Geol 588
-
GIS for Geoscientists II

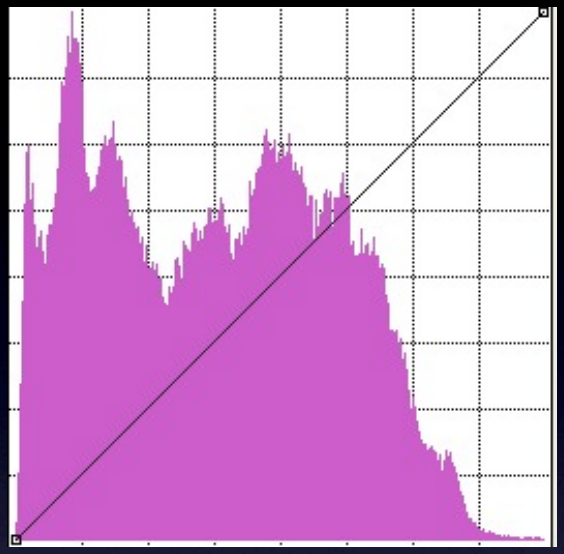
Lecture 5

Today

- HW 3 solutions
- Dealing with distance (cost) maps
- Pause
- Practical examples
- Take Home midterm over Spring break?

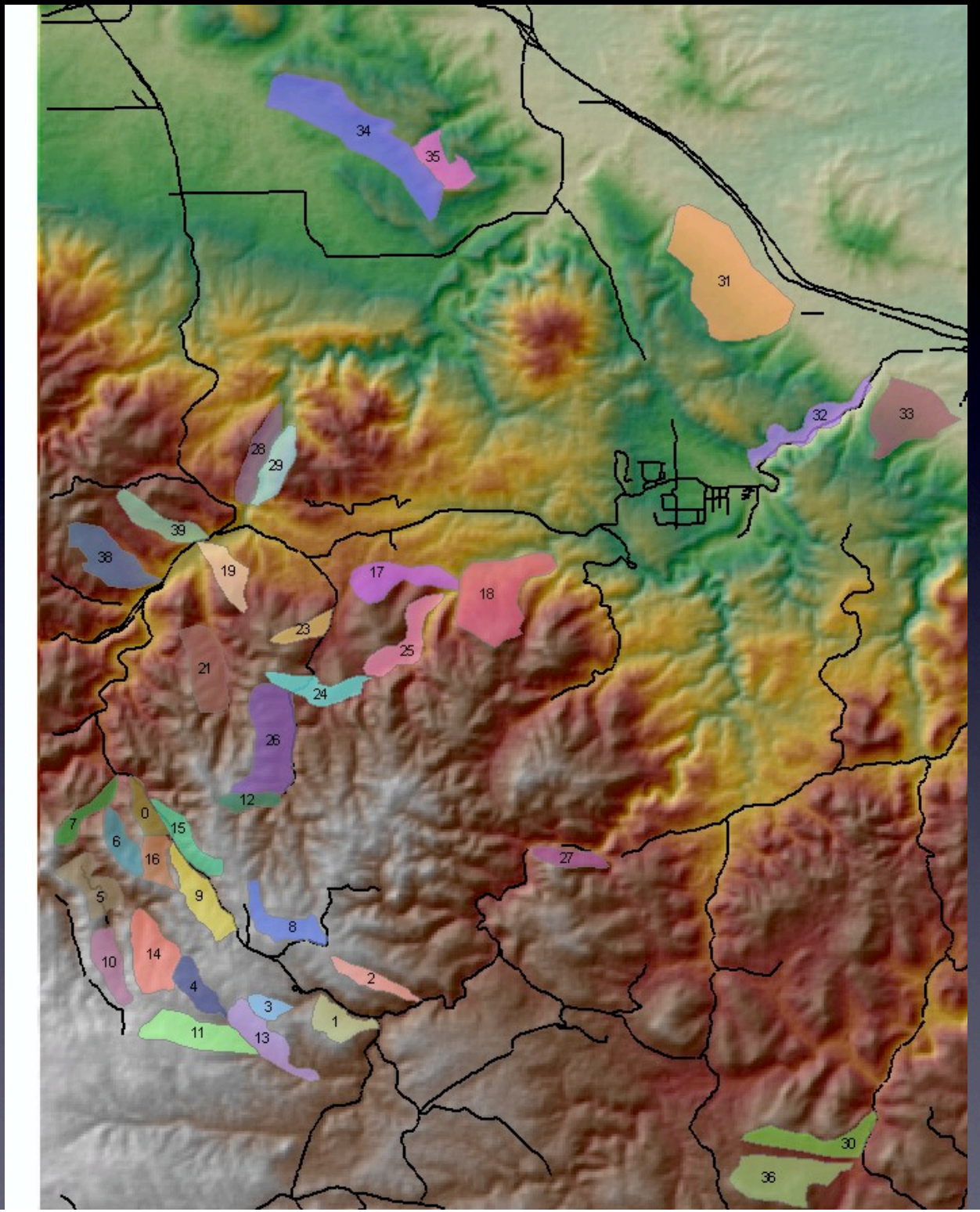
HW 3 solution - Ski Areas

- What zonalvalues do the ski areas have?
- Elevation, slope, distance to roads
- dem_steep is a floating point raster: properties -source - statistics (last section)
- elevation: 1301.556 m - 2277.573 m (avg.: 1670.188 m)
- focal (neighborhood) statistics: 3x3 mean vs. 3x3 median: small differences only:
- mean: 1302.74 m to 2263.37 m, median: 1302.42 to 2264. 73 m
- Both: move extreme (min/max) towards the average (smoothing)
- Median: sort high-to-low, pick "middle" value

