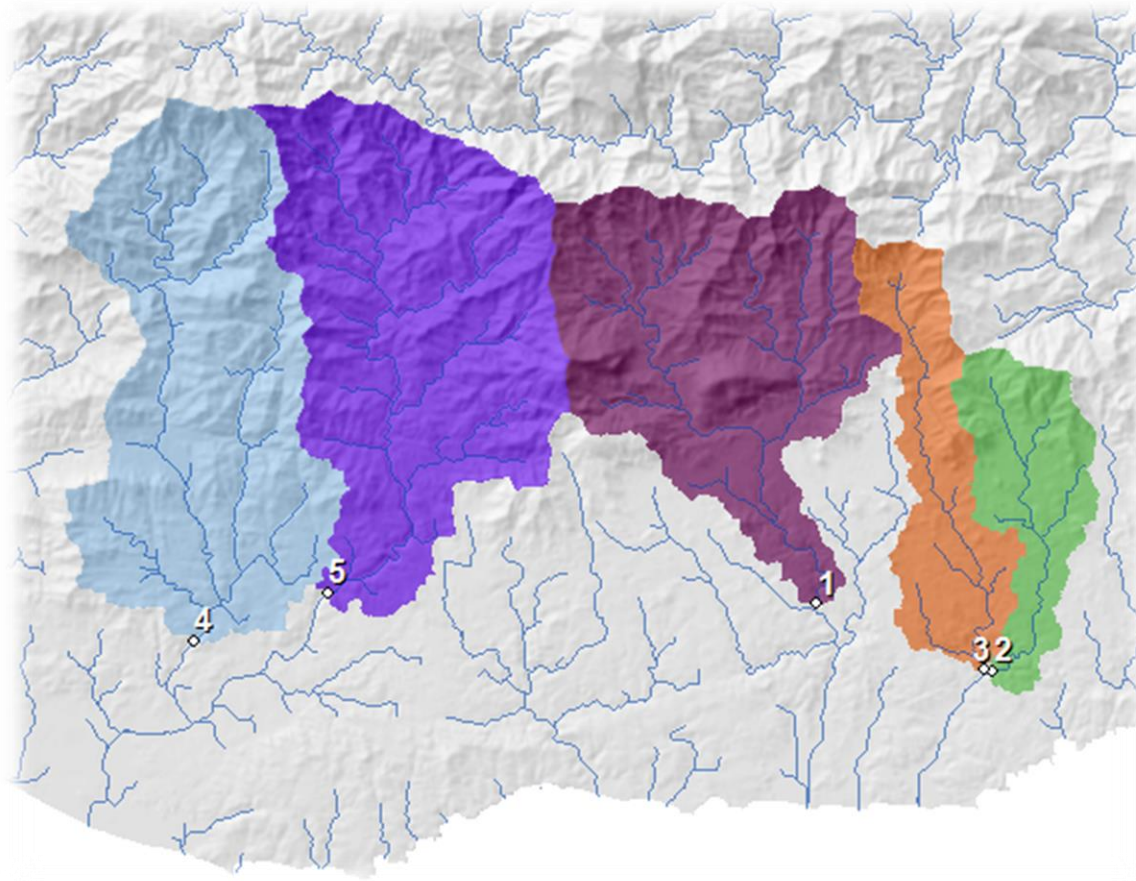


# Project 2: Sierra Costera Site Analysis

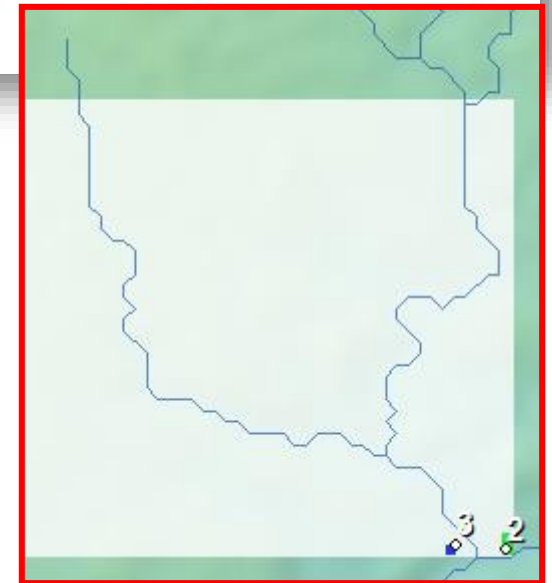
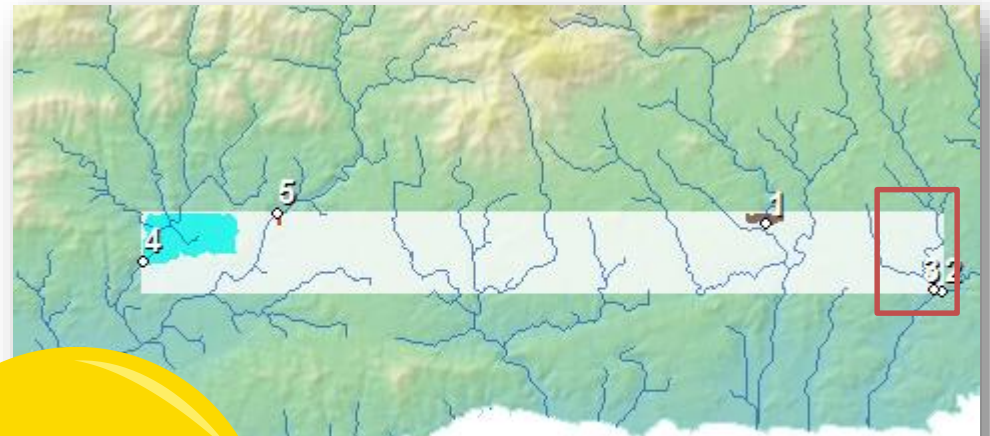
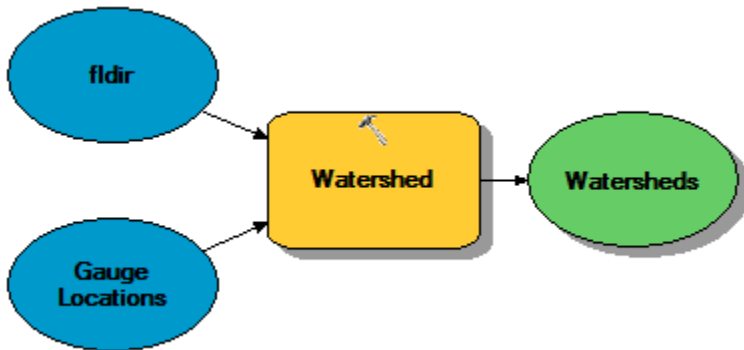
ENVIRON 761

