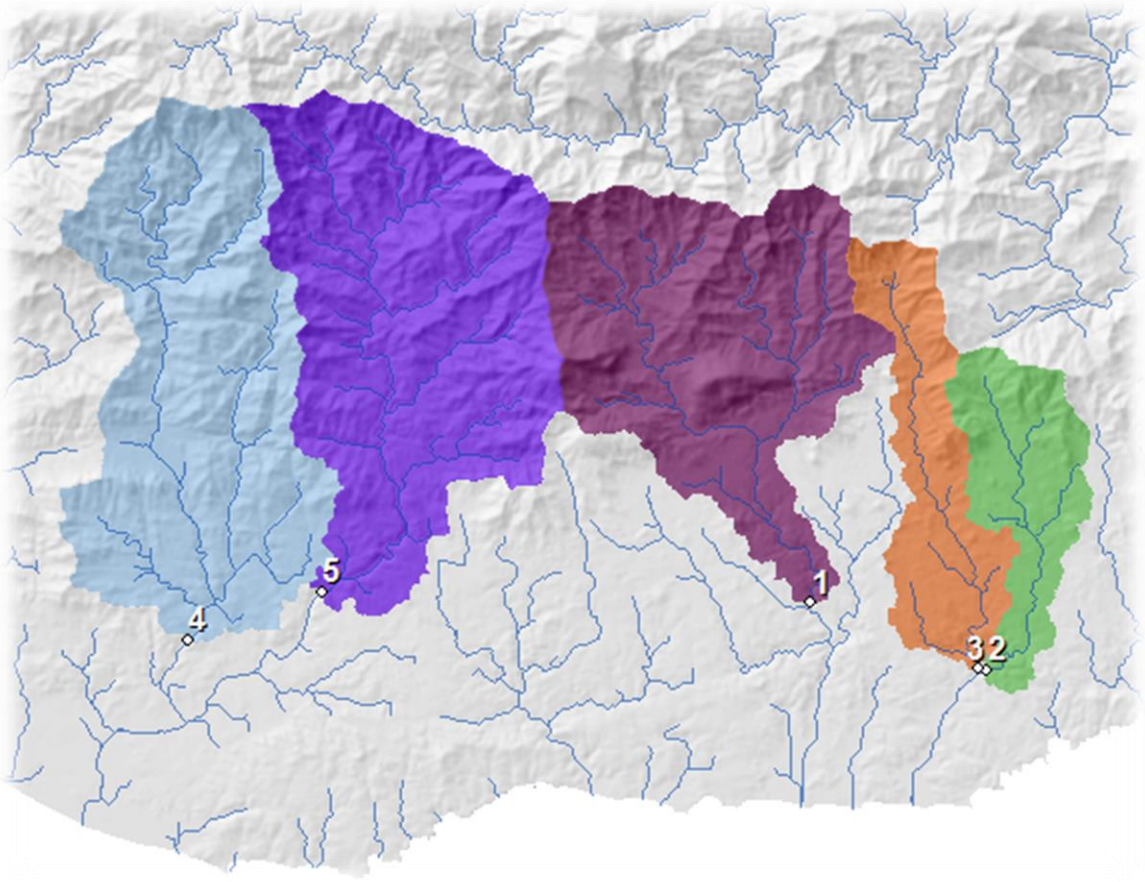
Duke
NICHOLAS SCHOOL OF THE ENVIRONMENT

Project 2:
Sierra Costera Site Analysis

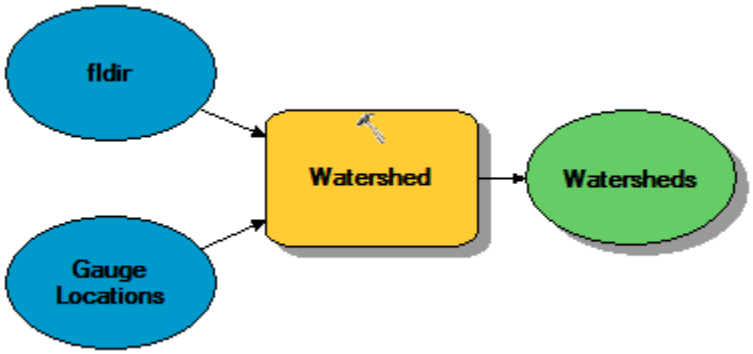
ENVIRON 761

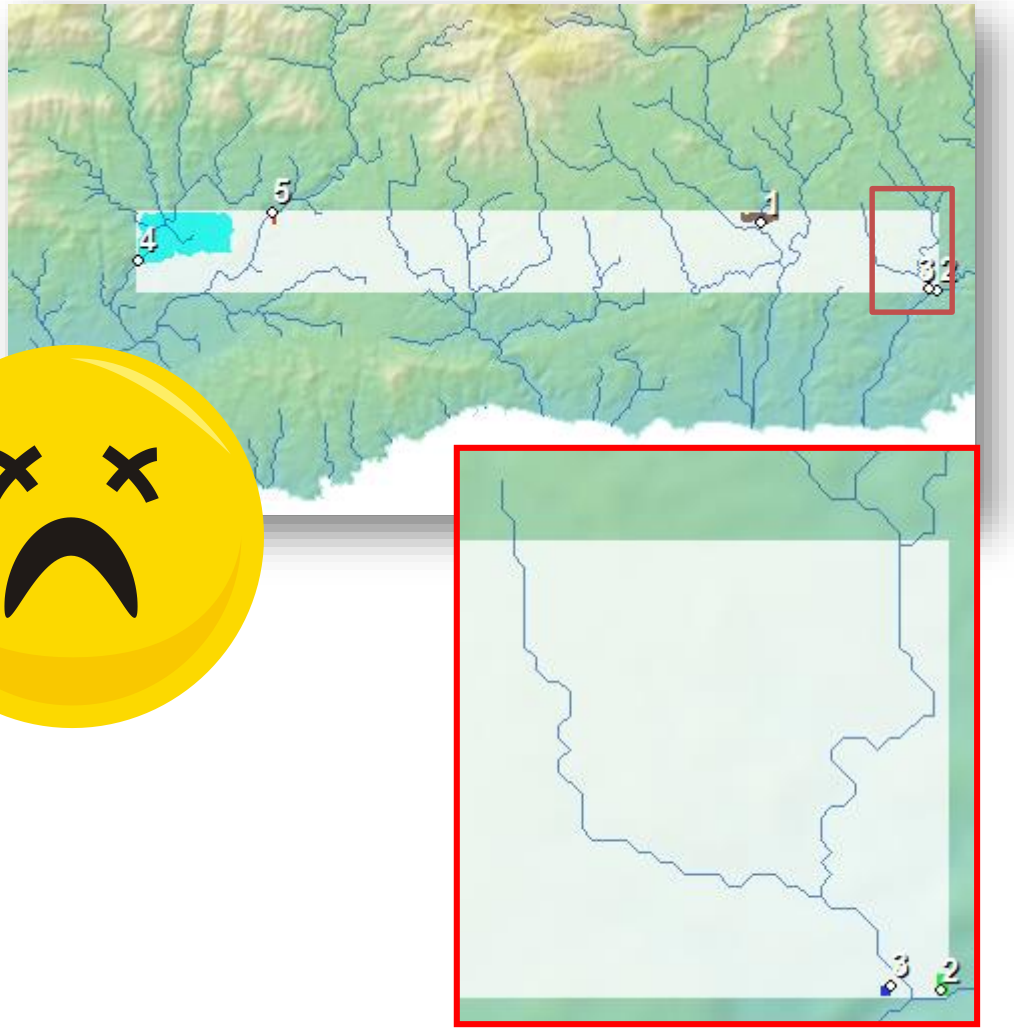
Geospatial Applications for
