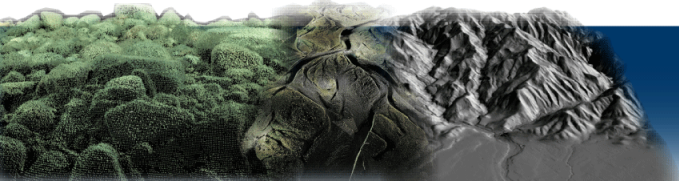
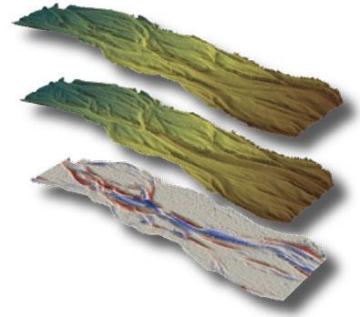


# GEOMORPHIC CHANGE DETECTION

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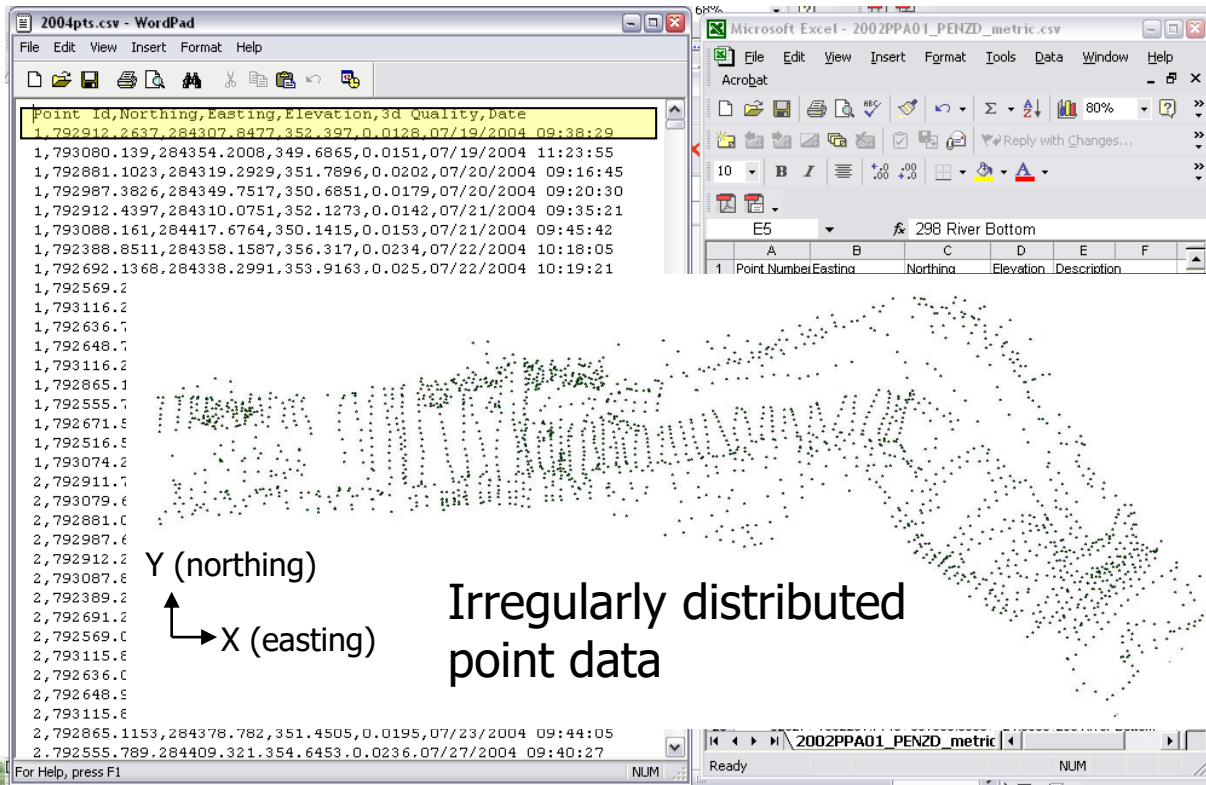
## ESPRESSO WORKSHOP