Geospatial Applications for  
Conservation & Land Management

# Part 2: Upstream & Terrain analyses

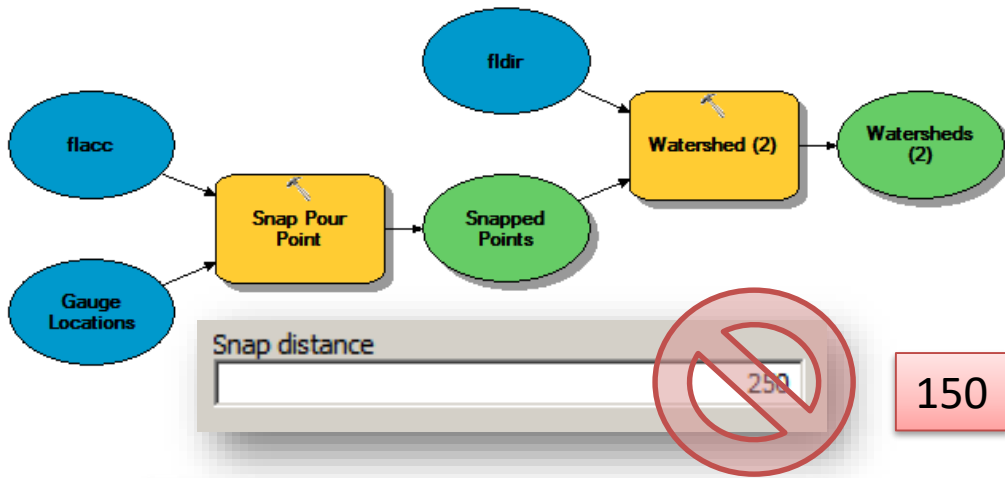


# Calculating upstream areas



- Set processing extent
- Snap pour points

# Calculating upstream areas

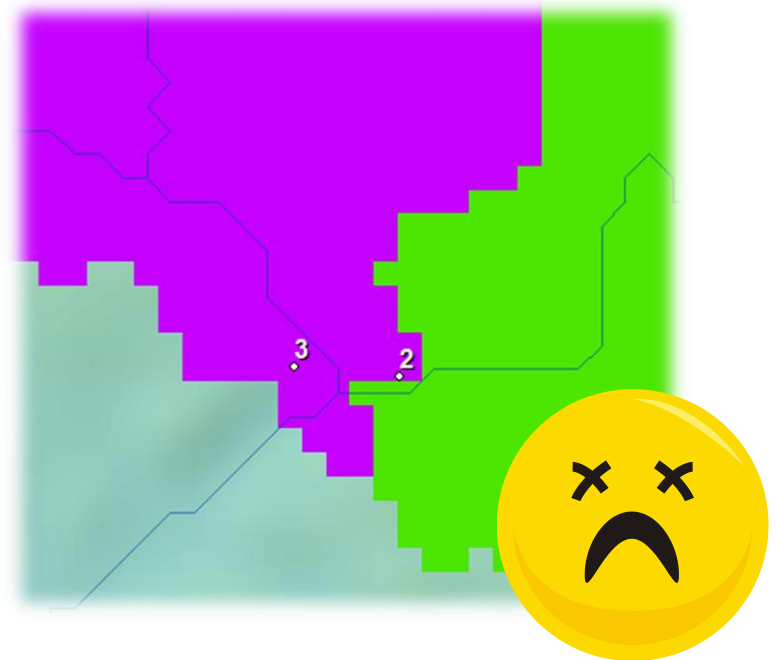
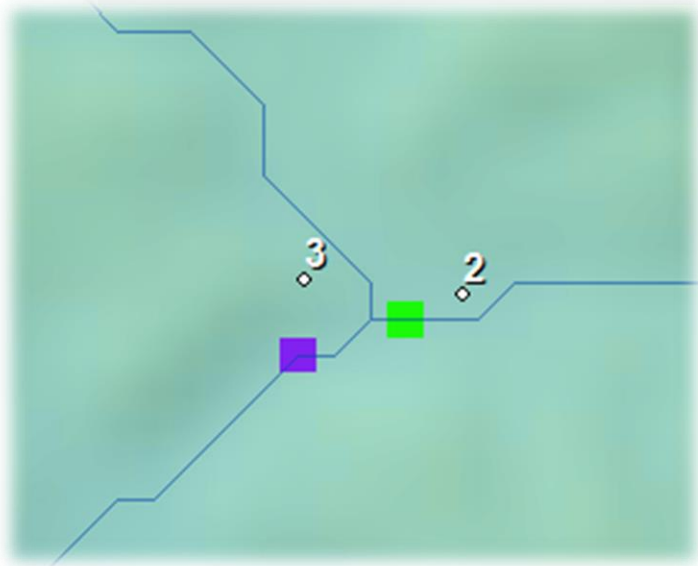


