Generation View

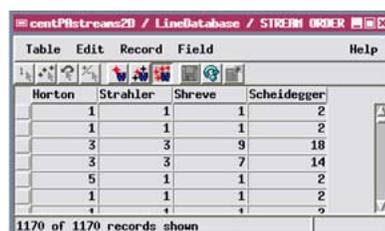
Outflow Tool

outflow nodes

Connected stream networks are automatically identified and drawn in separate colors in the View. Outflow nodes in this example were designated automatically for this 2D vector object from a DEM raster (hidden in the View for this illustration).

Strahler Order

- 1
- 2
- 3
- 4
- 5



Horton	Strahler	Shreve	Scheidegger
1	1	1	2
1	1	1	2
3	3	9	18
3	3	7	14
5	1	1	2
1	1	1	2
1	1	1	2

1170 of 1170 records shown

The Stream Order table created by the process records stream order values for each line. Stream lines in the illustration above are Theme-Mapped by Strahler order.