Creating Watersheds and Stream Networks

Neeraj Rajasekar

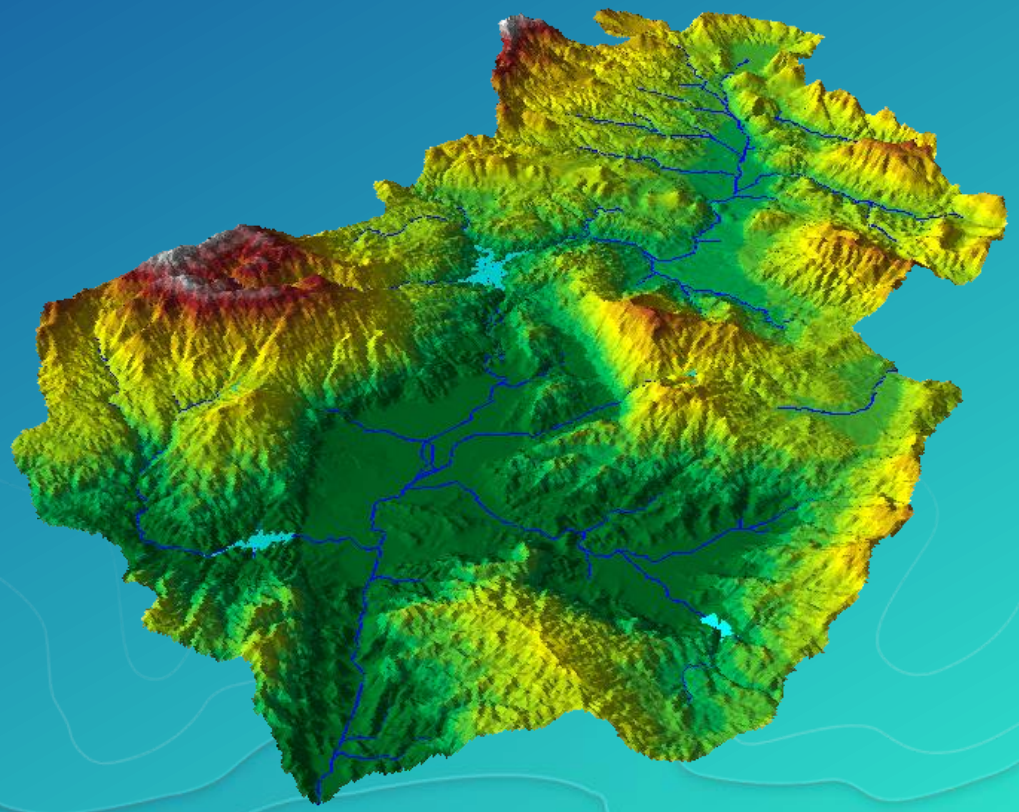
Workshop overview

- Data
- Understanding the tools
- Demo

Elevation Data

- **Types**
  - **DEM : Digital Elevation Model “bare Earth”**
  - **DSM : Digital Surface Model**

- **Data Structure**
  - **Raster**
  - **TIN**
  - **Terrain**



Where do you get DEM data?

- **Sources**
  - **Global**
    - **SRTM and HydroSHEDS - 30m and 90m**
    - **ASTER - 30m** *(challenging for surface runoff modeling)*
  - **United States NED 30m, 10 m, and higher**
  - **Available in ArcGIS Online**