Conservation & Land Management

Part 2: Upstream & Terrain analyses



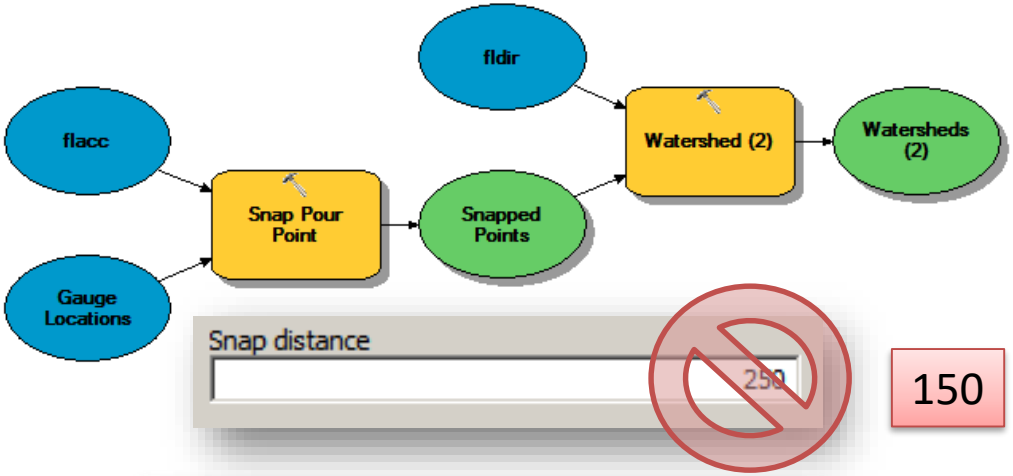
Calculating upstream areas





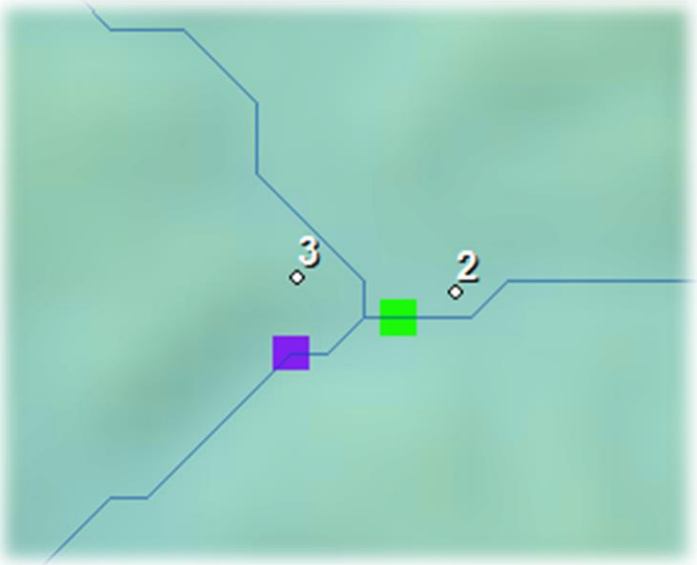
- Set processing extent
- Snap pour points

