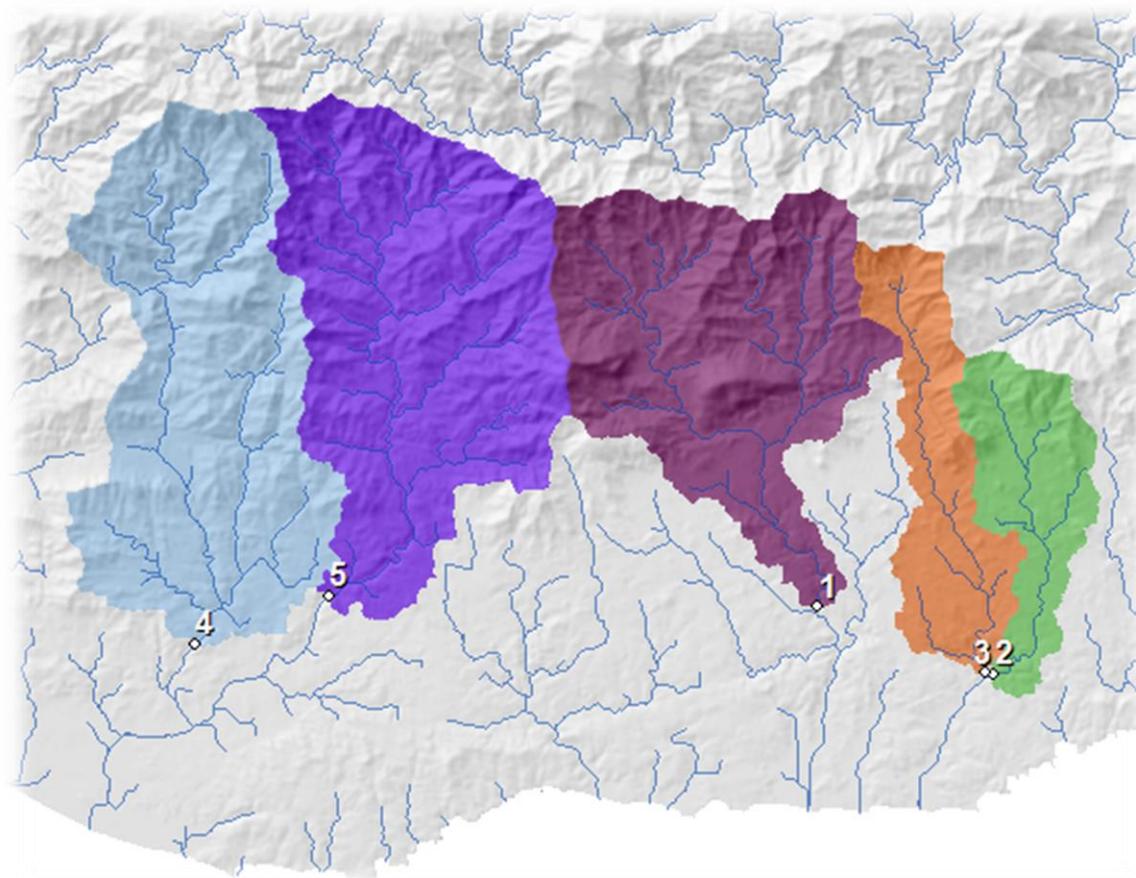


Project 2: Sierra Costera Site Analysis

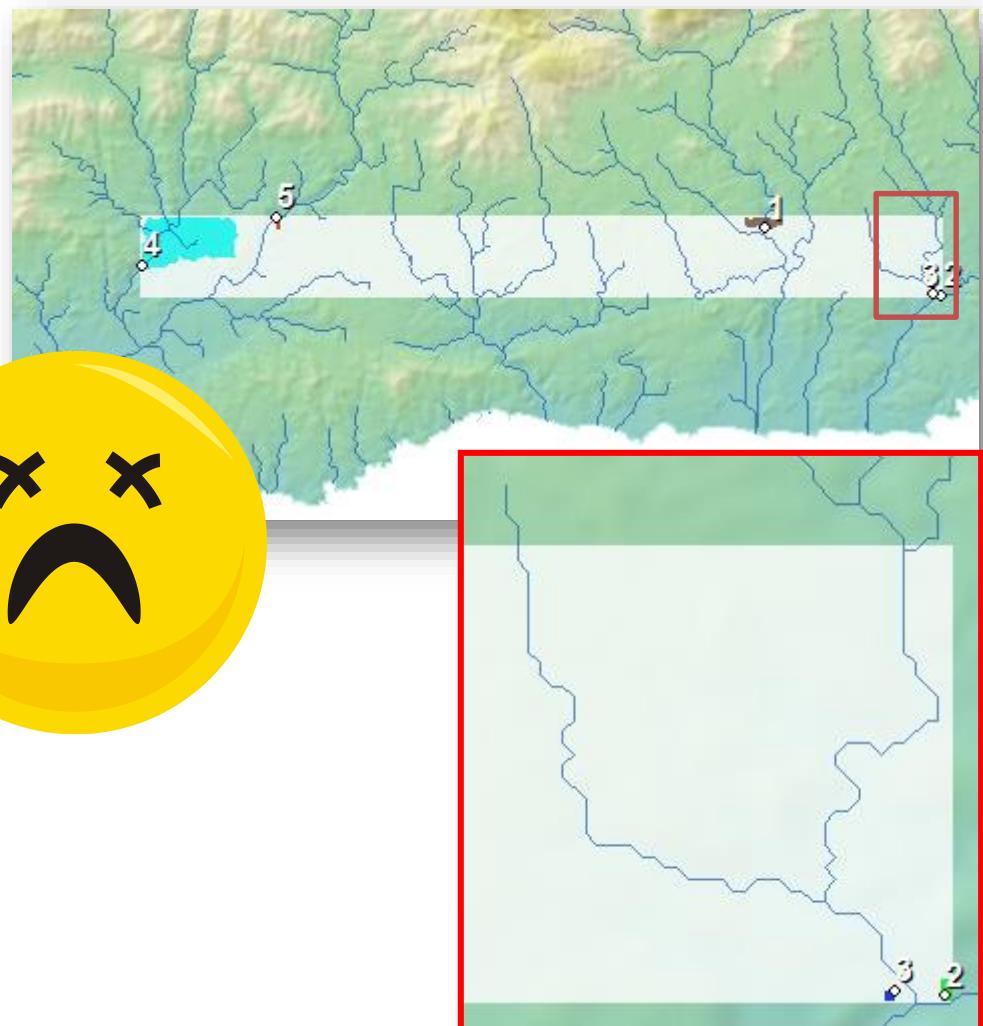
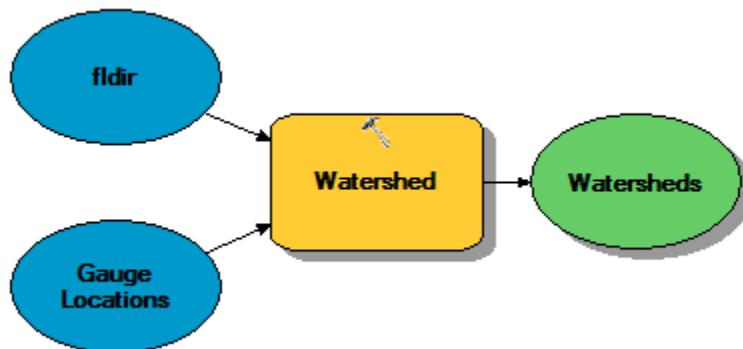
ENVIRON 761