- **LiDAR, IfSAR**

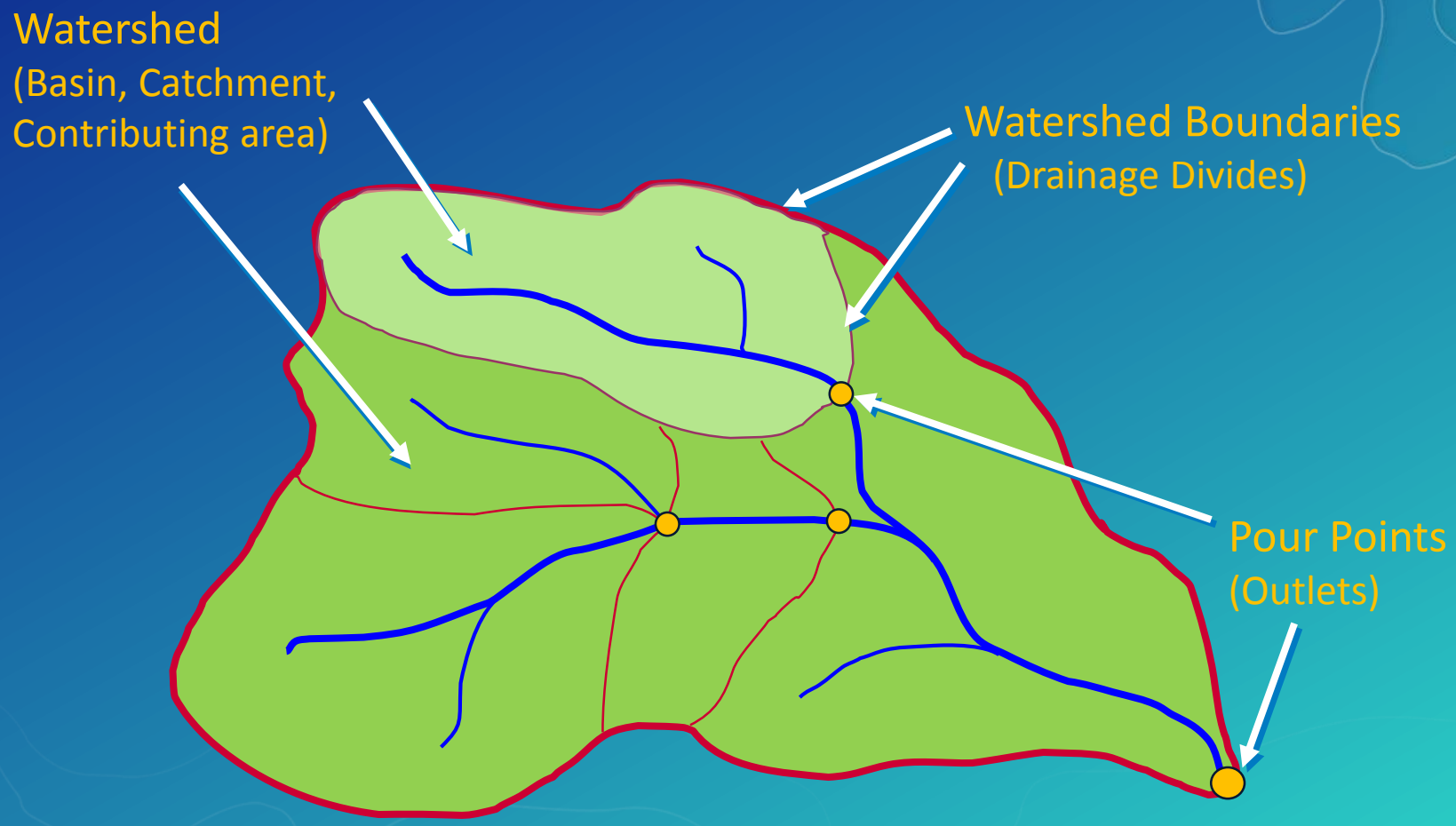
- **Generated photogrammetrically**

- **Created with interpolation tools**
  - **especially TopoToRaster**

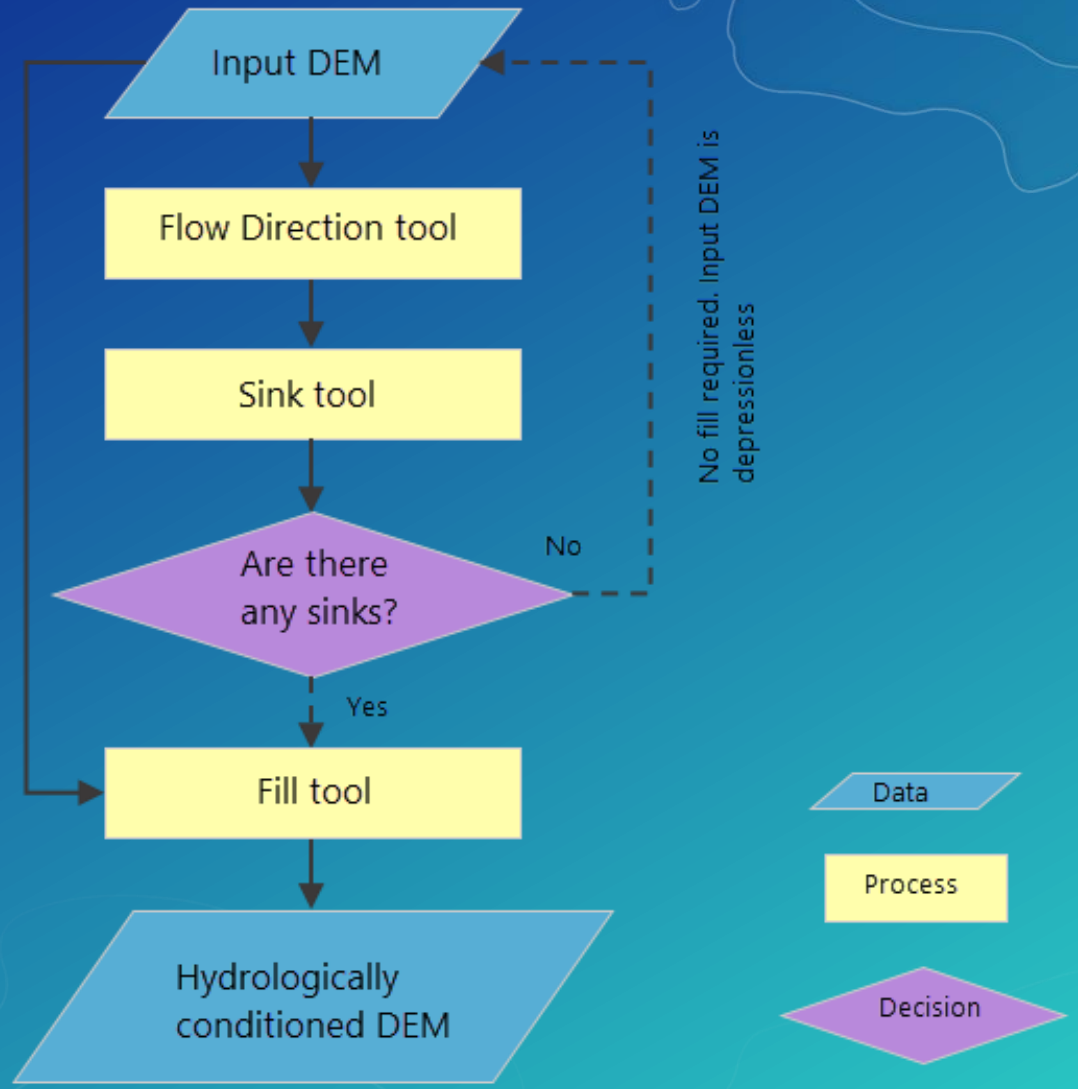
DEM Construction Considerations

- **Extent**
- **Map Projection** (use equal area)
- **Cell size and Resolution**
  - ***Must be appropriate for the landscape and scale being modeled.***
- **Source elevation data** (accuracy, density, sampling)
- **Interpolation techniques** (use TopoToRaster)
- **Special consideration for contour input**
  - **TopoToRaster interpolator – works well with contours, creates hydrologically correct DEM**