### REVIEW OF BUILDING DEMs



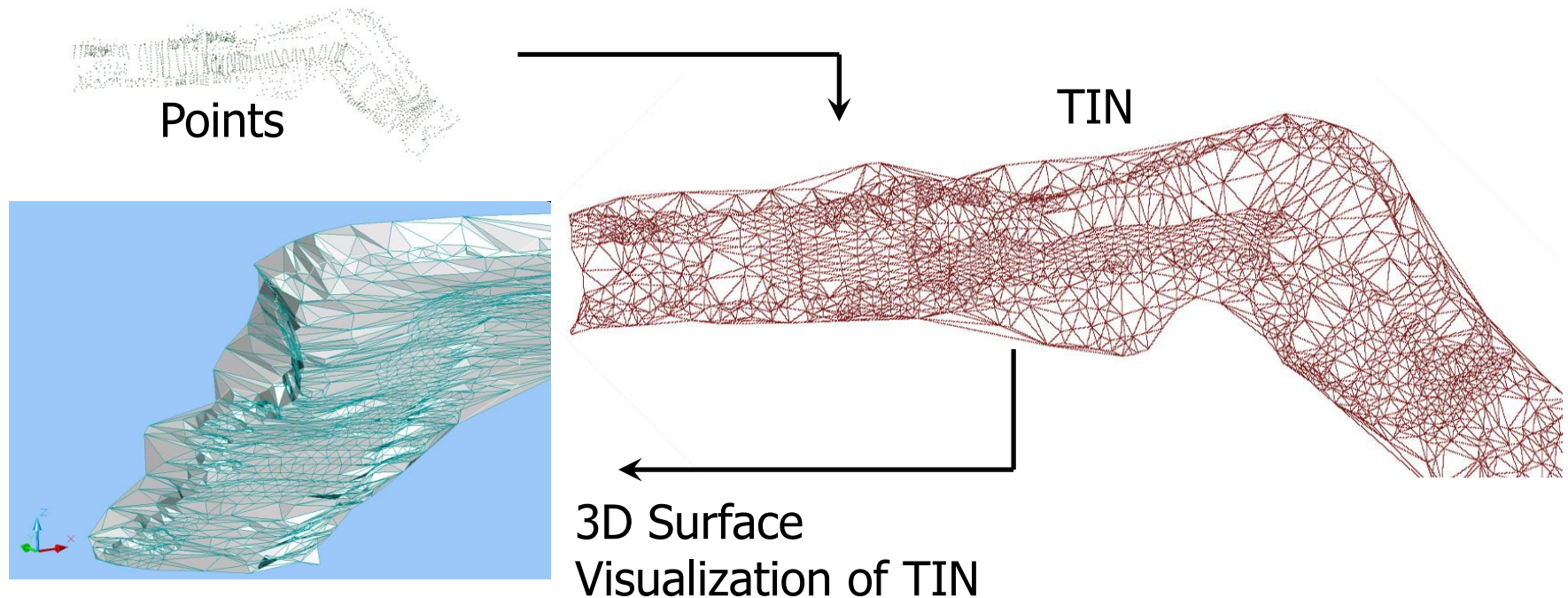
# TOPOGRAPHIC DATA: VECTOR DATA

- A collection of points with attributes:  
Point Number, Easting (x), Northing (y), Elevation (z), Description, etc.
- Variety of acceptable formats:  
**ascii** (\*.txt or \*.asc or \*.dat), **delimited** (\*.csv), **Excel** (\*.xls) or **shapefiles** (\*.shp and \*.shx).

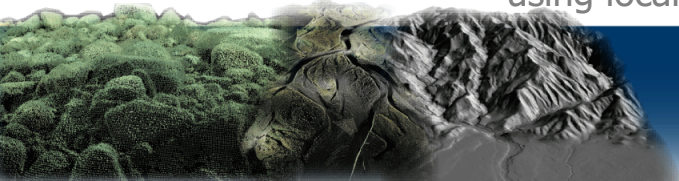


# BUILDING A TIN FROM VECTOR DATA

**Triangular Irregular Network (TIN):** the simplest and most common interpolation technique for building surfaces with irregularly spaced elevation data (McCullagh, 1981)

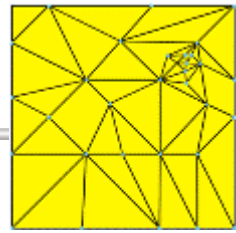
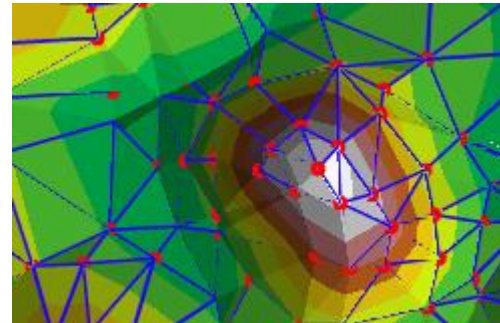
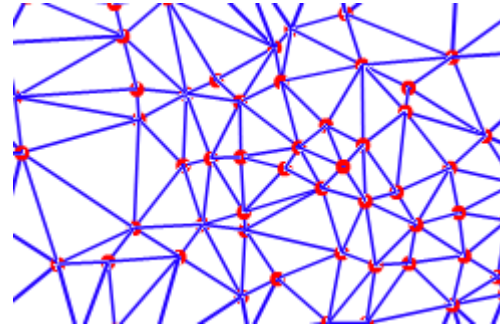