Geospatial Applications for
Conservation & Land Management

Part 2: Upstream & Terrain analyses

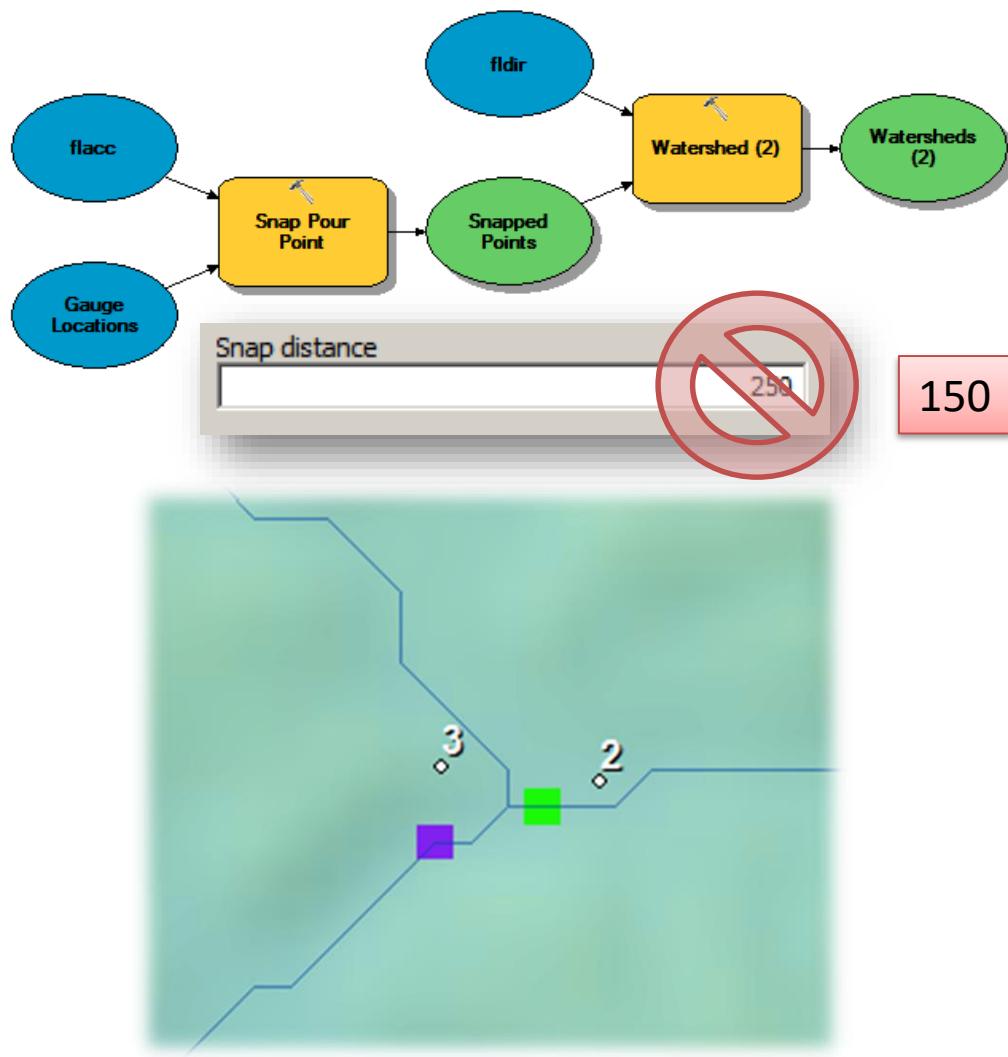


Calculating upstream areas