Drainage System



Function Processing

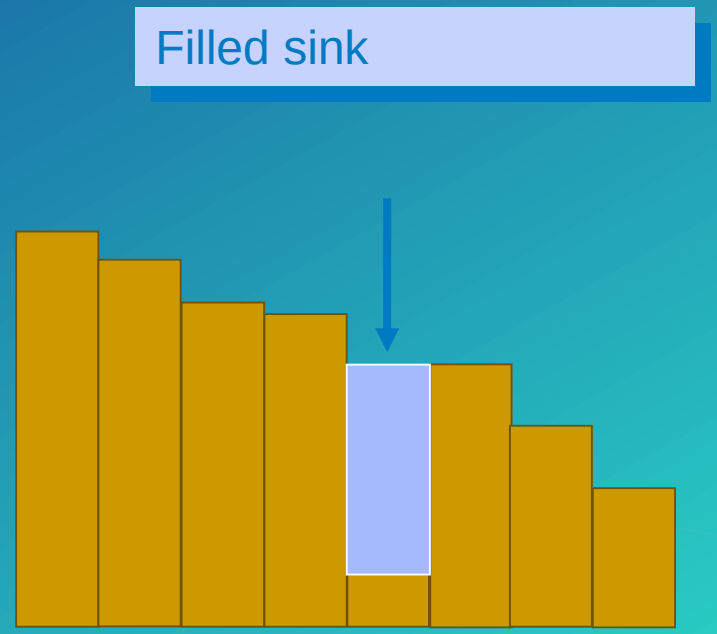


Hydrologically Correct DEM

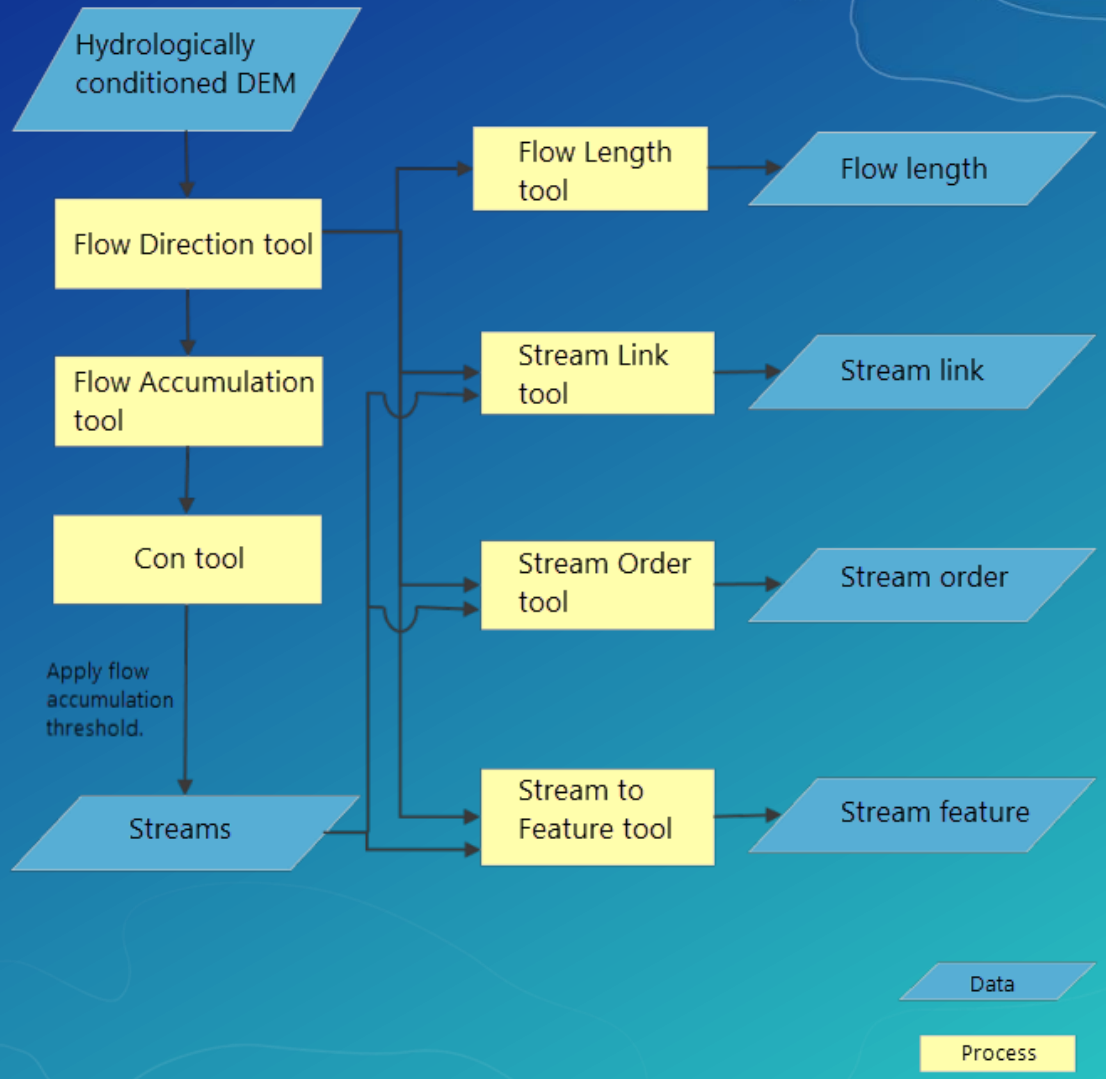
- Sinks
  - Some sinks are real
    - Do not fill in the Great Salt Lake
- Streams in the correct place?
  - To burn or not to burn…
- Watershed boundaries in the correct place?
  - To fence or not to fence…

DEM Errors – Sinks and Spikes

- Sinks: when sinks are (or are not) sinks
- E.g. Lakes, depressions, karst and glacial landscapes
  - Global fill
  - Dealing with internal basins
  - Selective fill
    - Depth
    - Area