Snap distance

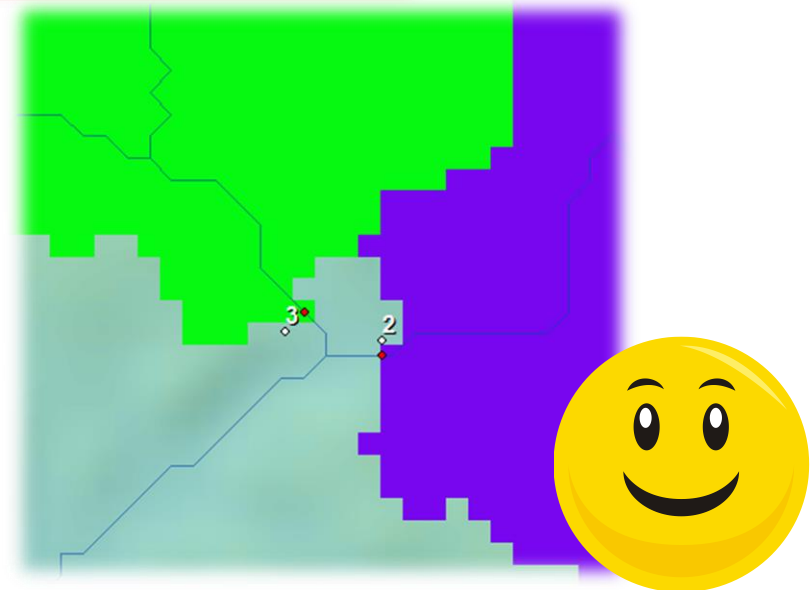
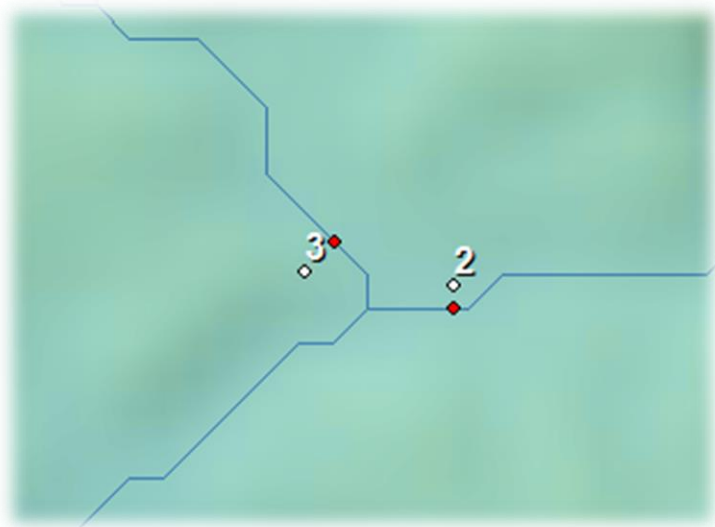
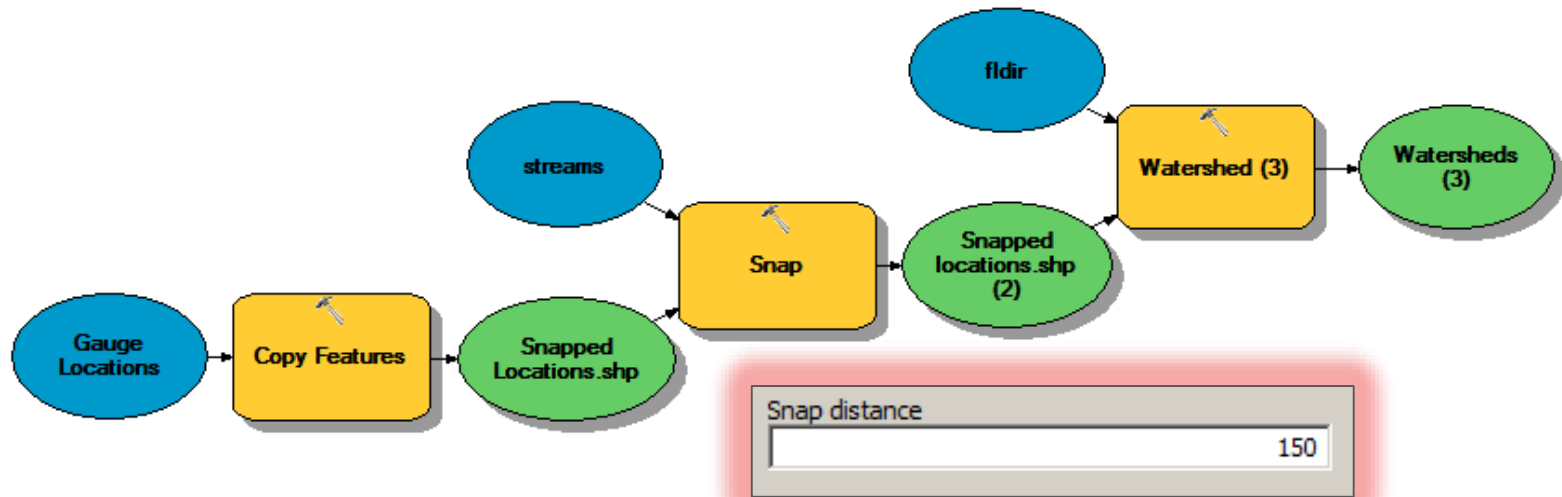
250