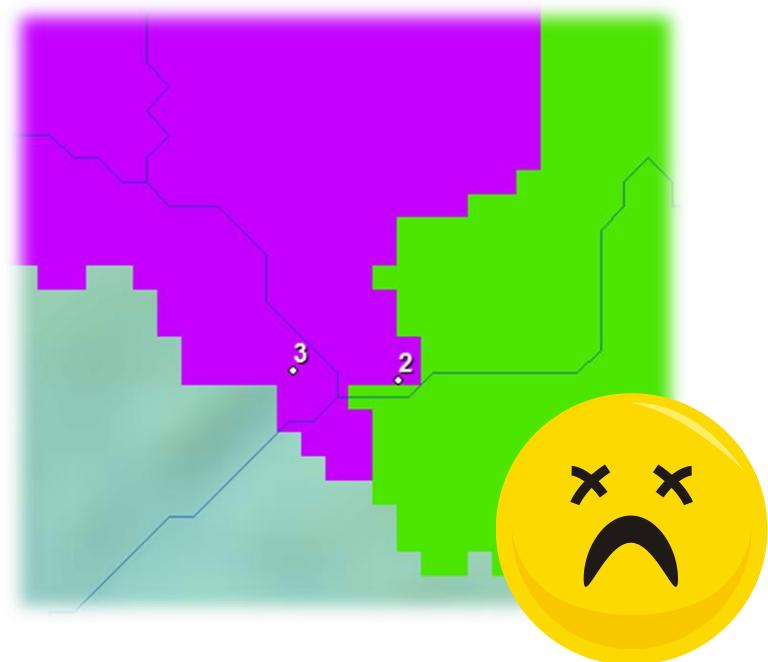


- Set processing extent
- Snap pour points

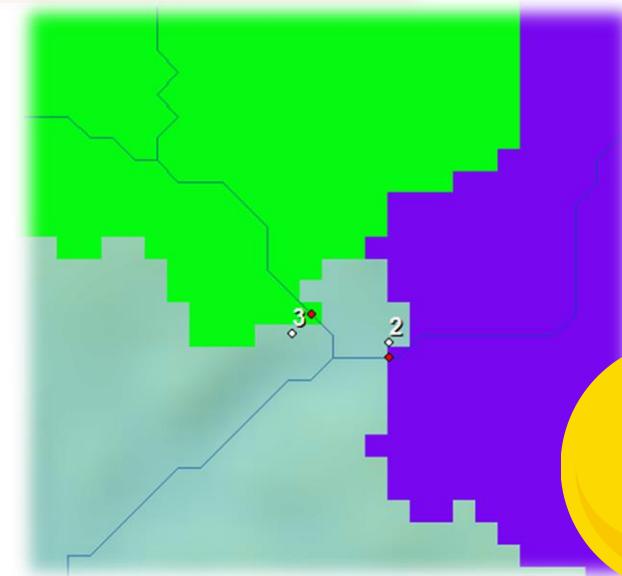
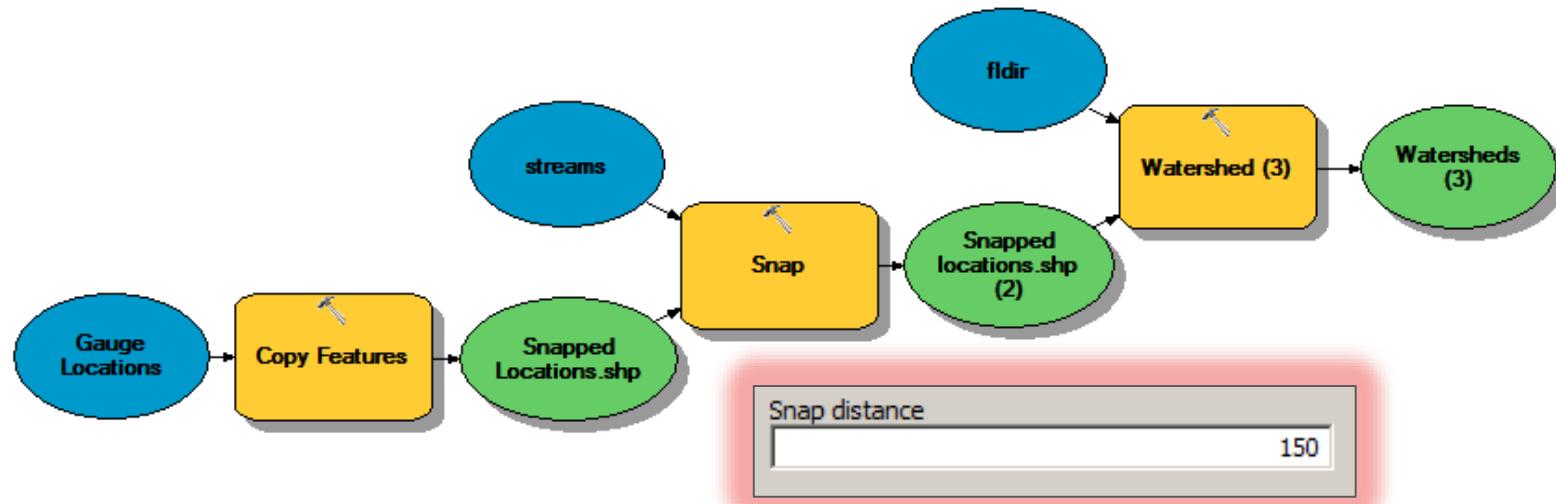
Calculating upstream areas