Function Processing



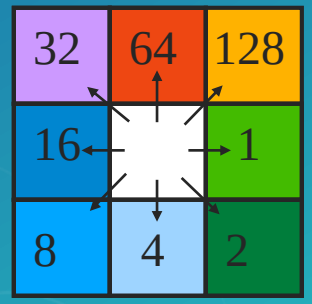
Flow Direction

78	72	69	71	58	49
74	67	56	49	46	50
69	53	44	37	38	48
64	58	55	22	31	24
68	61	47	21	16	19
74	53	34	12	11	12

Elevation

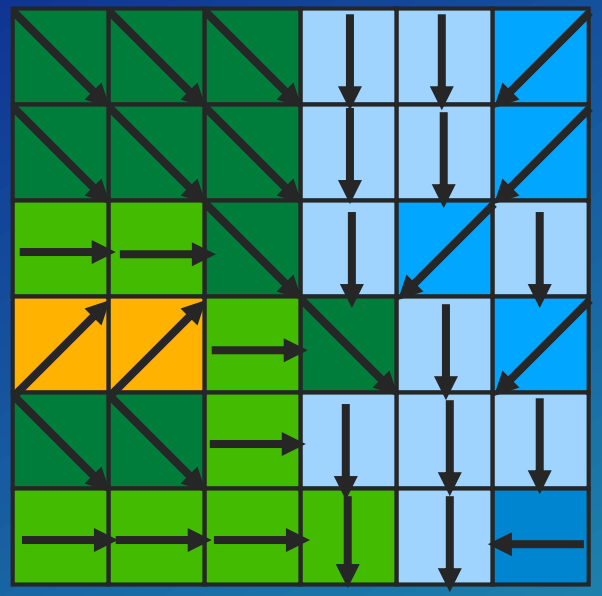
2	2	2	4	4	8
2	2	2	4	4	8
1	1	2	4	8	4
128	128	1	2	4	8
2	2	1	4	4	4
1	1	1	1	4	16

Flow Direction



Direction Coding

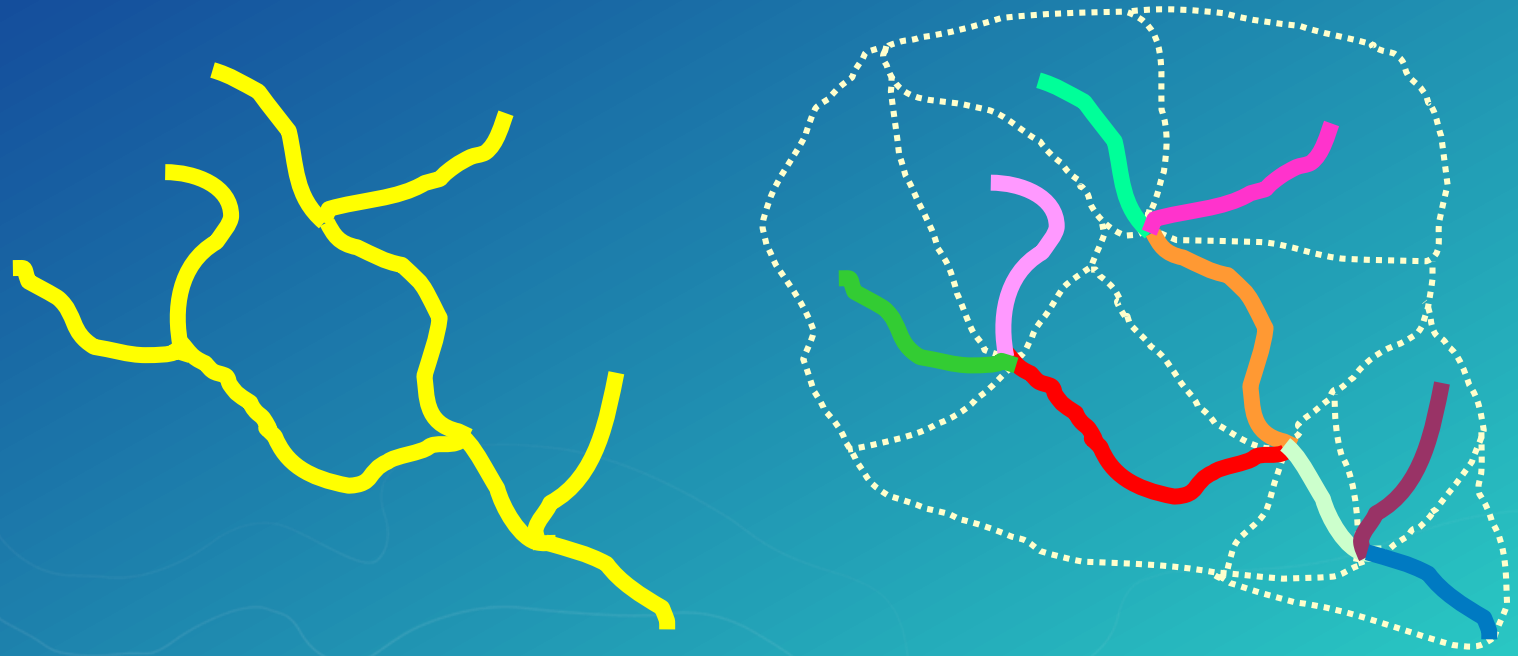
Flow Accumulation



0	0	0	0	0	0
0	1	1	2	2	0
0	3	7	5	4	0
0	0	0	20	0	1
0	0	0	1	24	0
0	2	4	7	35	2

Stream Link

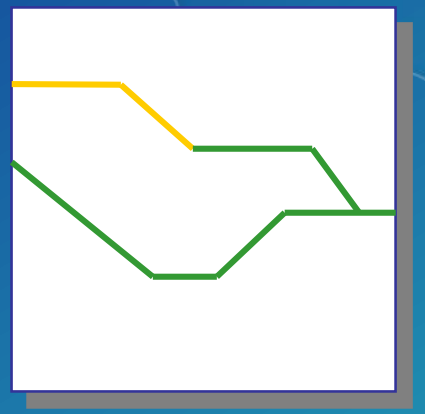
- Assign a unique value to each stream segment.
  - Can be used as input to Watershed tool