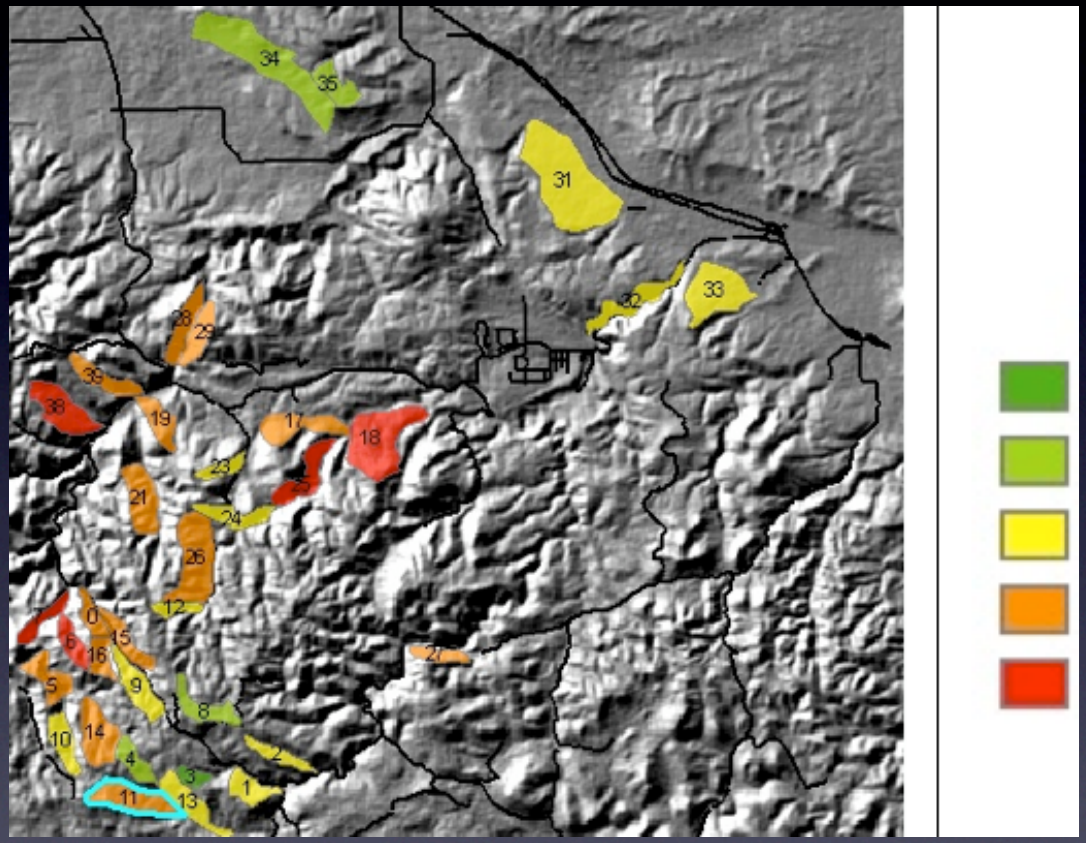


- Median: more robust to outliers
- Honest color comparison: same min/max

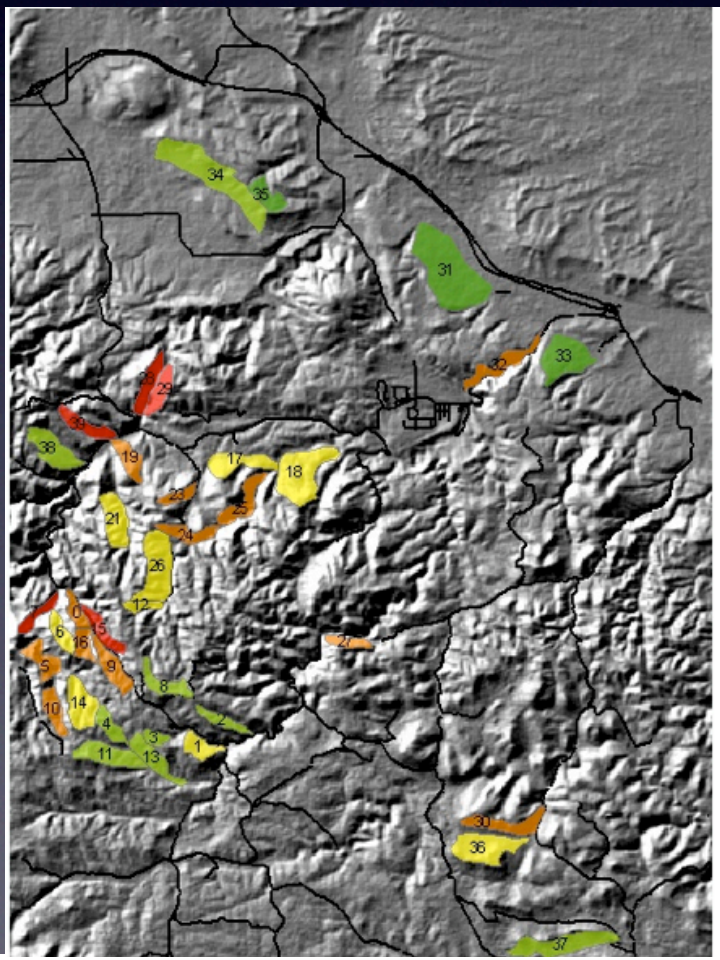
mean - median

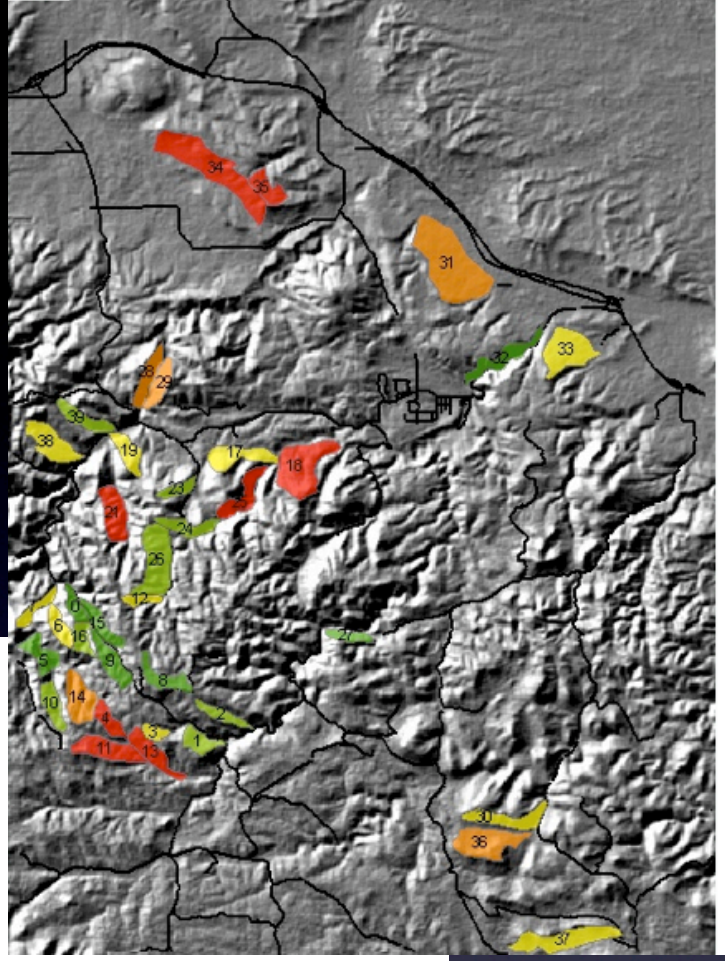

34
35
31
32
33
28
29
39
38
19
17
18
23
25
21
24
26
12
0
7
15
6
16
27
5
9
8
10
14
2
4
3
1
11
13
30
36

- Zonal statistics for
- Mean Slope: 5.5 deg. to 25.10 deg.
- Area: 265,000 sq. m. to 32,675,000 sq. m. (not pixels!)
- Absolute Min/Max Elevation: 1393.71 m - 2144.53 m
- Assign a color to each polygon according to a field (e.g., ski_area.RANGE)



- Coloring:
  5 colors - 5 suitability ratings (rating 1 - rating 5)
- Can we compare ratings across maps?





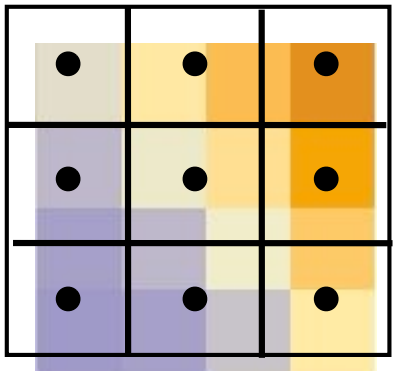
Mean Road Distance
- Less than 250m
- Up to 500m
- Up to 750m
- Up to 1000m
- More than 1000m

Slope Variation (SD)
- Very Uniform
- Somewhat Uniform
- Moderately Consistent
- Somewhat Variable