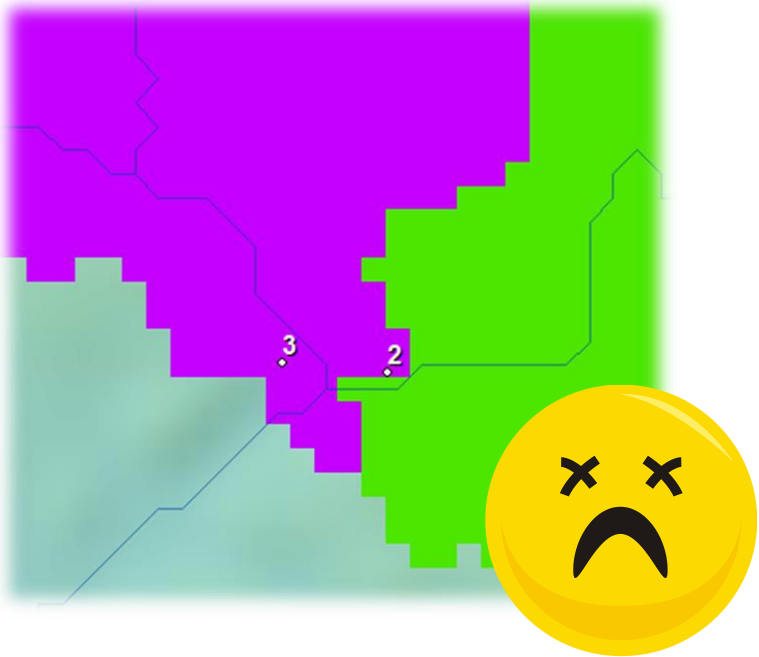
Calculating upstream areas



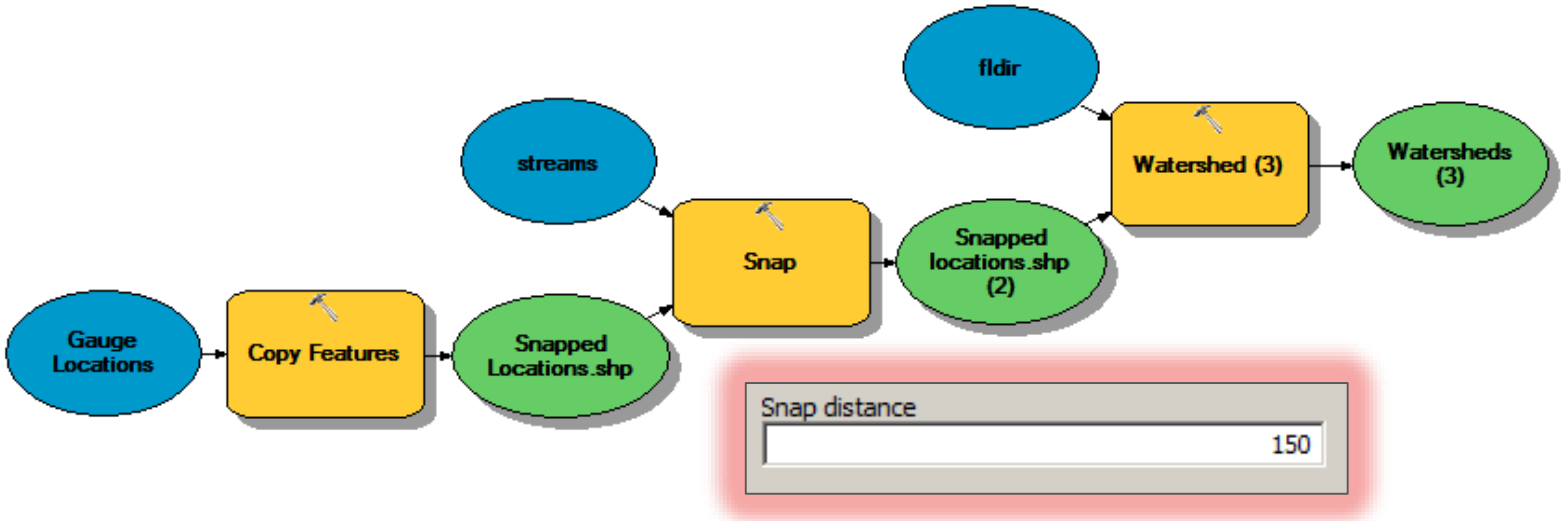
150

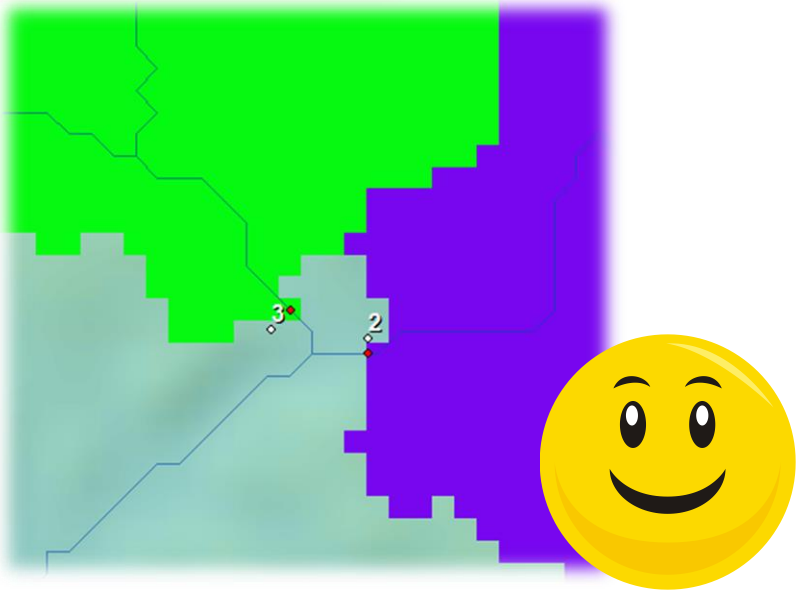
A larger snap distance increases the chance that you miscalculate the upslope area