150

A larger snap distance increases the chance that you miscalculate the upslope area



# Calculating upstream areas



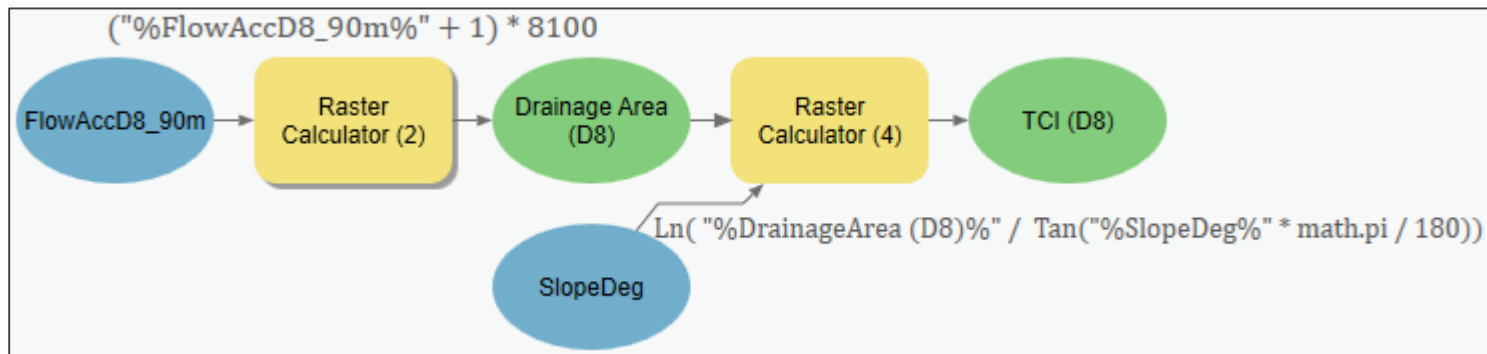
# Terrain Analyses

- Topographic Convergence Index (TCI)
  - ArcGIS (D-8) vs. TarDEM (D-inf)
- Topographic Position Index
  - Fine scale vs. Coarse Scale
- Slope position
  - Fine scale vs. Coarse Scale
- Landforms
  - *Combines* fine and coarse scale

# Topographic Convergence Index

$$\text{TCI} = \ln(a/\tan(b))$$

- $a$  = Drainage Area (from flow accumulation)
  - Add '1' (to include the cell itself), and
  - Multiply by area of a cell
- $\tan(b)$  =  $\tan(\text{slope})$ 
  - Convert from *degrees* to *radians*:  $\text{slope} * \text{math.pi}/180$
  - Compute tangent of this:  $\tan(\text{slope} * \text{math.pi}/180)$



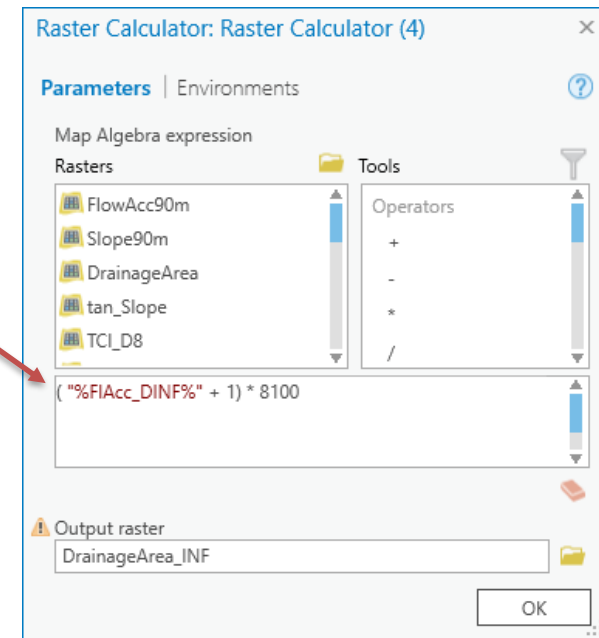
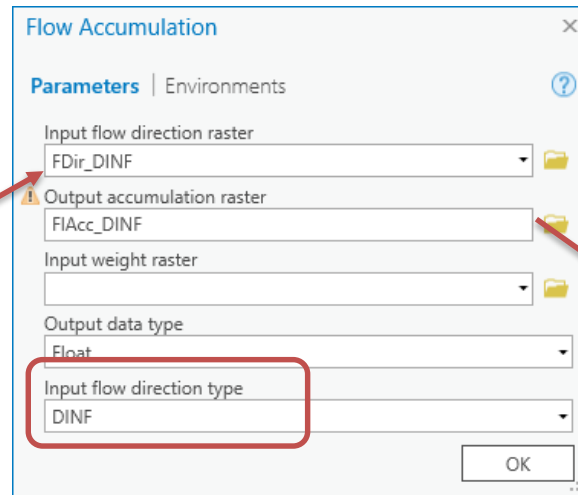
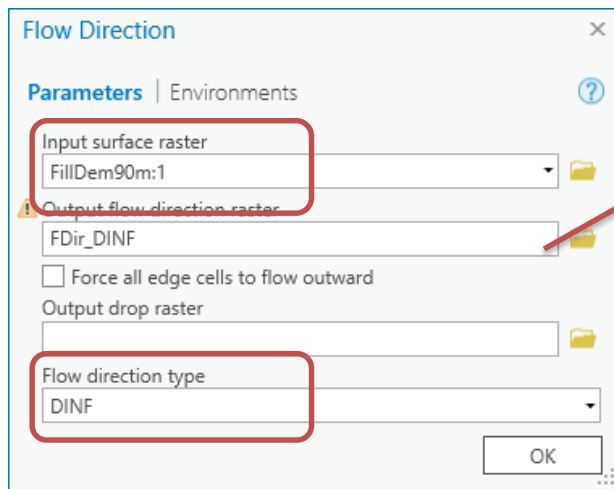
# Topographic Convergence Index