- Highly Variable

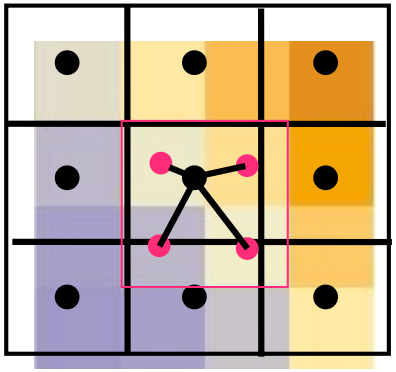
- Simple approach: Average of the three ratings
- What is a "good" area?

- Lines as zones for zonal statistics:
- COUNT? AREA?

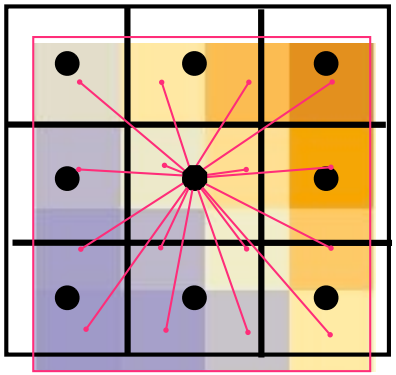
COUNT	AREA	MIN	MAX	RANGE	MEAN	STD
132	330000	1557.03	1690.48	133.455	1625.32	43.5501
289	722500	1648.16	2026.02	377.86	1824.35	118.661
178	445000	1915.51	2058.07	142.561	1980.04	39.9121



Nearest neighbor resampling grabs the value from the old cell that falls at the center of the new cell. It preserves the original value and should always be used with categorical data, or when the original data values need to be preserved. It is the fastest method.



Bilinear resampling calculates a new value from the four cells that fall closest to the center of the new cell. It uses a distance-weighted algorithm based on the old cell centers. It is best used with continuous data such as elevation.