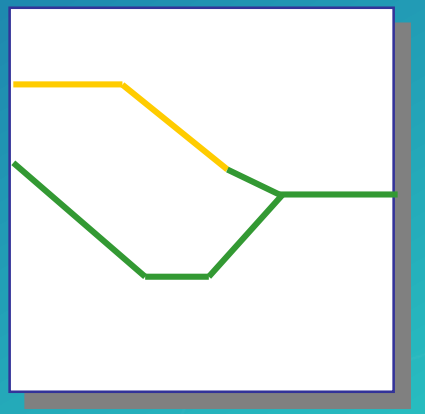
Creating Vector Streams

Value = No Data

1	1				
		1	2	2	
2			2	2	2
	2	2			

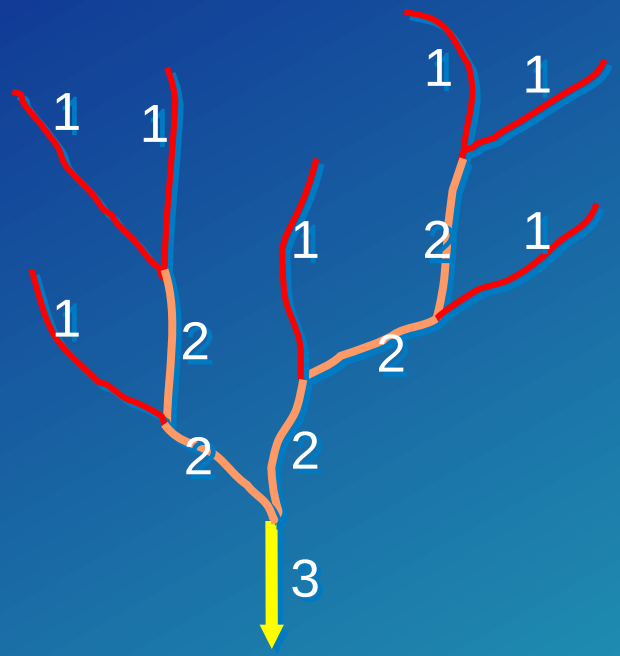


StreamToFeature

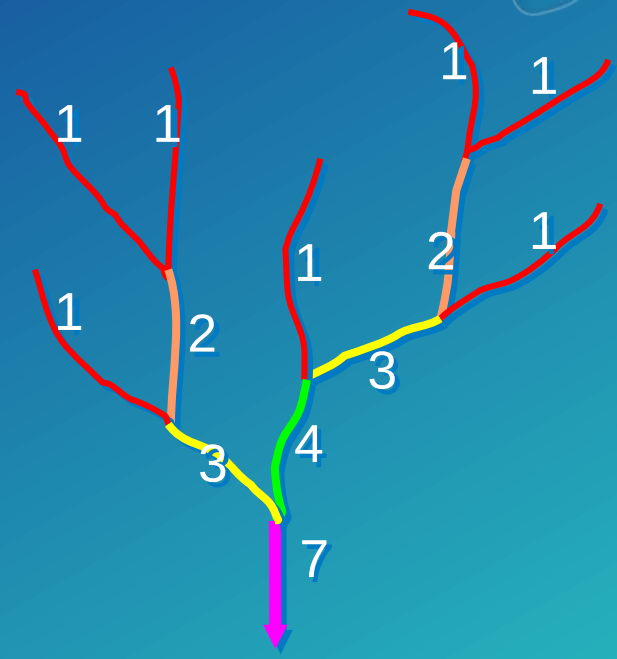