- D-8 vs D-INF

*D8 flow accumulation is too coarse*

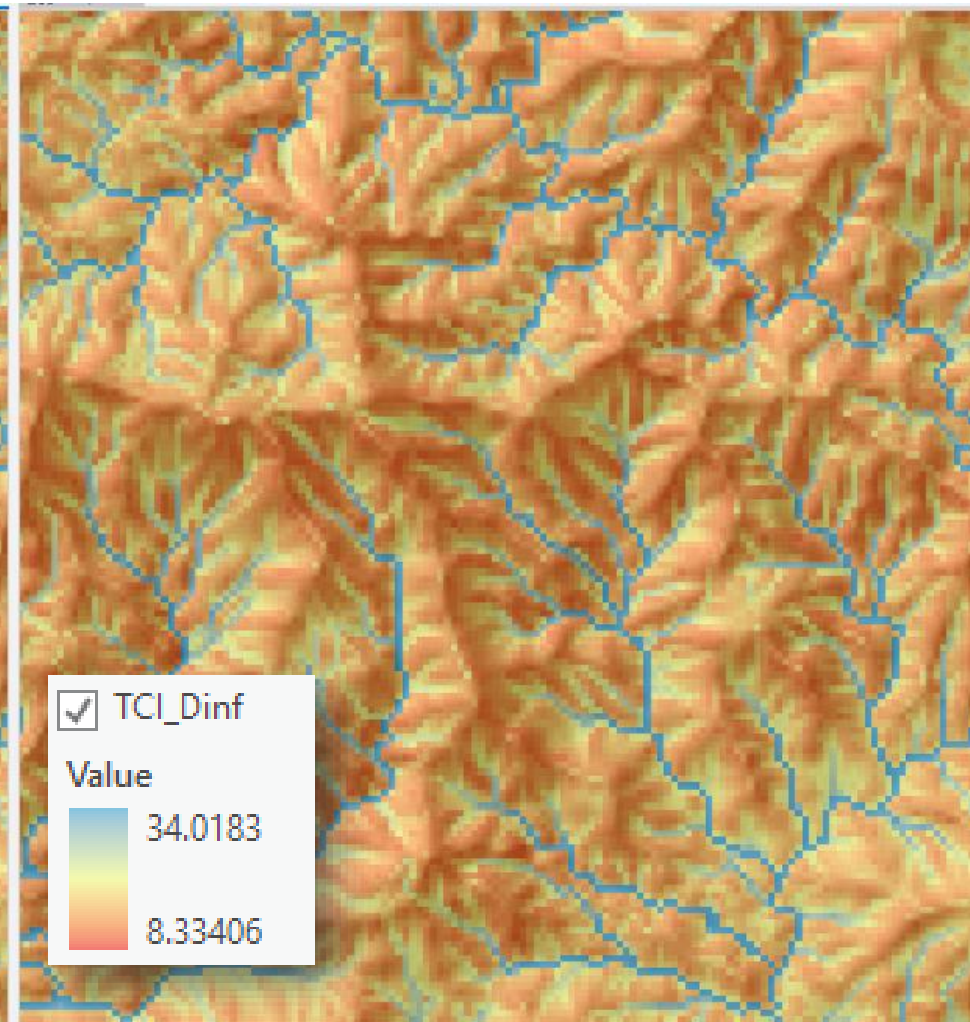
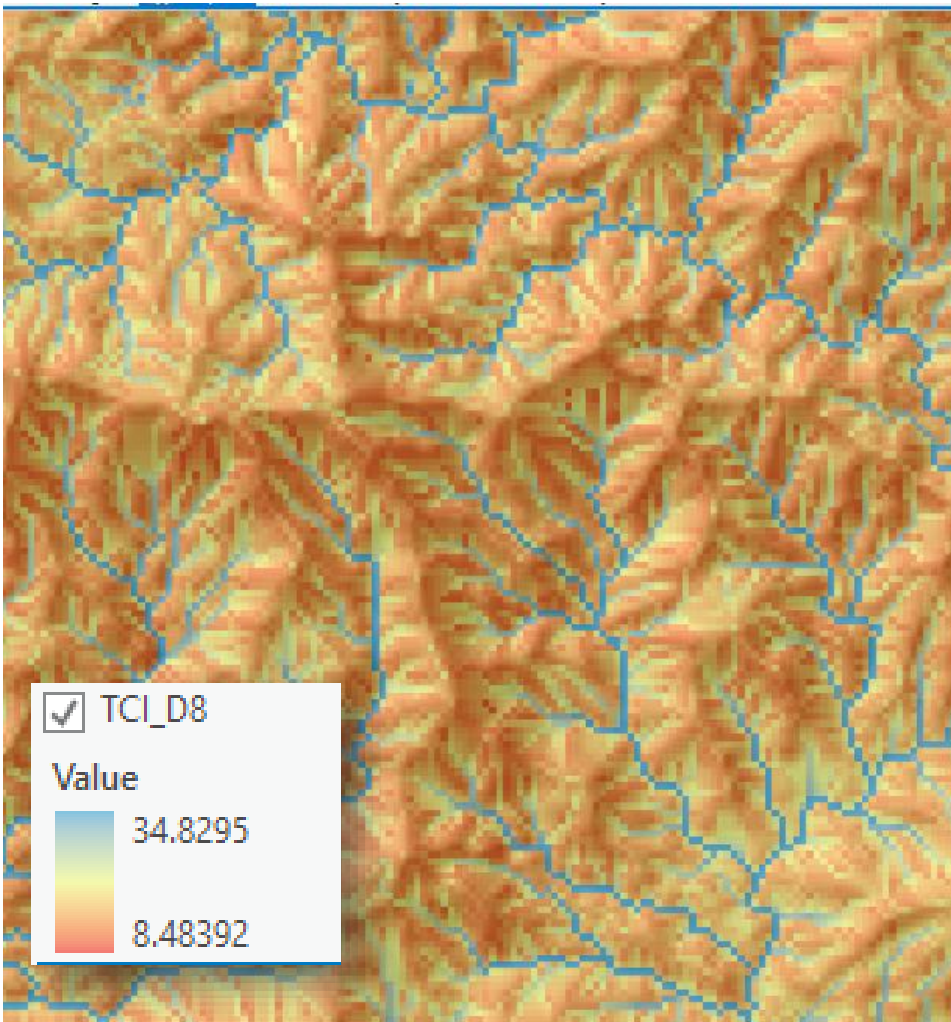
– Compute DINF flow direction & accumulation