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



Calculating upstream areas



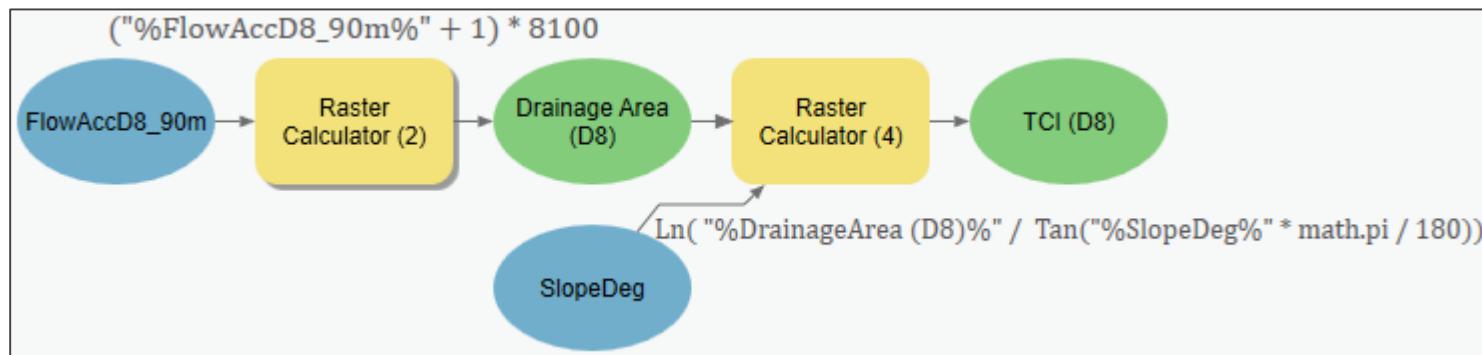
Terrain Analyses

- 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

$$TCI = \ln(a/\tan(b))$$

- $a = \text{Drainage Area}$ (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*: *slope* * `math.pi/180`
 - Compute tangent of this: `tan(slope * math.pi/180)`