RasterToFeature

Stream Ordering



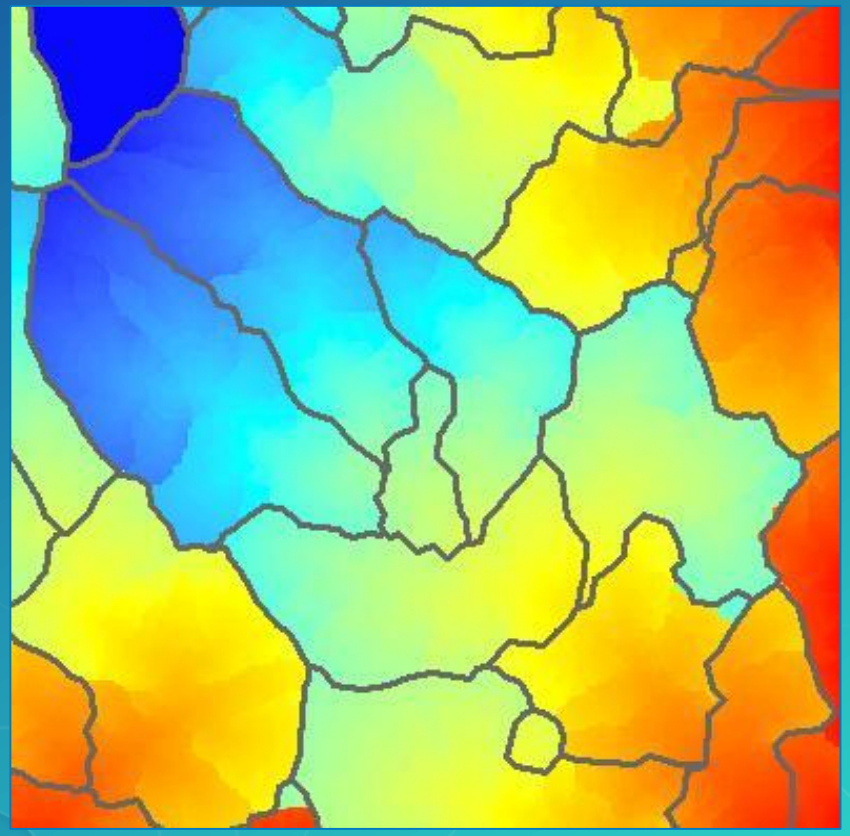
Strahler



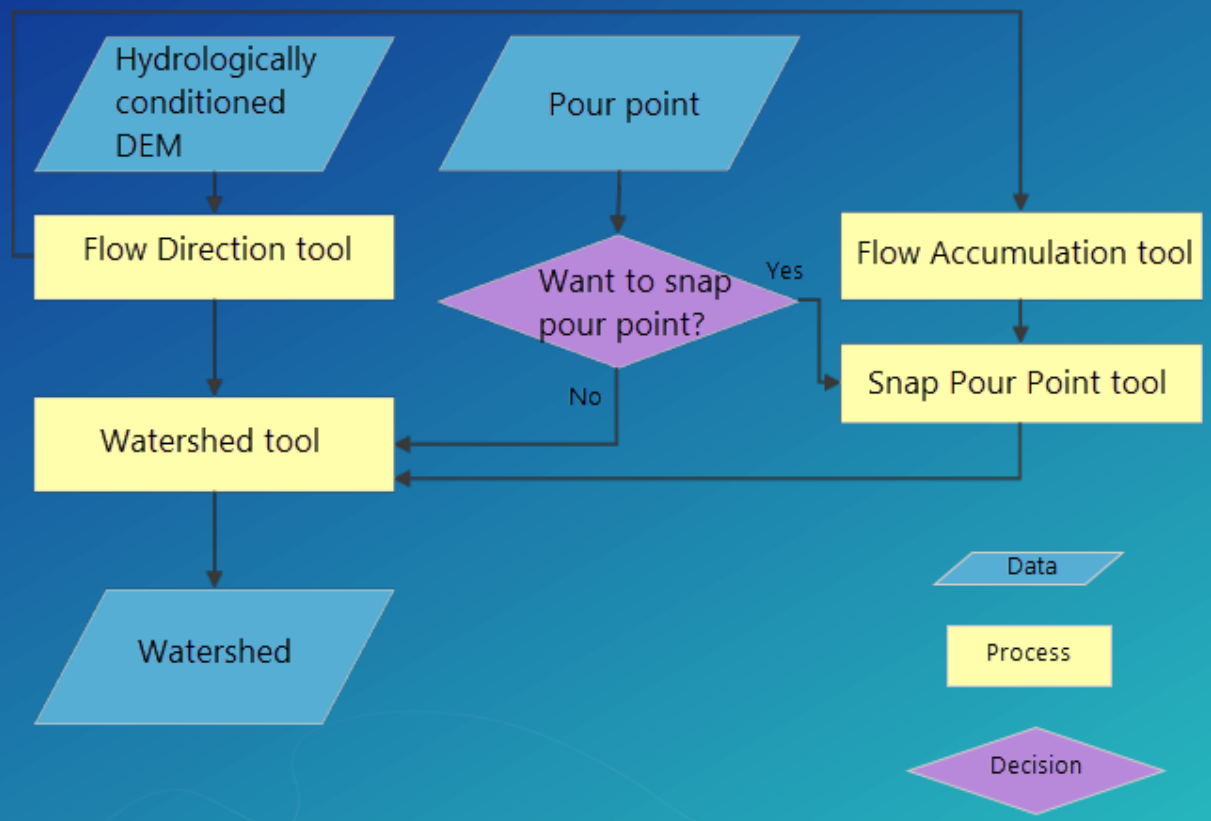
Shreve

Flow Length

- Calculate the length of the upstream or downstream flow path from each cell.