McCullagh MJ. 1981. Creation of smooth contours over irregularly distributed data using local surface patches. *Geophysical Analysis*. 13: 51-63.



# DETAILS OF TINs

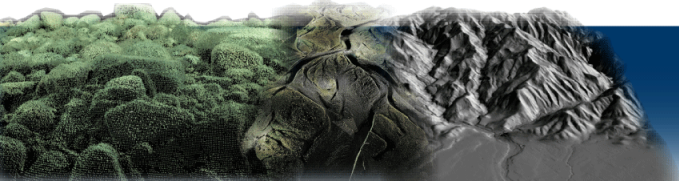
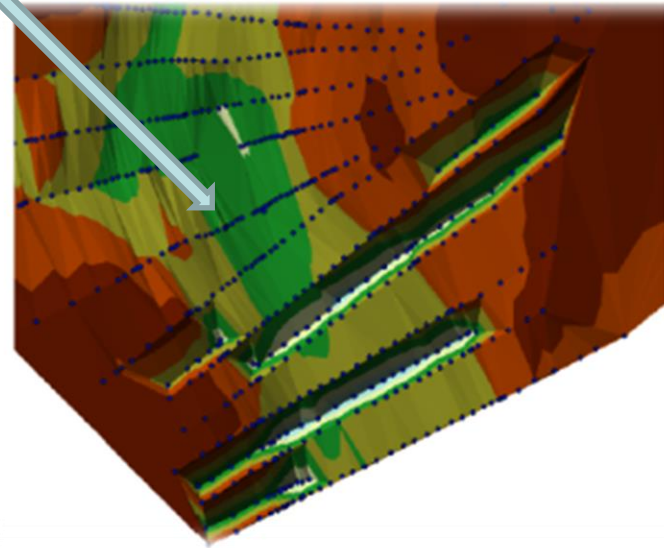
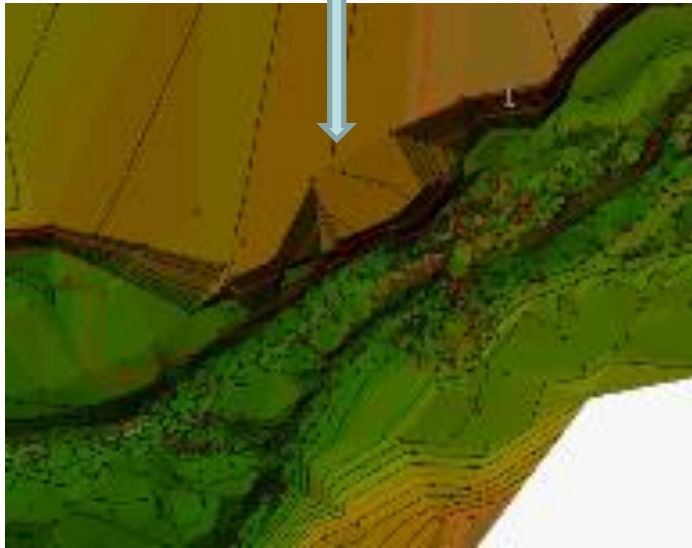
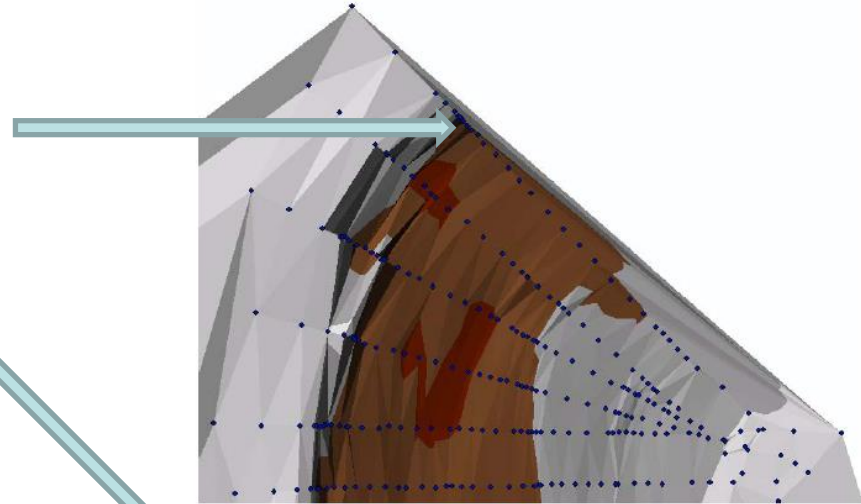
- Vertices connected with a series of edges to form network of triangles (continuous)
- ArcGIS uses Delaunay triangulation, which maximizes interior angles
- Resolution can vary