Calculating upstream areas





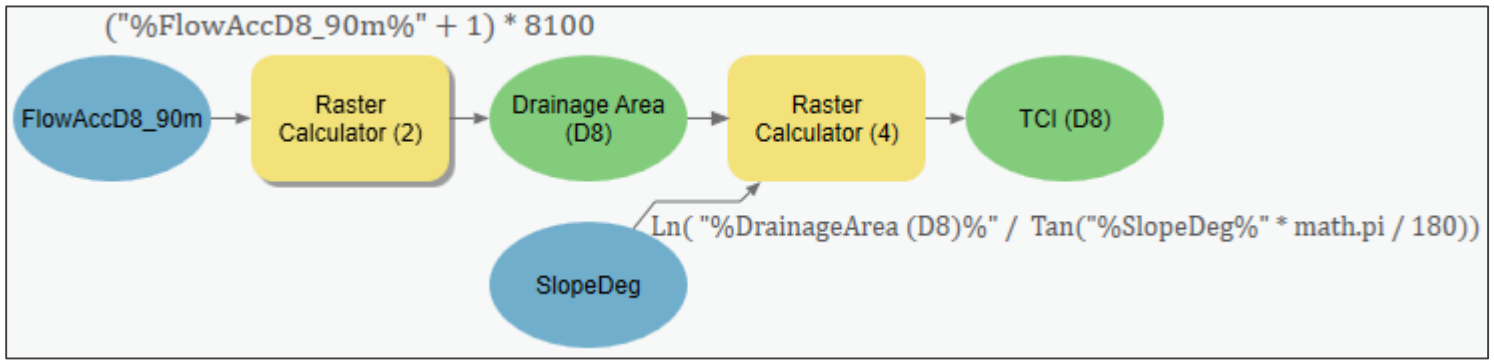
Terrain Analyses

- 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

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

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



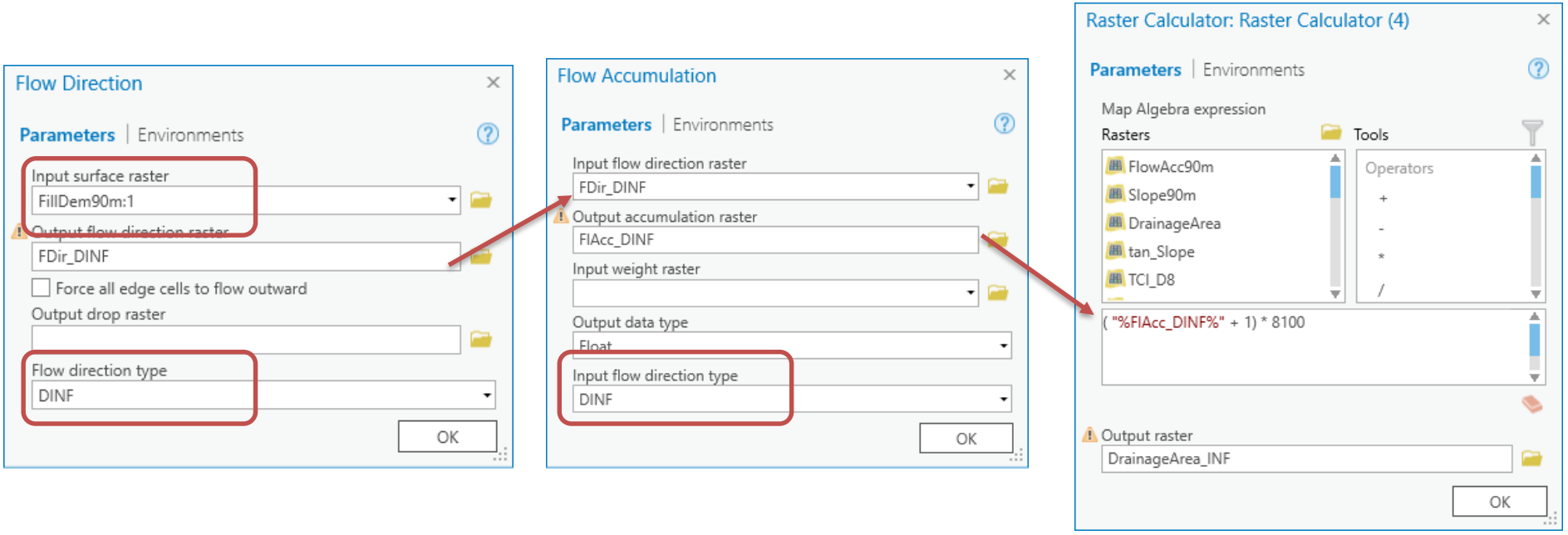
Topographic Convergence Index

- D-8 vs D-INF