- Convert DINF accumulation to drainage area, as before





# Topographic Convergence Index



# Topographic Position Index

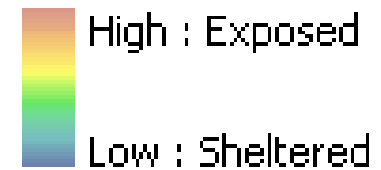
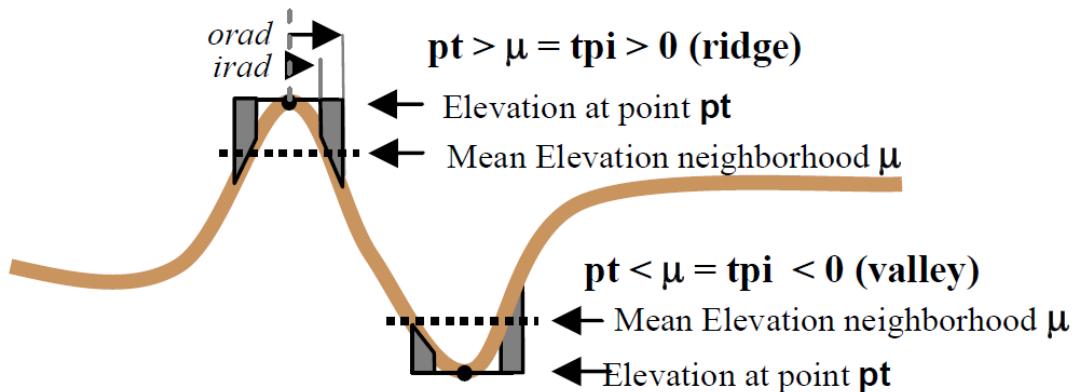
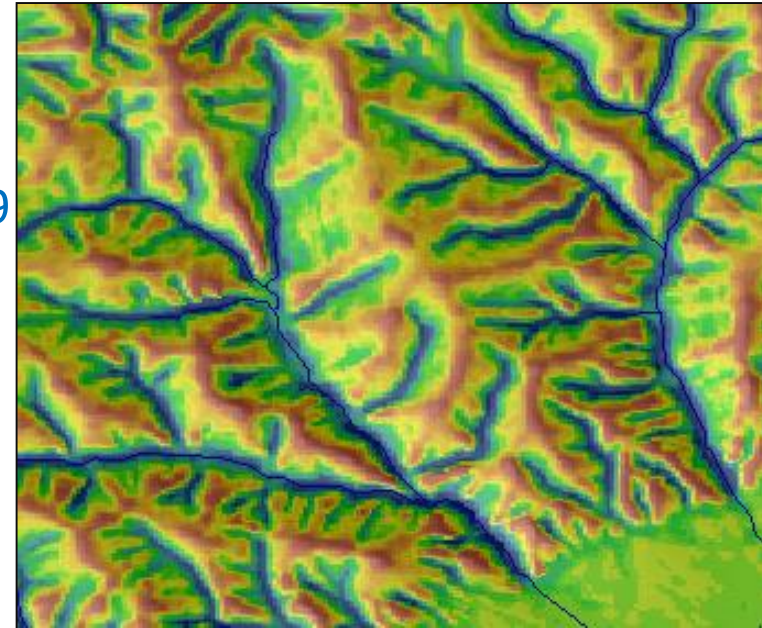
50	45	50
30	30	30
8	10	10

Mean elev (3x3):