Topographic Convergence Index

- D-8 vs D-INF

D8 flow accumulation is too coarse

- Compute DINF flow direction & accumulation

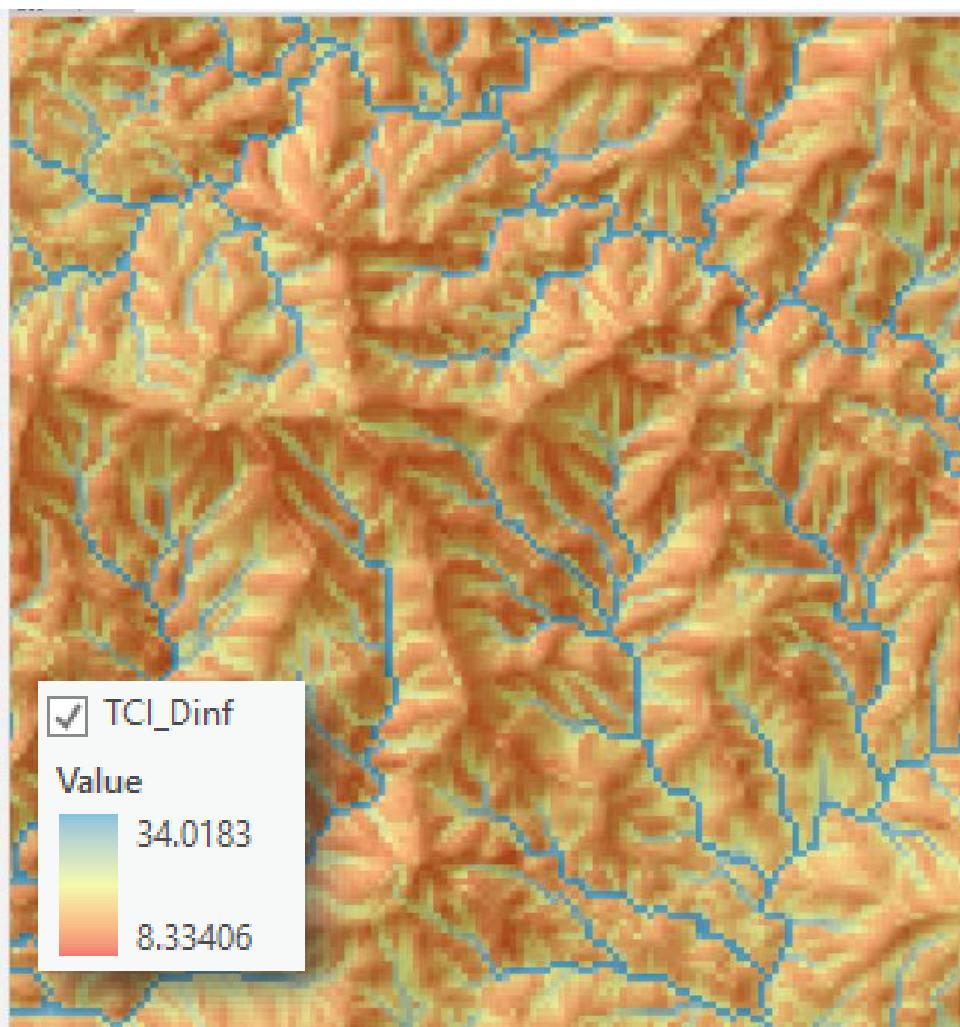
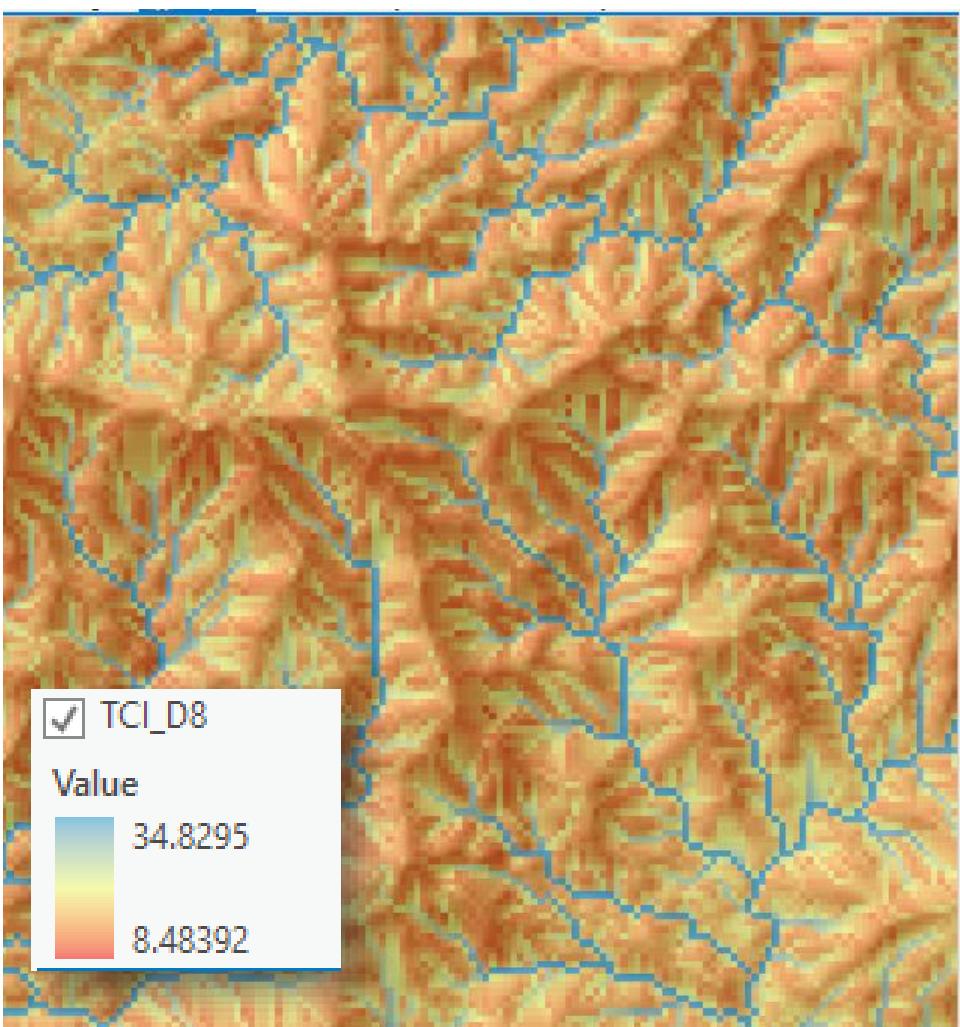
- Convert DINF accumulation to drainage area, as before

The screenshot shows three ArcGIS Pro dialog boxes:

- Flow Direction**: Parameters | Environments. Input surface raster: FillDem90m:1. Output flow direction raster: FDir_DINF. Flow direction type: DINF.
- Flow Accumulation**: Parameters | Environments. Input flow direction raster: FDir_DINF. Output accumulation raster: FIAcc_DINF. Input weight raster: (empty). Output data type: Float. Input flow direction type: DINF.
- Raster Calculator: Raster Calculator (4)**: Parameters | Environments. Map Algebra expression: ("%FIAcc_DINF%" + 1) * 8100. Operators: +, -, *, /. Tools: FlowAcc90m, Slope90m, DrainageArea, tan_Slope, TCI_D8. Output raster: DrainageArea_INF.

Red arrows point from the "Output flow direction raster" field in the Flow Direction dialog to the "Input flow direction raster" field in the Flow Accumulation dialog, and from the "Input flow direction type" field in the Flow Accumulation dialog to the "Map Algebra expression" field in the Raster Calculator dialog.