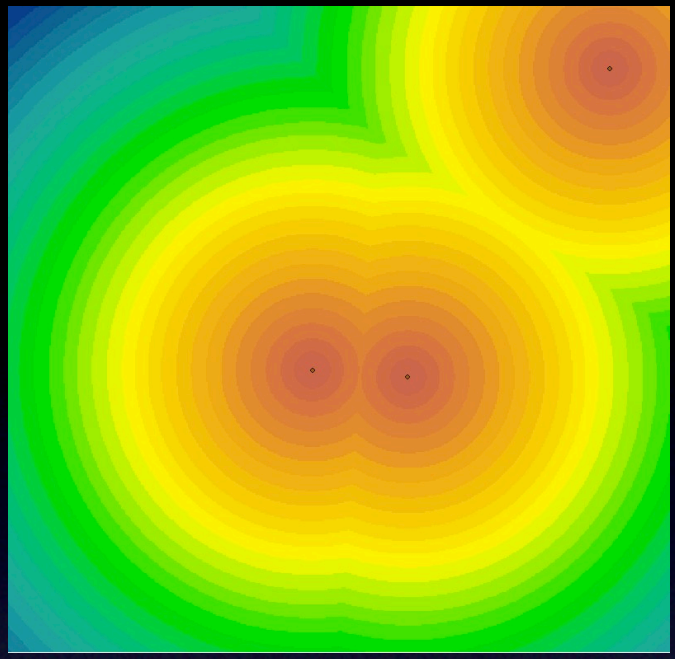


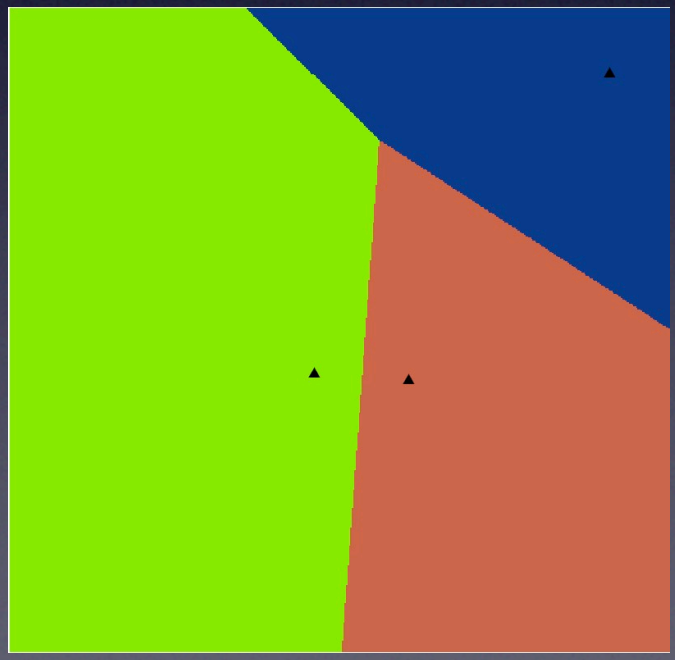
Cubic convolution resampling

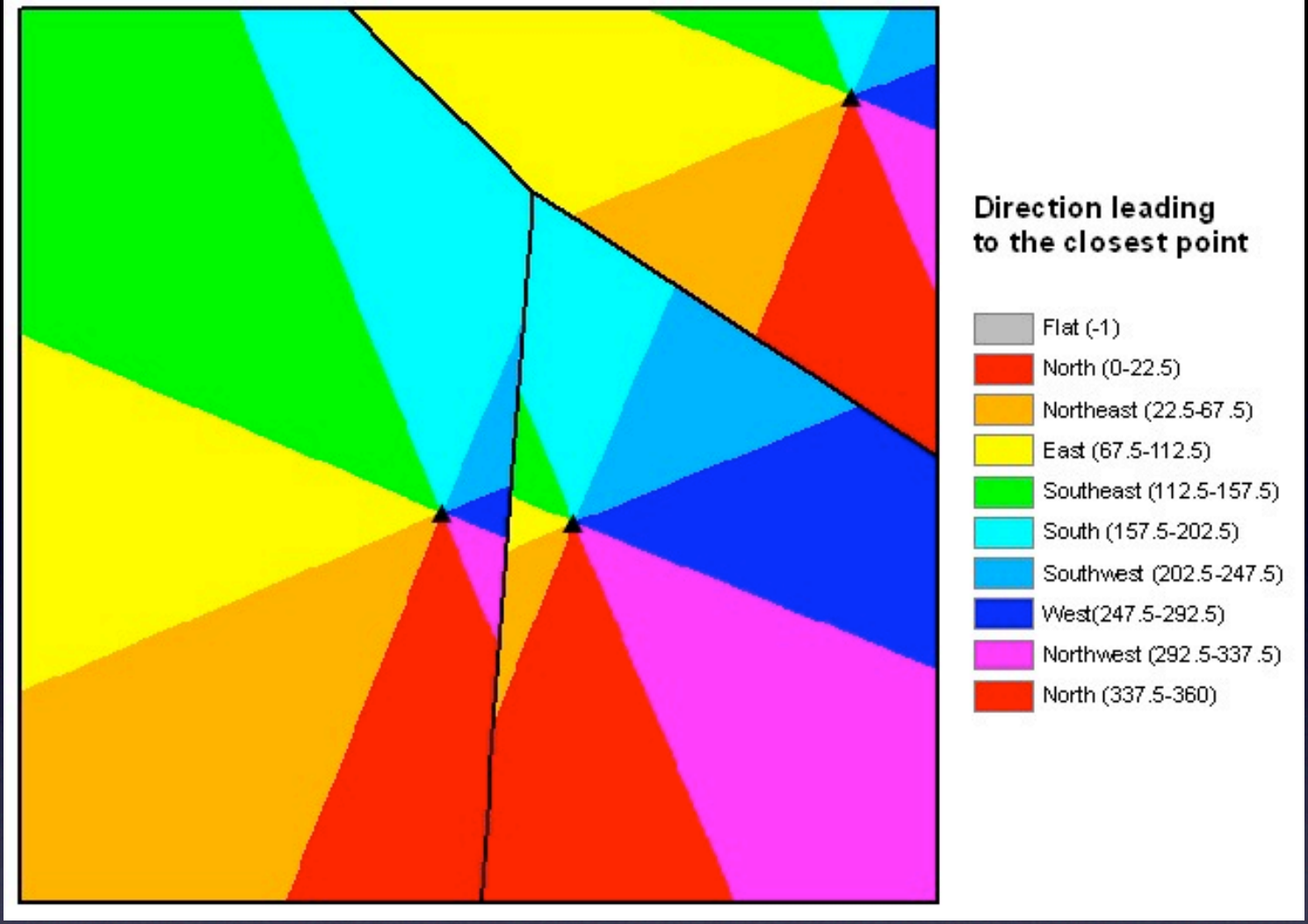
calculates a new value from the sixteen cells that fall closest to the center of the new cell. It uses a distance-weighted algorithm based on the old cell centers. It is best used with continuous data such as elevation. It is the most time-consuming method.