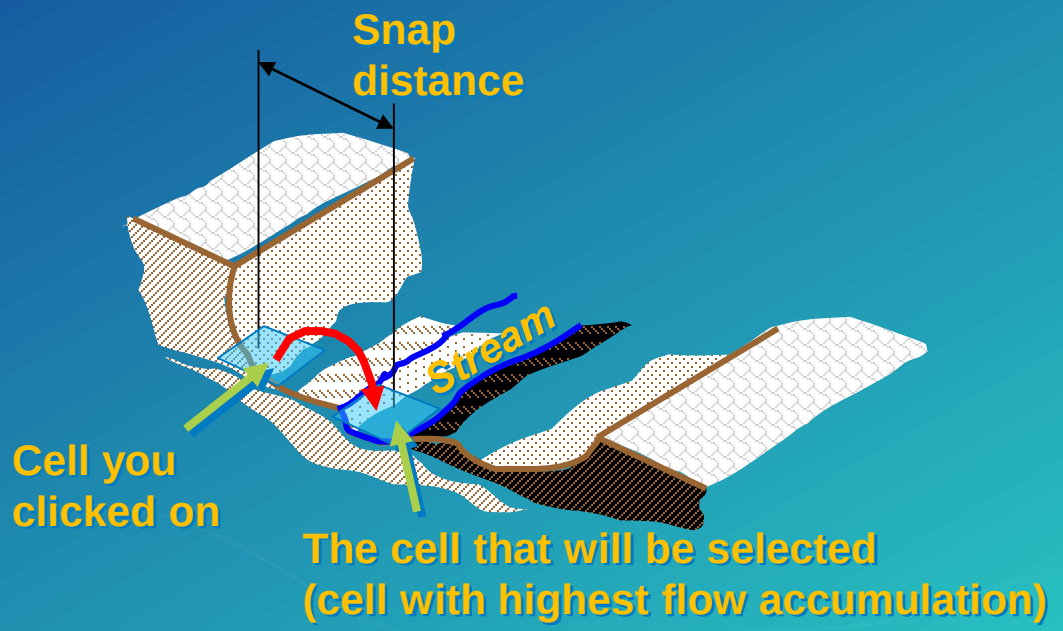


Function Processing



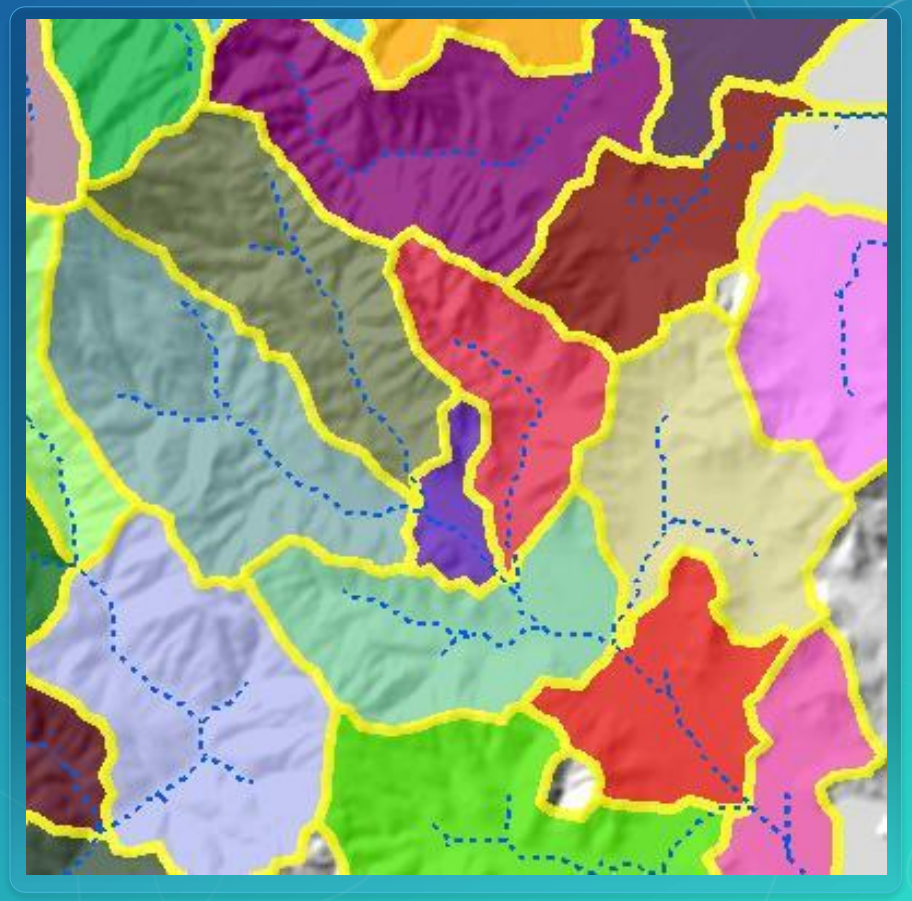
Snapping Pour Points

- **Use the Snap Pour Point tool to snap the “pour point” of a watershed to the cell of highest flow accumulation within a neighborhood.**
  - **Prevents accidental creation of tiny watersheds on channel side slopes.**



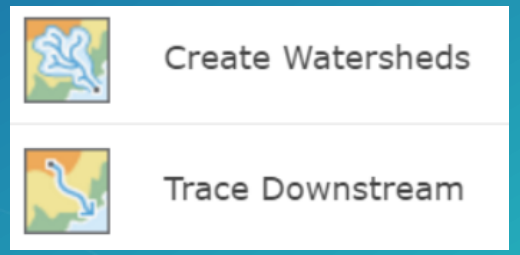
Watershed Delineation

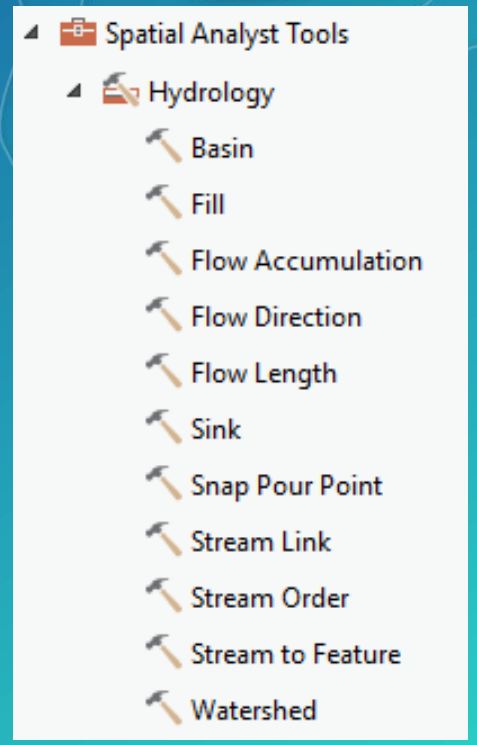
- Identify the contributing area to a cell or group of cells.



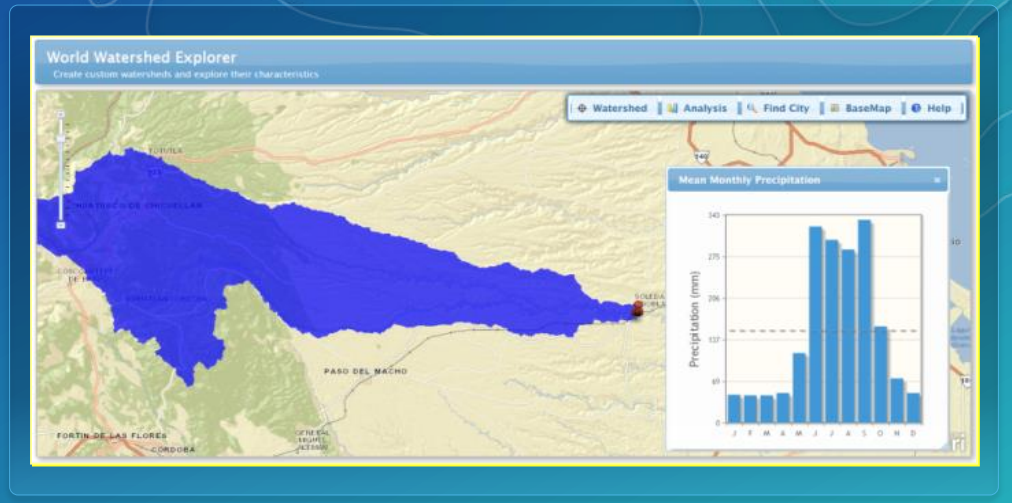
Where is this functionality?