Topographic Convergence Index



Topographic Position Index

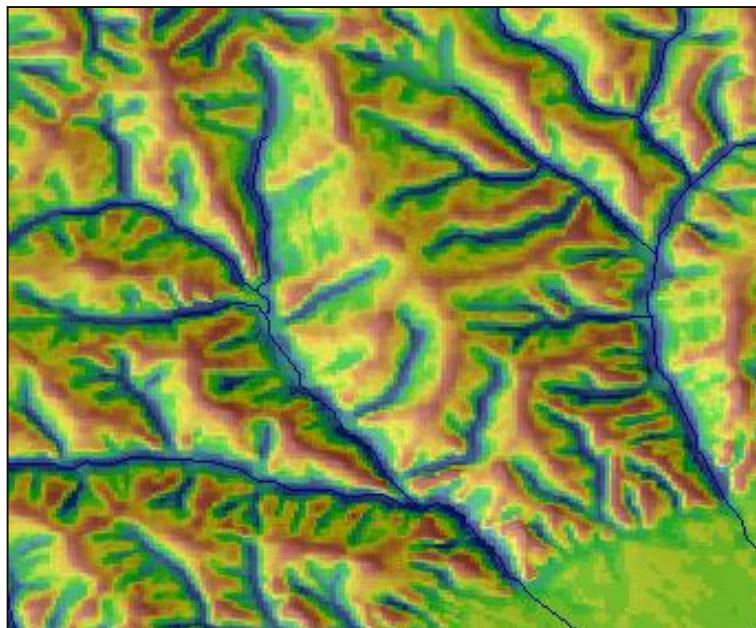
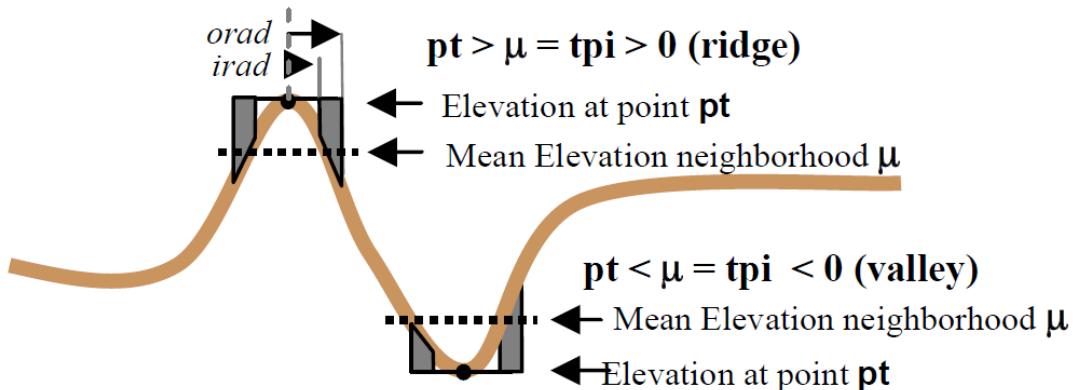
50	45	50
30	30	30
8	10	10

Mean elev (3x3):