Dealing with distances

- Two types: **Straight line** (euclidean) distance + **cost** distance
- straight line distance needs: points or lines (= many points)
- each cell: distance to the closest point (anywhere!)
- NOT known: which (ID) is that closest point?
- Added Info 1: Allocation raster: Which point is the closest? (space partition)
- Similar to ? (last lecture)



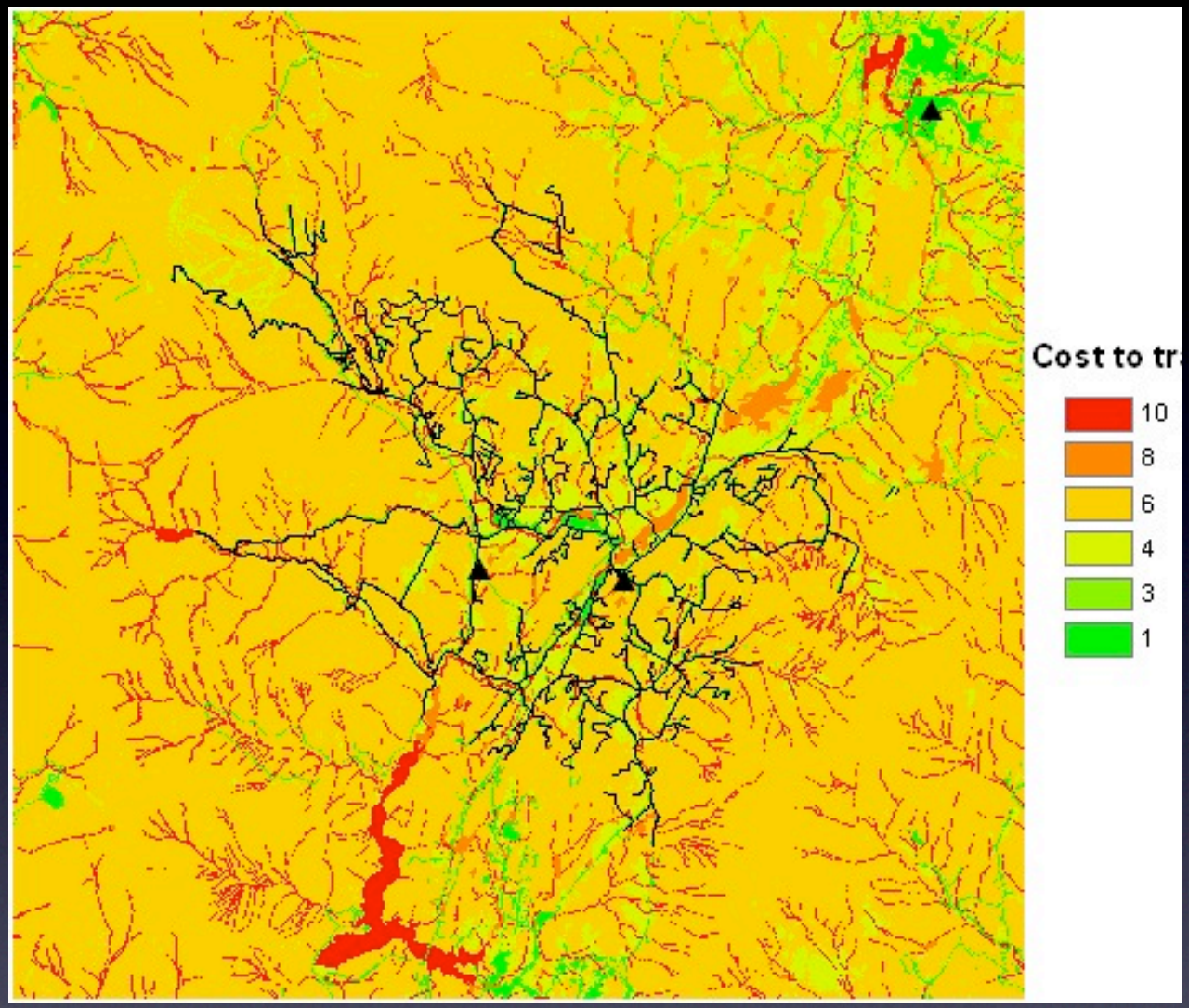




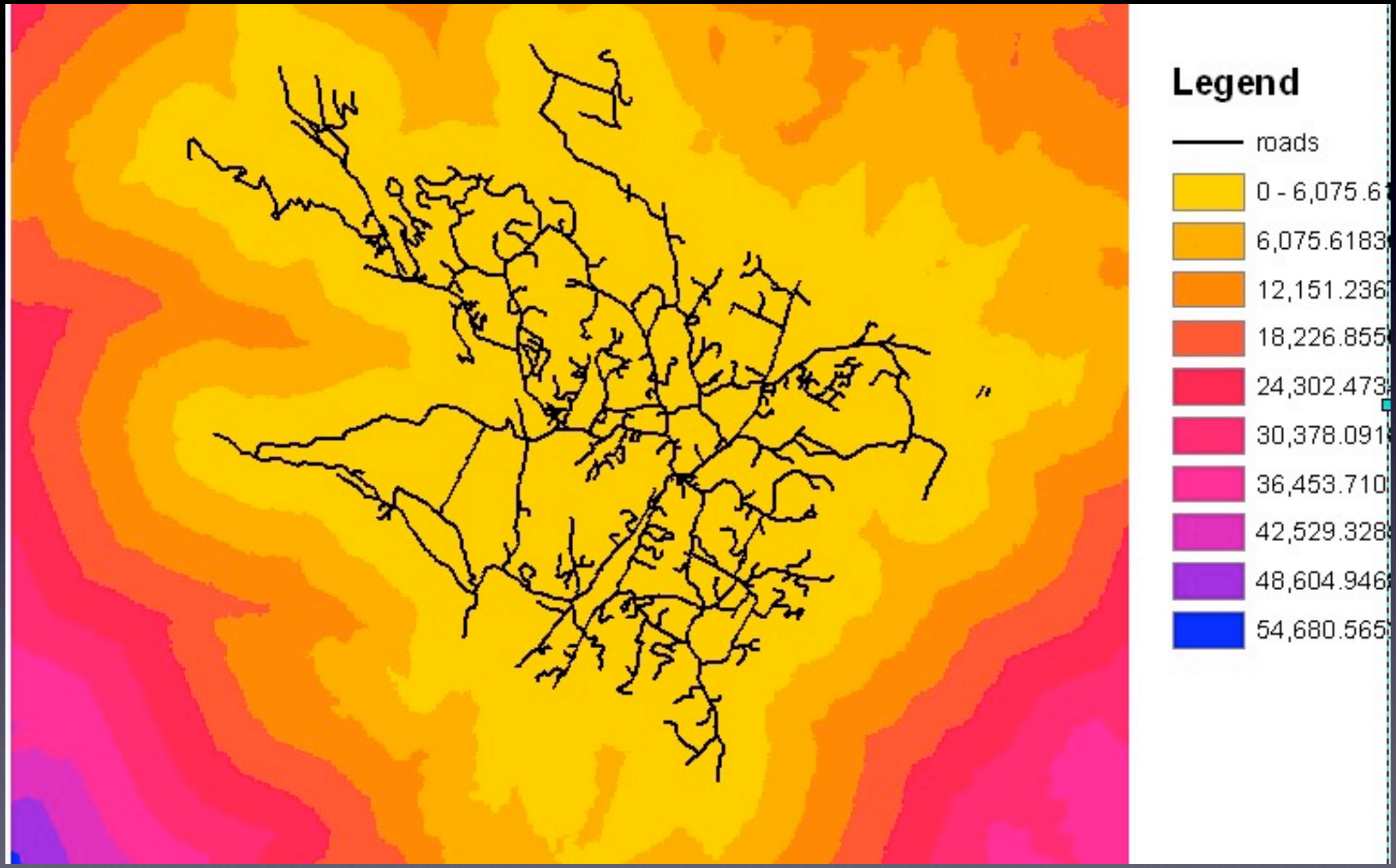
- Added info 2: Direction grid
- Each cell encodes: "which direction do I need to go to get to the closest point"
- Same scheme as aspect map (azimuth)

Real cost to traverse a cell

- Rule: to traverse this cell - **pay** X "$"
- X on a scale of A to B
- Examples:
- slope: 0 (%) to 50 (%)
- land use (1 - 10):
  - roads (city) cost 1
  - fields cost 6
  - water cost 10