- Tools in the Spatial Analyst Toolbox
- Sample tools, models, workflows and Arc Hydro tools are available in GeoNet and Geoprocessing tool gallery
- Web hosted Watershed Delineation and Trace Downstream in:
  - ArcMap and Pro as Ready to User Services
  - ArcGIS Online Analytics
  - Web AppBuilder





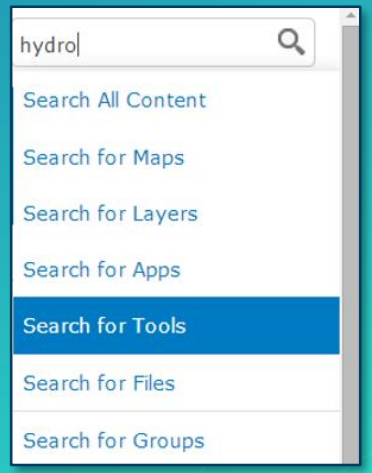
Hosted Hydro Analysis Services



- Watershed Delineation Service
- Trace Downstream Service
- Profile Service
- Elevation Summary Statistics

Source

US – based upon 30 m elevation and vectors derived from NHDPlus V2
Global – based upon 90 m elevation from HydroSHEDS
New contributions welcome through Community Maps…



https://blogs.esri.com/esri/arcgis/2014/07/11/introducing-esris-world-elevation-services/

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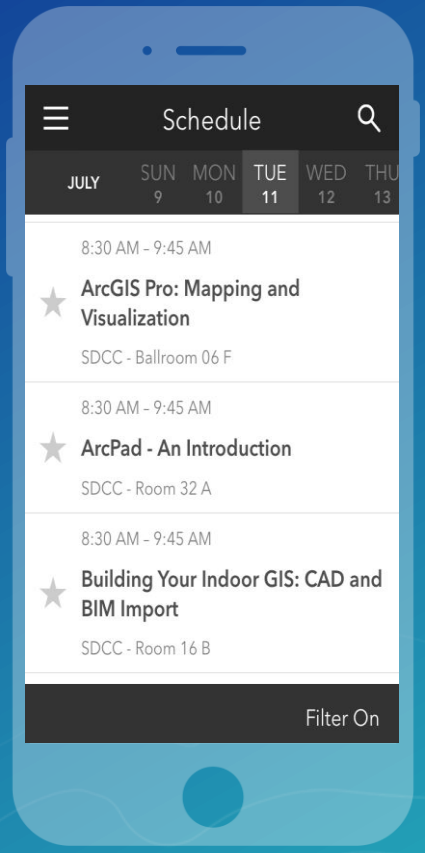
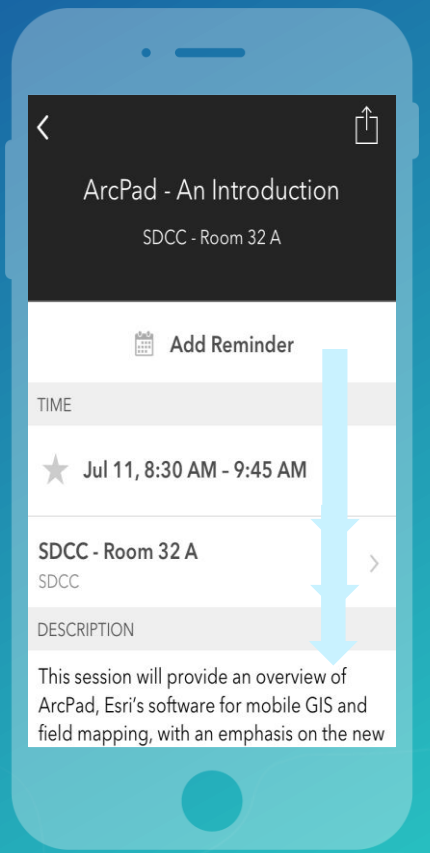
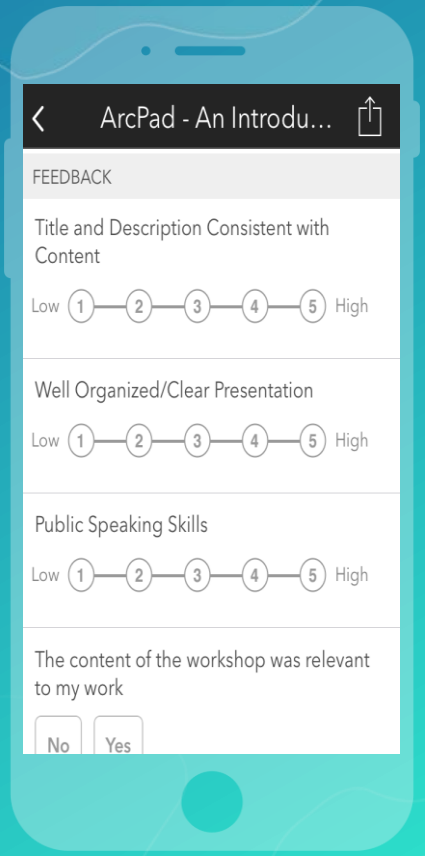


Scroll down to find the survey



Complete Answers and Select "Submit"

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