$$= (50+45+50+30+30+30+8+10+10)/9$$

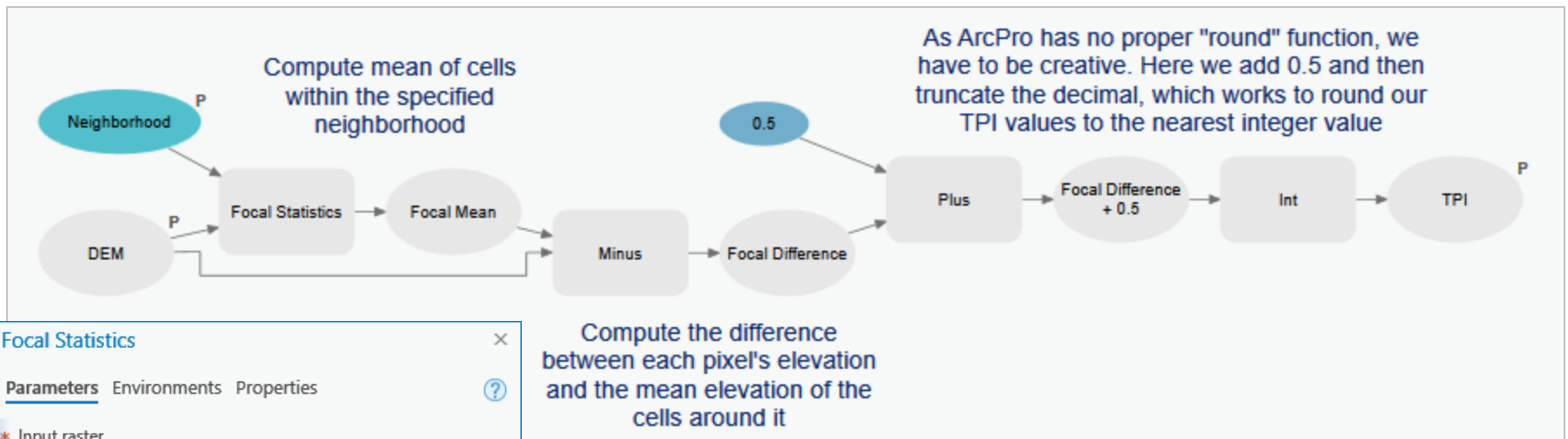
$$= 29.2$$

$$30 - 29.2 = 0.8 = \textit{exposed (convex)}$$



# Topographic Position Index

- Importance of scale



**Focal Statistics**

Parameters Environments Properties

\* Input raster: DEM

Output raster: tmp\_tpi1

Neighborhood: Annulus

Inner radius: 5

Outer radius: 10

Units type: Cell

Statistics type: Mean

Ignore NoData in calculations

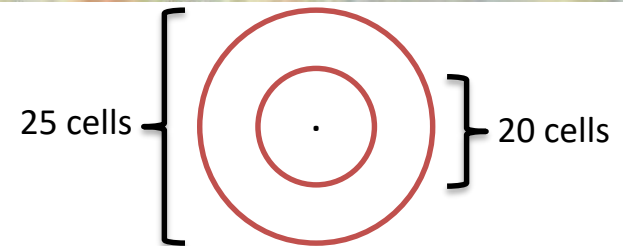
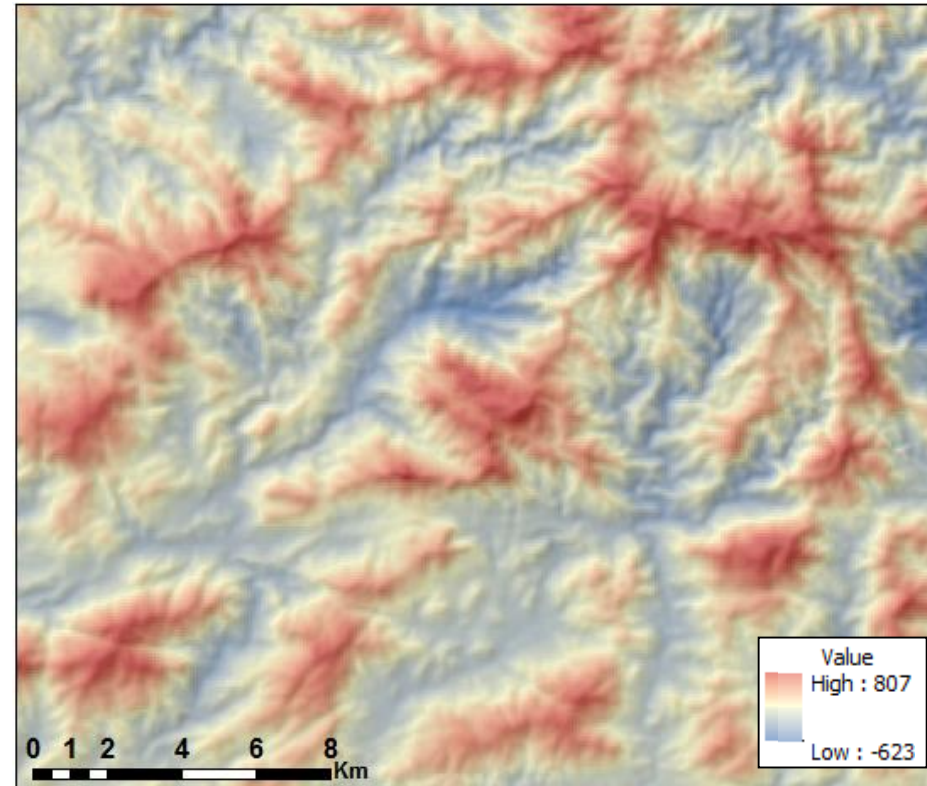
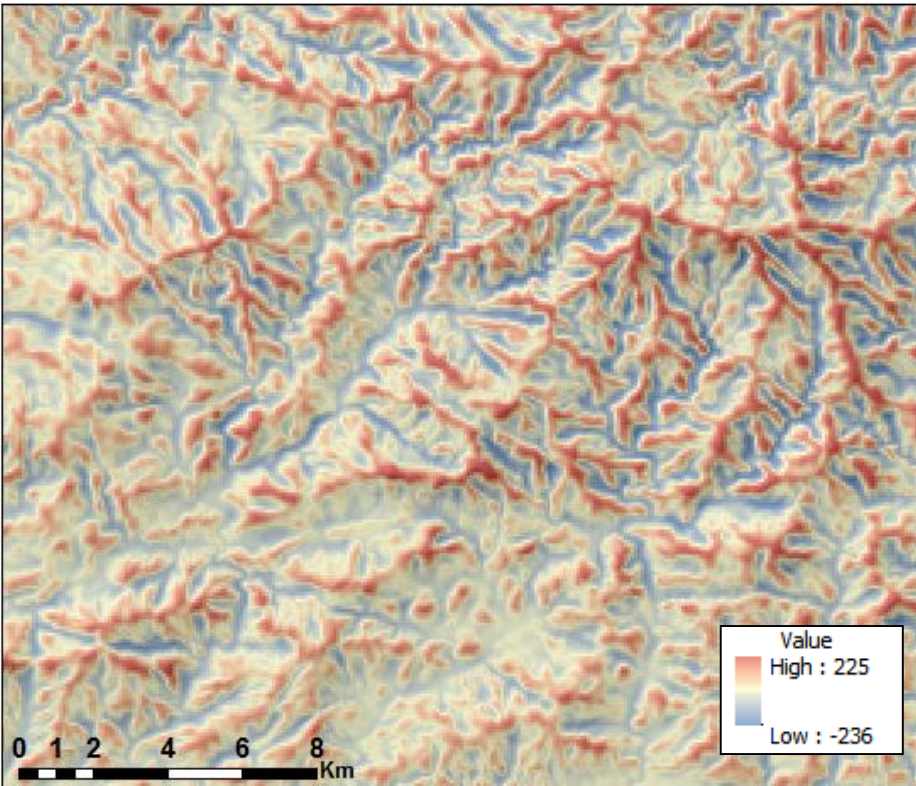
OK