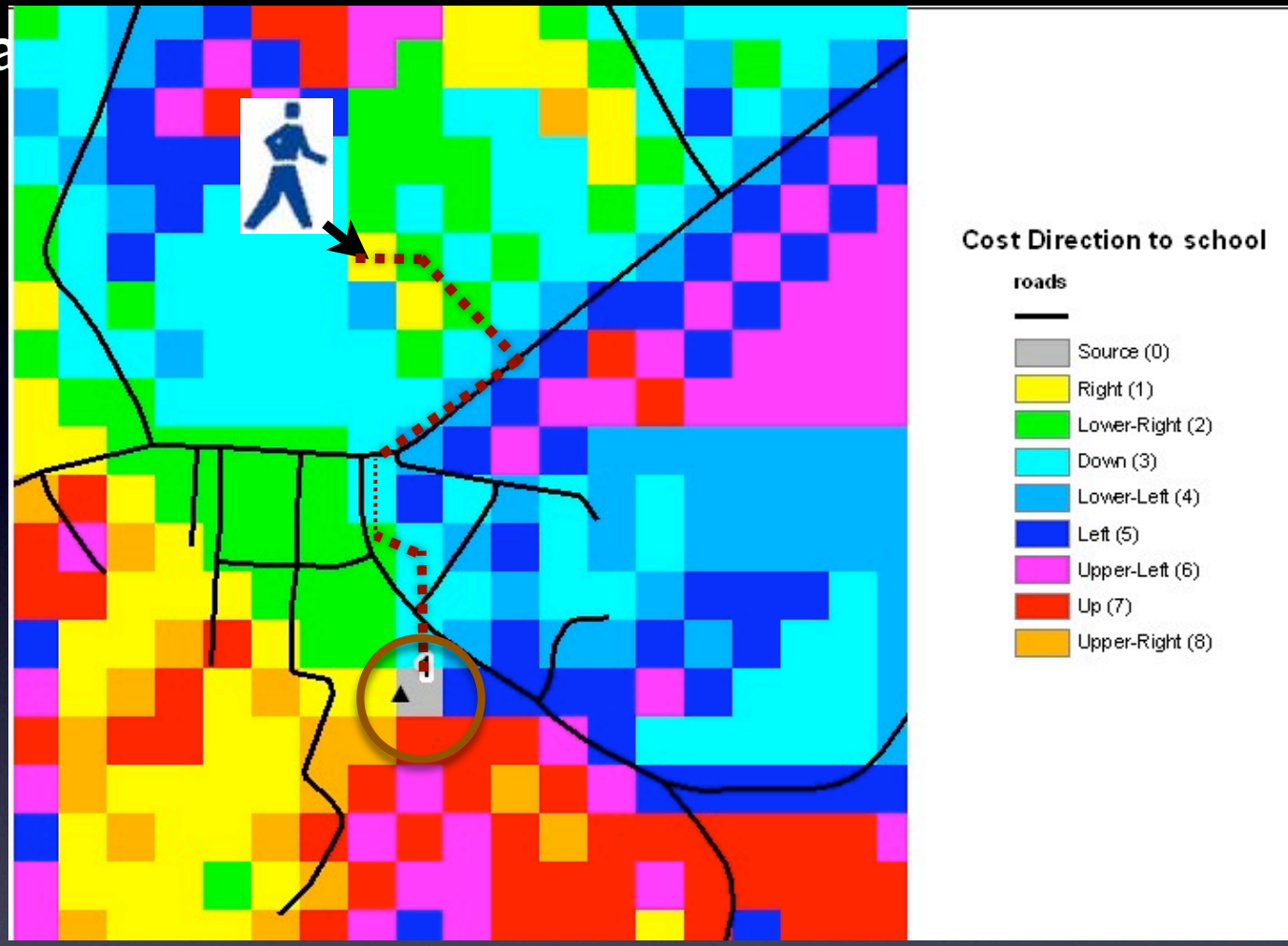


Result: Cost weighted distance from any road (roads are **sources** - shows cost only)



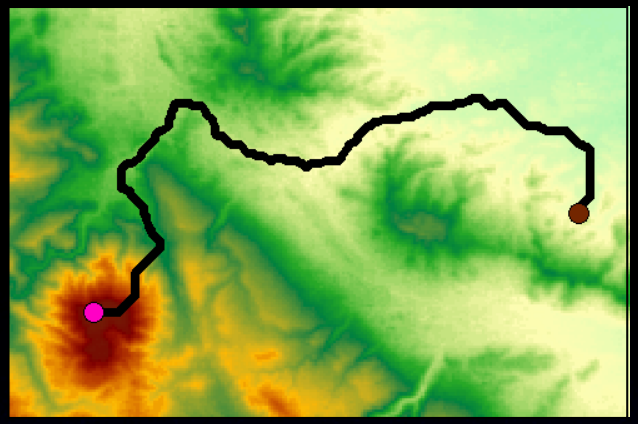
Additional outputs of cost weighted distance opera

- Cost **direction** raster
- optional - but needed later for *shortest path* operation
- here: grey pixel is the only source (not roads!)