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

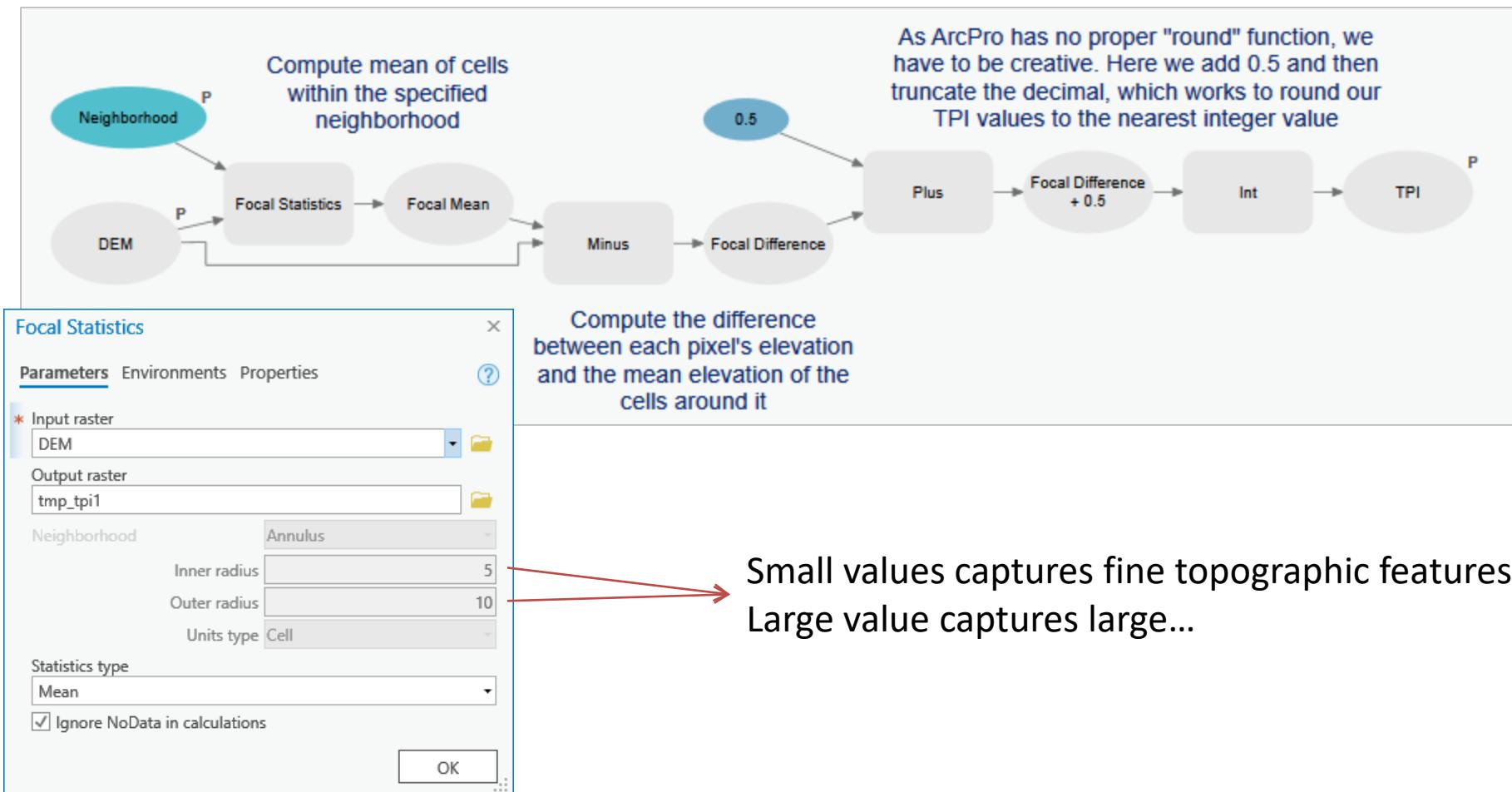
$$= 29.2$$

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



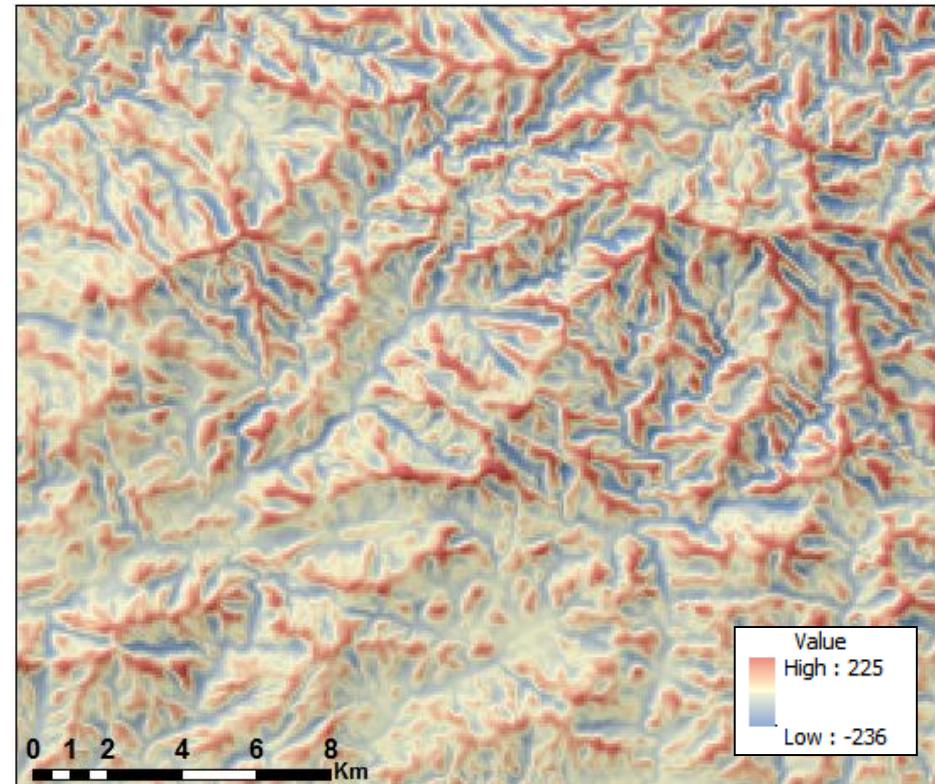
Topographic Position Index

- Importance of scale

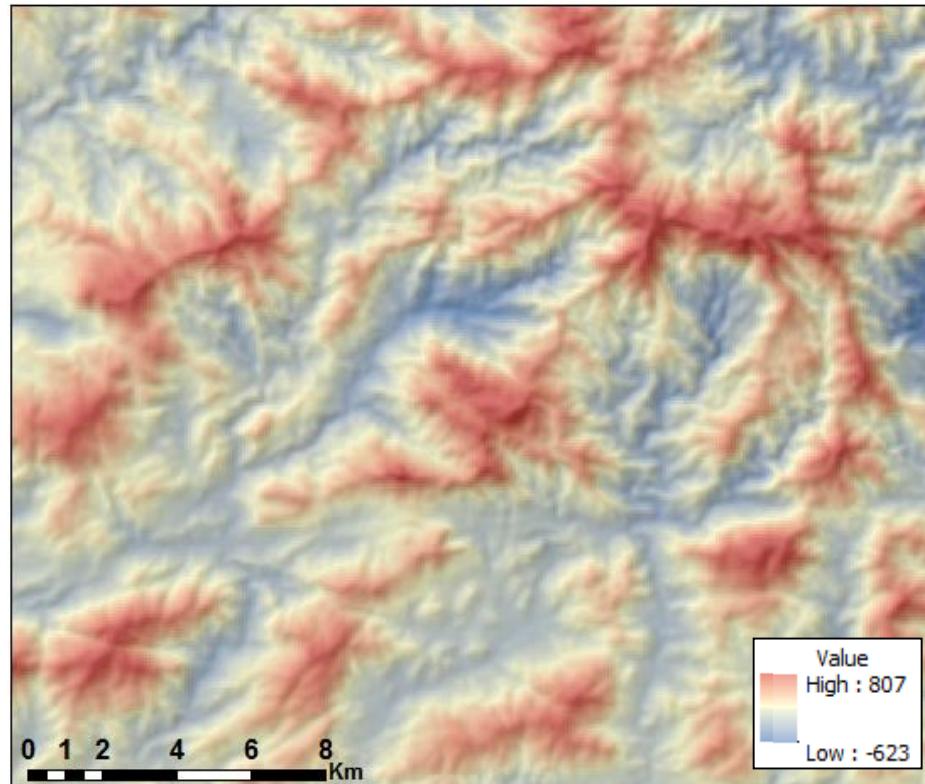


Topographic Position Index

Fine scale TPI



Coarse scale TPI

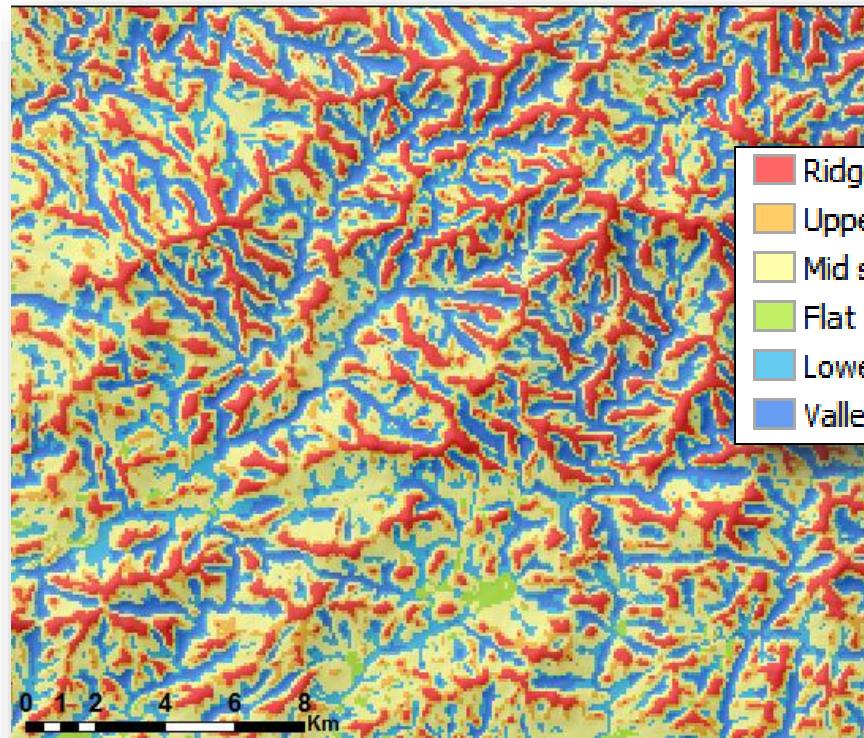


5 cells { } 1 cell

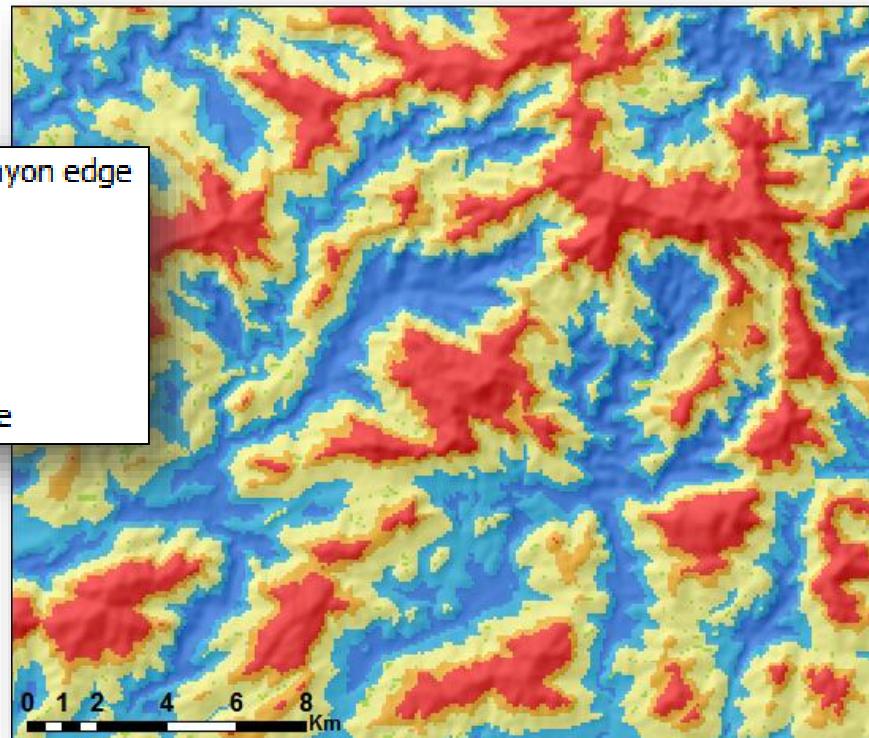
25 cells { } 20 cells

Slope Position

Fine



Coarse



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

Landforms

- [purple square] Canyons, deeply incised streams
- [pink square] Midslope drainages, shallow valleys
- [blue square] Upland drainages, headwaters
- [cyan square] U-shaped valleys
- [green square] Plains
- [light green square] Open slopes
- [yellow square] Upper slopes, mesas
- [orange square] Local ridges/hills in valleys
- [brown square] Midslope ridges, small hills in plains
- [dark brown square] Mt tops, high ridges