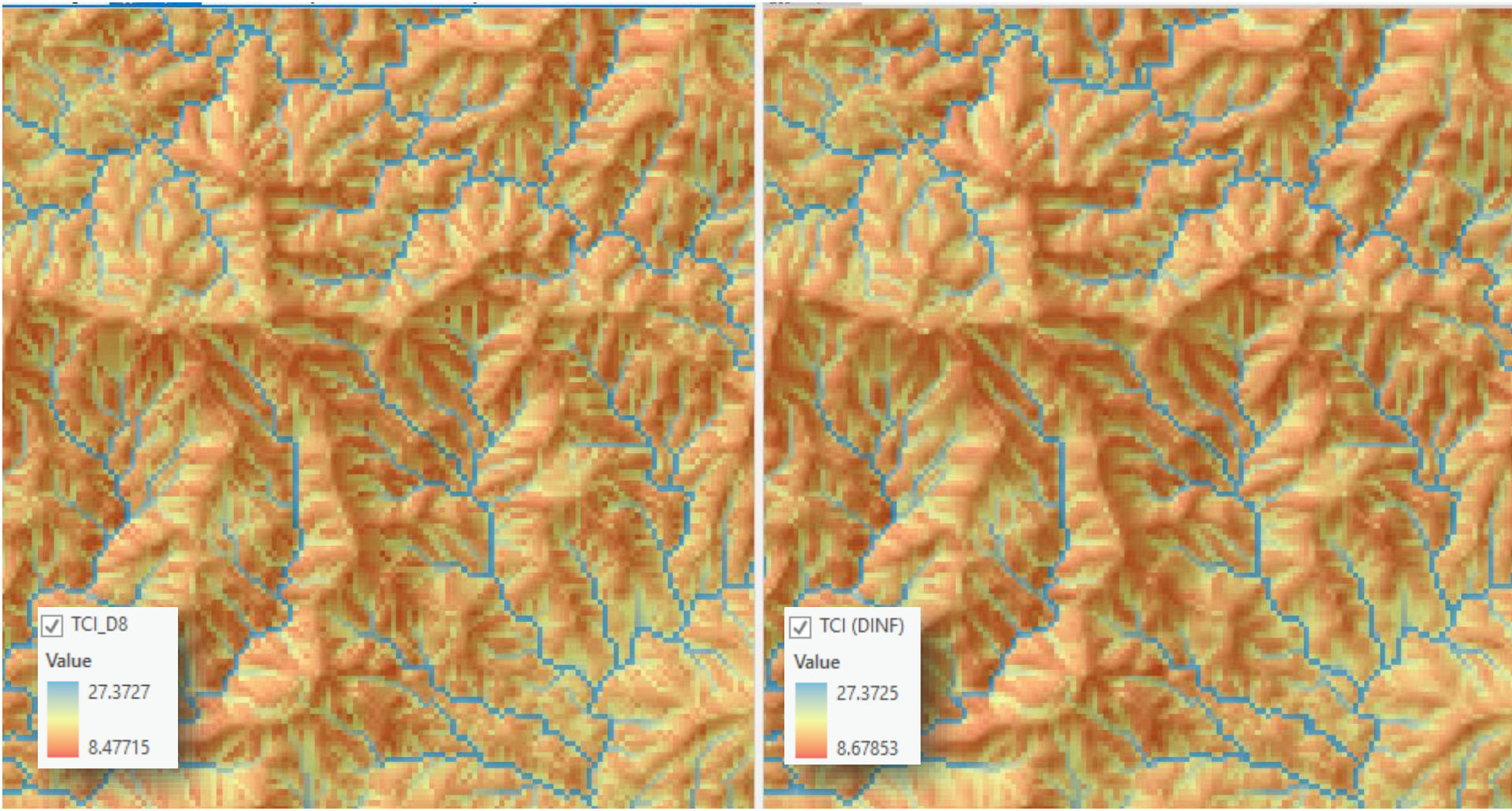
  D8 flow accumulation is too coarse

  – Compute DINF flow direction & accumulation

    - Convert DINF accumulation to drainage area, as before



Topographic Convergence Index



Topographic Position Index

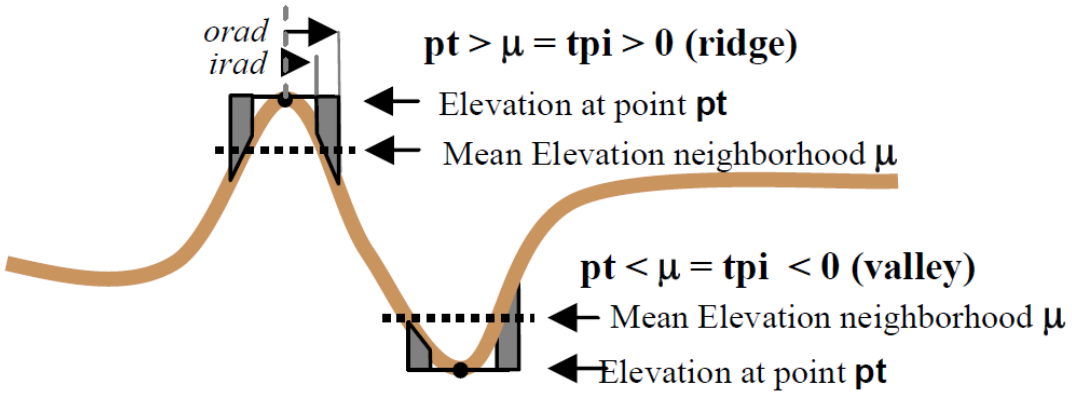
50	45	50
30	30	30
8	10	10

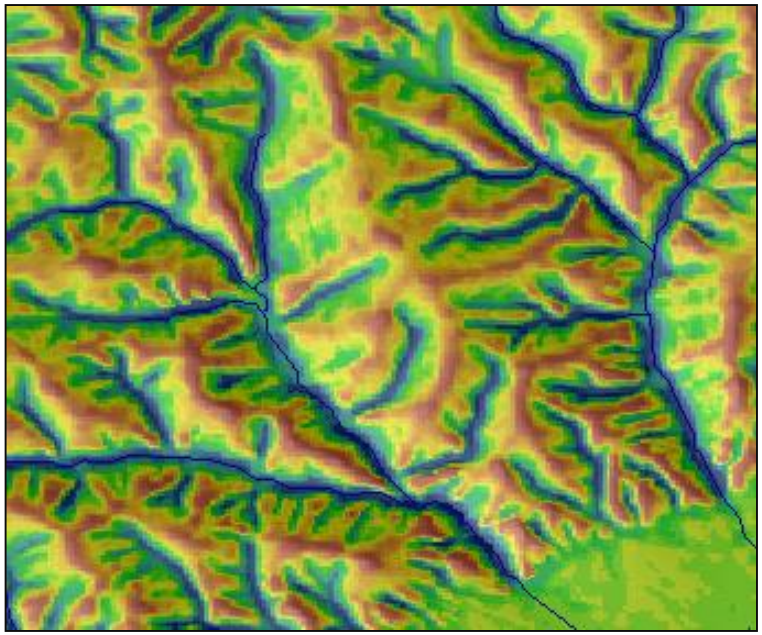
Mean elev (3x3):