- 8 possible choices (directions)
- "On current cell, which direction do I need to go to get the shortest way back to the source?"
- Repeat until source is hit
- roads: cheat cost - create pathways towards source



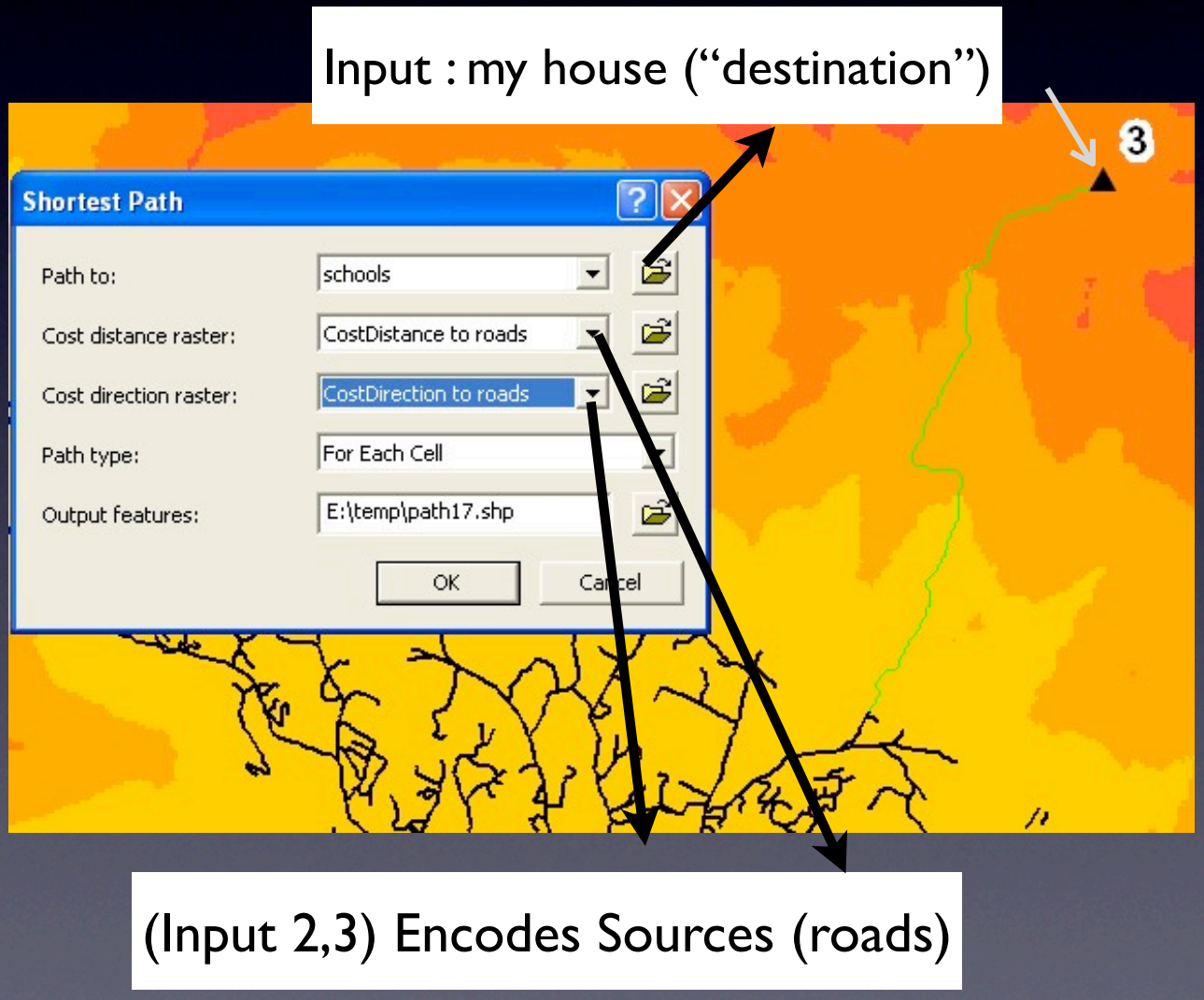
direction raster is needed for "shortest path" operation!