Small values captures fine topographic features  
Large value captures large...

# Topographic Position Index

Fine scale TPI

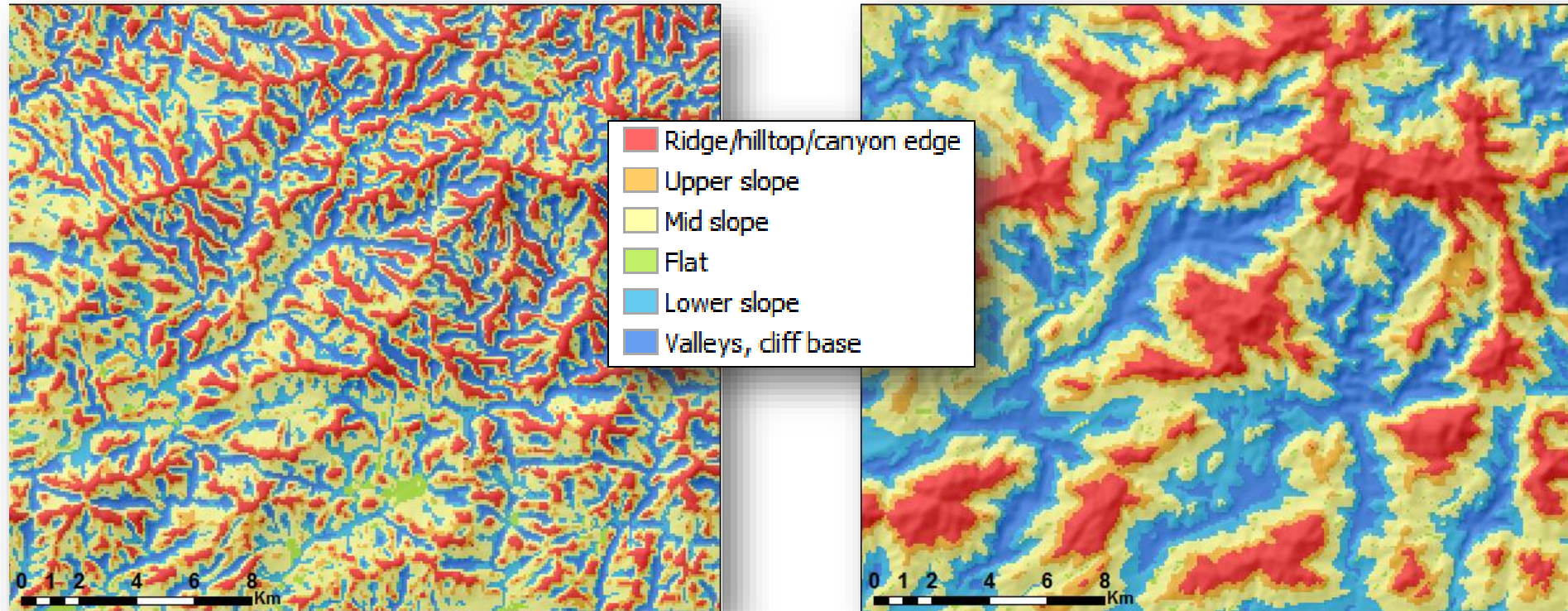
Coarse scale TPI



# Slope Position

Fine

Coarse



Class	Description Breakpoints
1	ridge $> +1$ STDEV
2	upper slope $> 0.5$ STDV $\leq 1$ STDV
3	middle slope $> -0.5$ STDV, $< 0.5$ STDV, slope $> 5$ deg
4	flats slope $\geq -0.5$ STDV, $\leq 0.5$ STDV, slope $\leq 5$ deg
5	lower slopes $\geq -1.0$ STDEV, $< 0.5$ STDV
6	valleys $< -1.0$ STDV

# Landforms

- Canyons, deeply incised streams
- Midslope drainages, shallow valleys
- Upland drainages, headwaters
- U-shaped valleys
- Plains
- Open slopes
- Upper slopes, mesas
- Local ridges/hills in valleys
- Midslope ridges, small hills in plains
- Mt tops, high ridges