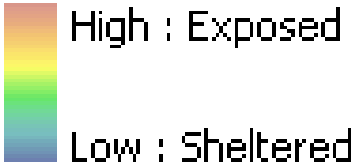
= (50+45+50+30+30+30+8+10+10)/9

= 29.2

30 – 29.2 = 0.8 = *exposed (convex)*

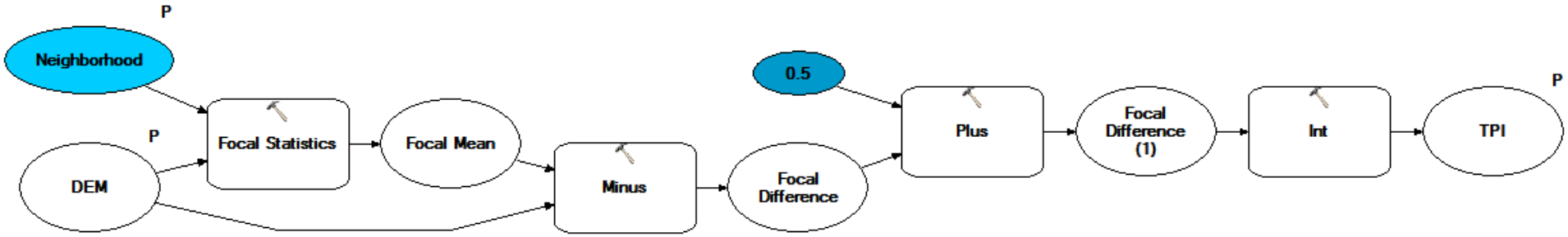


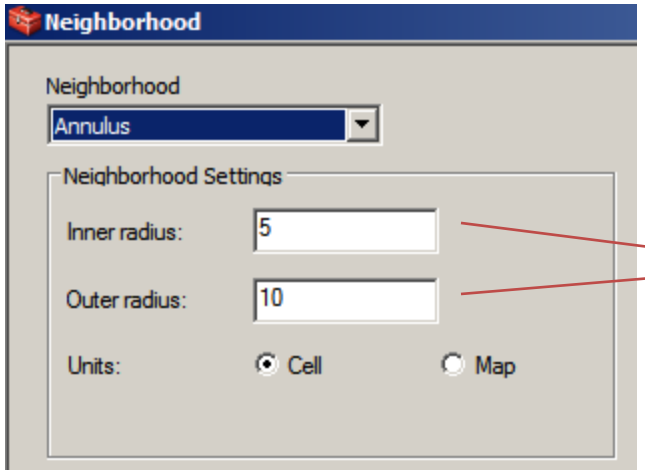




Topographic Position Index

- Importance of scale

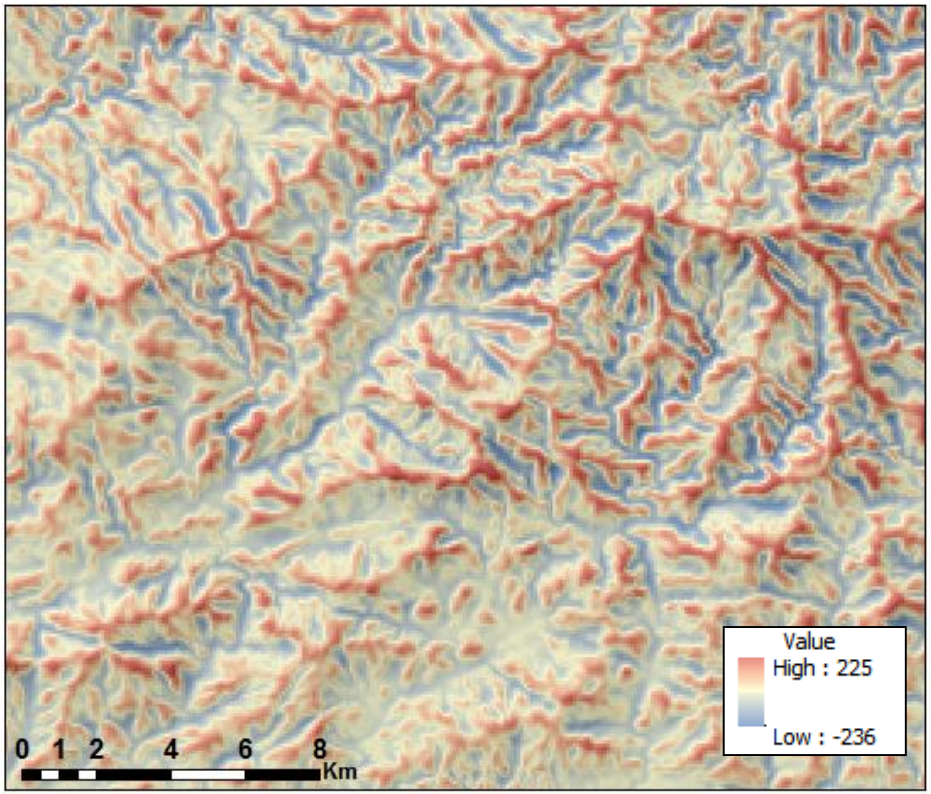




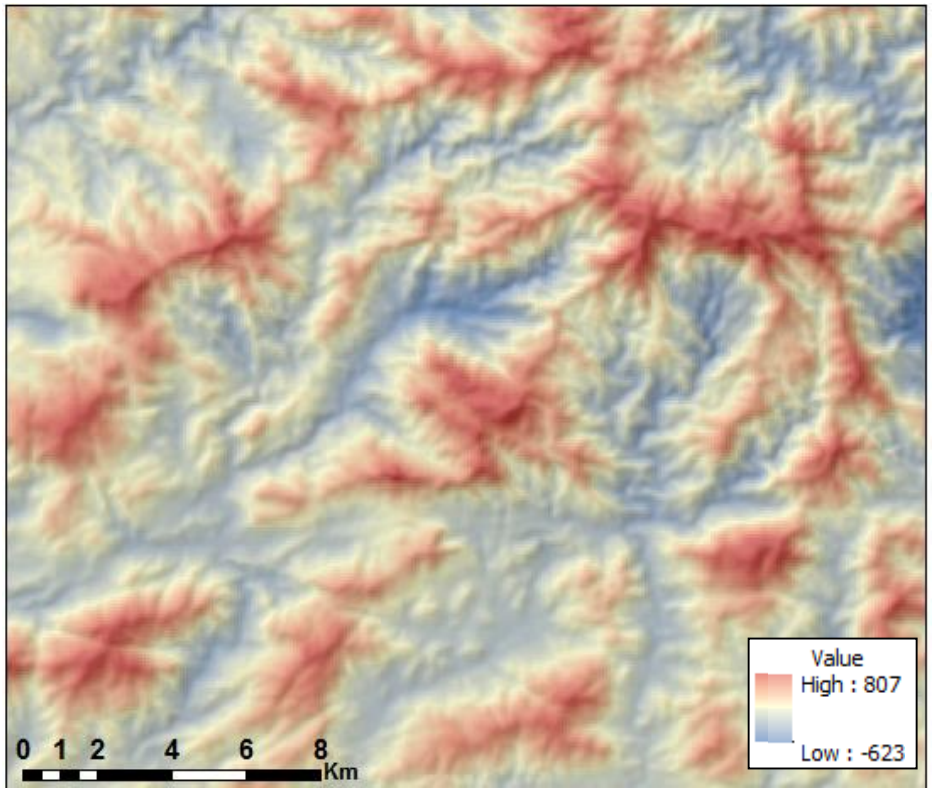
Small values captures fine topographic features
Large value captures large…