Shortest path operation

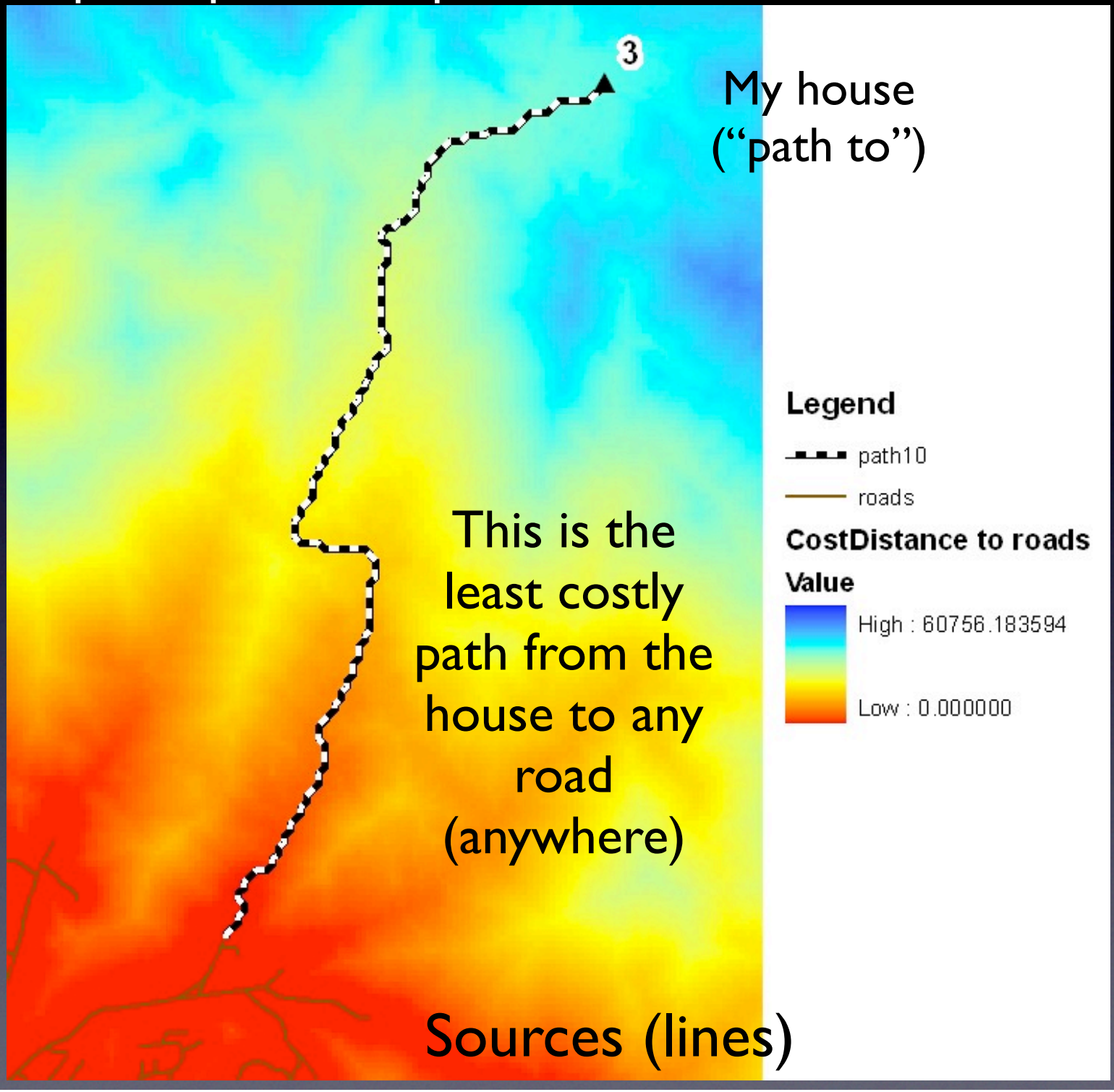


Means "Start here"

- Input 1: path to, "destination" point"
- Think: **start** here (!)
- Inputs 2 & 3: Cost distance raster, my "**source** point(s)"
- result: shortest (cost) line to go from start to **any source point(s)**



Shortest path operation - point to nearest road



Distance - class exercise

- copy geol588\data\distance_exercise folder
- load dist_ex.mxd, landuse cost raster - reclass of landuse
- Spatial Analyst - Distance - Straight line distance to school =, "cost" is 1 m everywhere!
  - What's the (straight line) distance from My House to the closest school? Which school is the clostest?
- switch off My House layer for now (will use for shortest path)
- Spatial Analyst - Distance - Cost Weighted ...
  - Weighted Distance to (sources) schools,
    both cases: Cost Raster: landuse cost, create direction: YES, create allocation: YES
  - Compare to straight line - what does it cost weighted mean?
- Spatial Analyst - Distance - Shortest Path:
  - Path to: "Destination" = My house (switch back on) (yes, it's silly ...)
  - Cost distance and direction of **source**: (created in last step)
- Look at cost surface as DEM in ArcScene