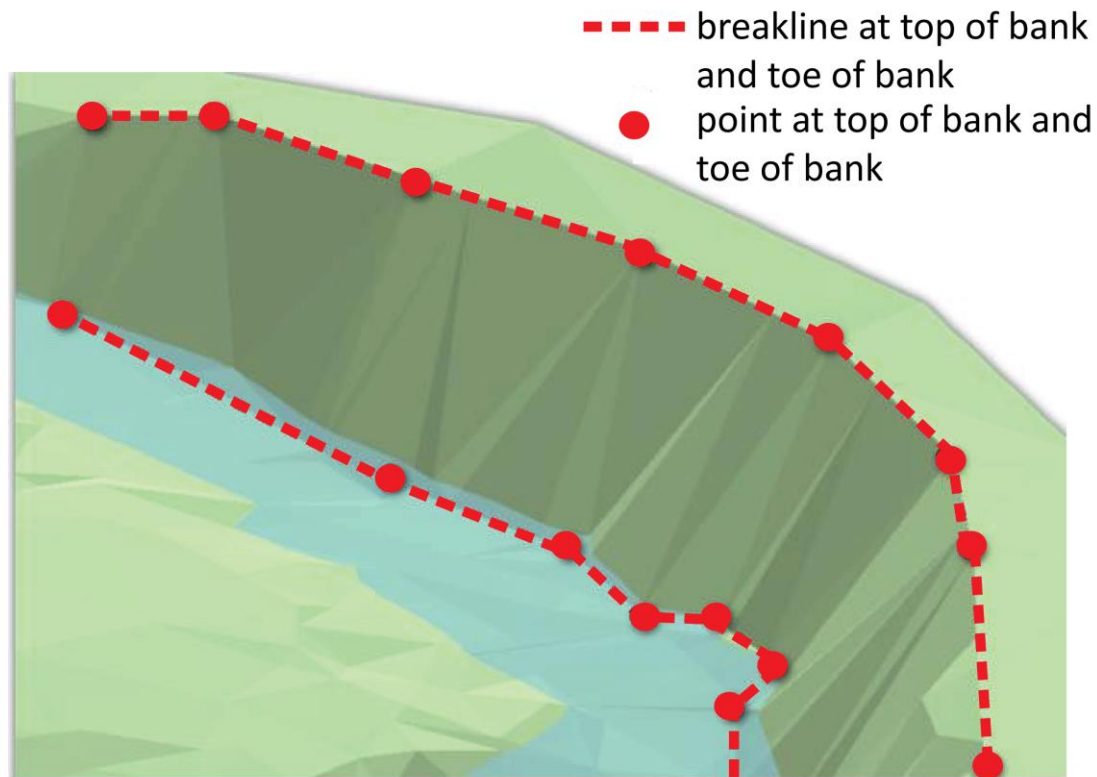
# WHAT CAN GO WRONG WITH SOME TINs?

- Artificial channel dams at boundaries
- Rod height busts
- TIN Facet errors



# BREAKLINES

- Prevents interpolation from going across
- Breaklines become TIN edges
- Allows for higher quality surfaces with lower point density



**Figure 1.** Example of top of bank and toe of bank XYZ points and breaklines. Breaklines are often used to capture continuous linear features and breaks in slope (e.g. toe of bank) as, under certain stream conditions, breaklines can afford greater coverage more rapidly than XYZ point acquisition alone.