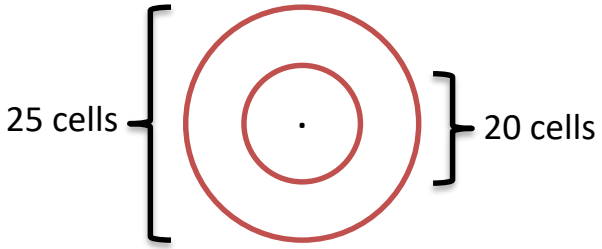
Topographic Position Index

Fine scale TPI



Coarse scale TPI

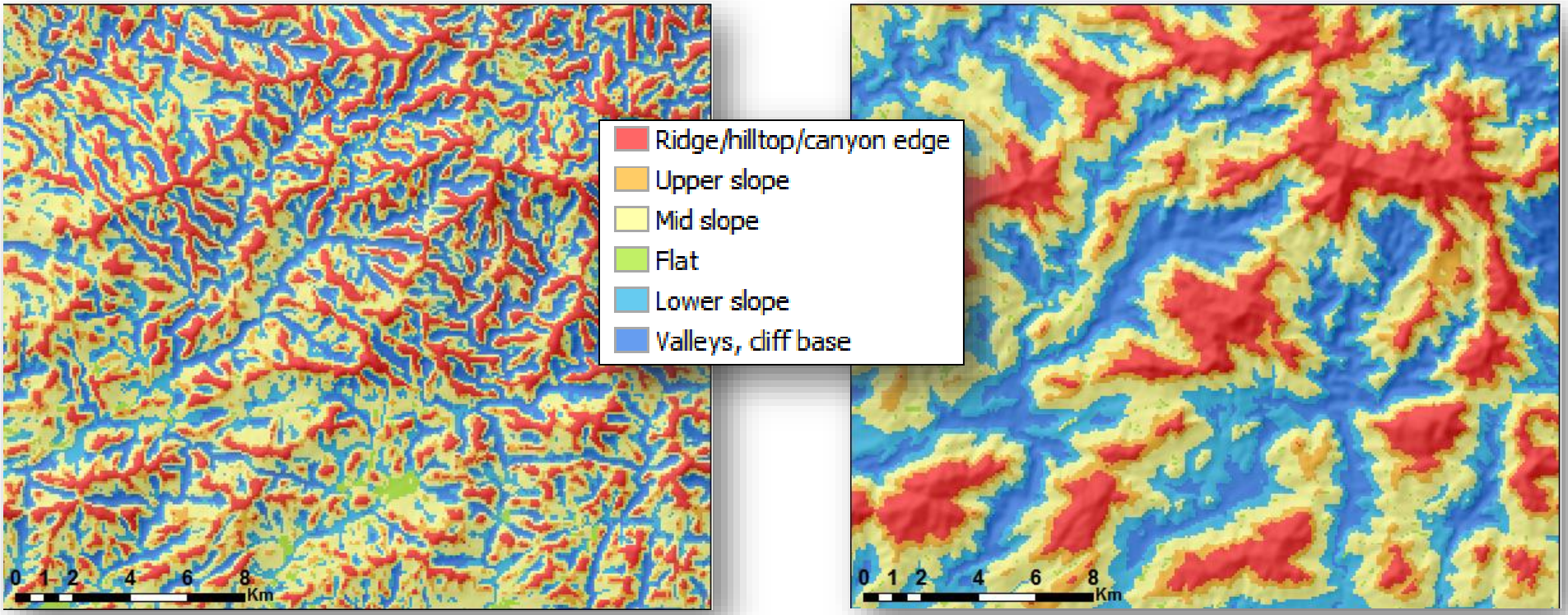




Slope Position

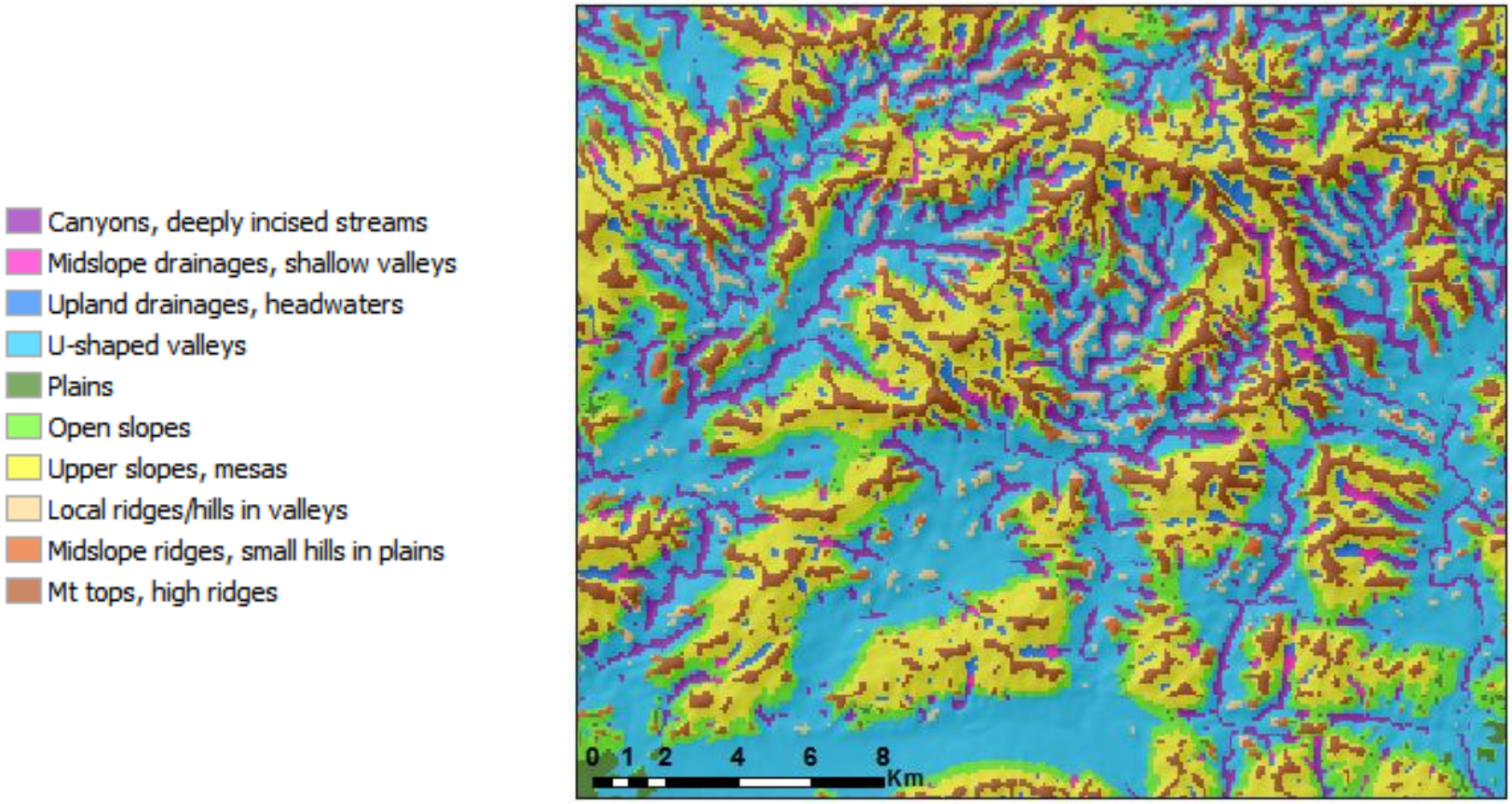
Fine

Coarse



Class	Description Breakpoints
1	ridge > + 1 STDEV
2	upper slope > 0.5 STDV =< 1 STDV
3	middle slope > -0.5 STDV, < 0.5 STDV, slope > 5 deg
4	flats slope >= -0.5 STDV, =< 0.5 STDV , slope <= 5 deg
5	lower slopes >= -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
0 1 2 4 6 8
Km