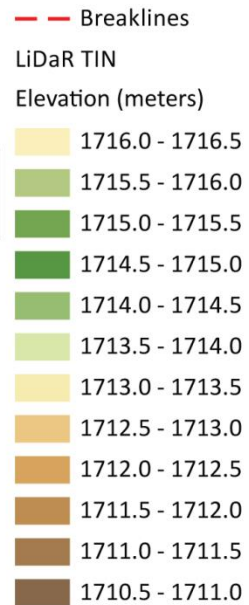
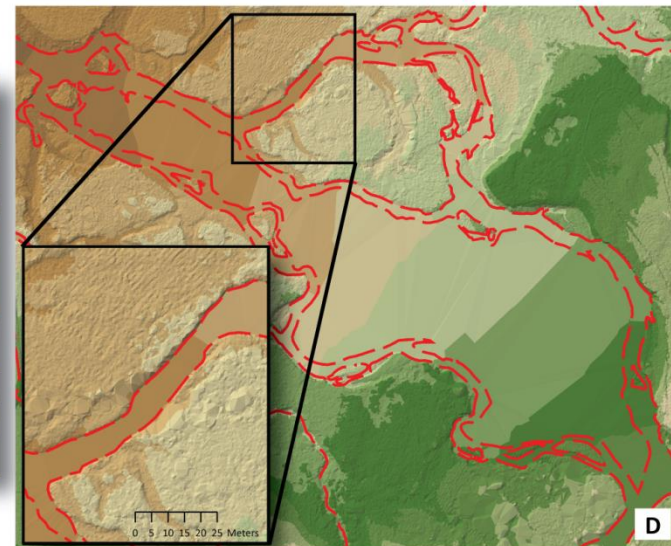
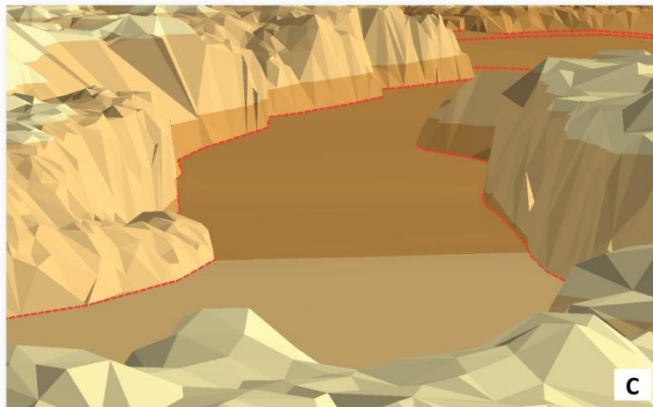
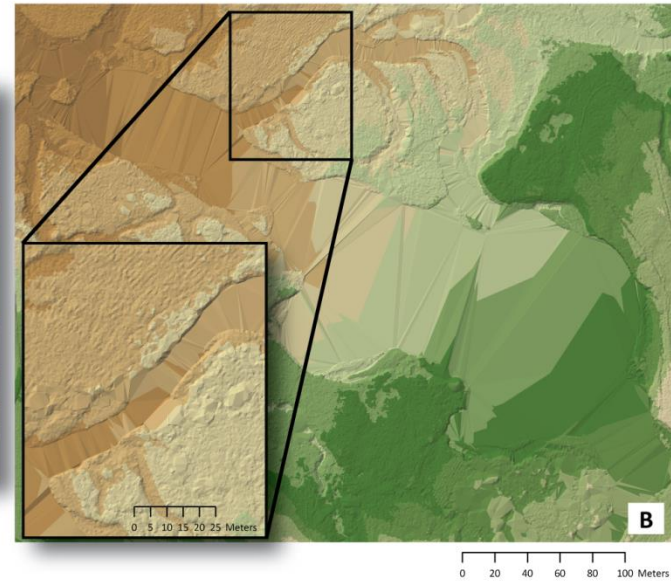
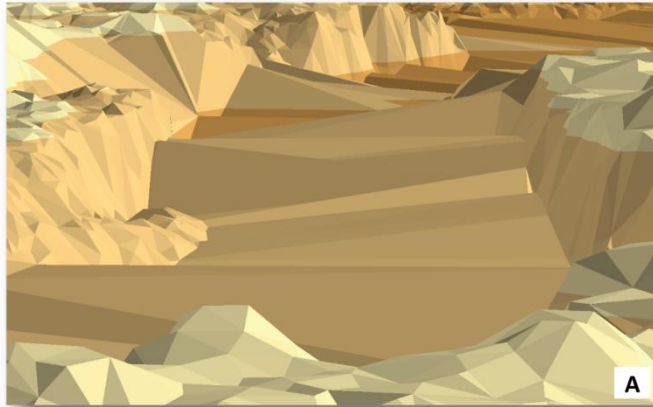
From Portugal et al. (In Prep); Adapted from Bouwes et al. (2011) CHaMP Protocol





# HYDRO-ENFORCED BREAKLINES

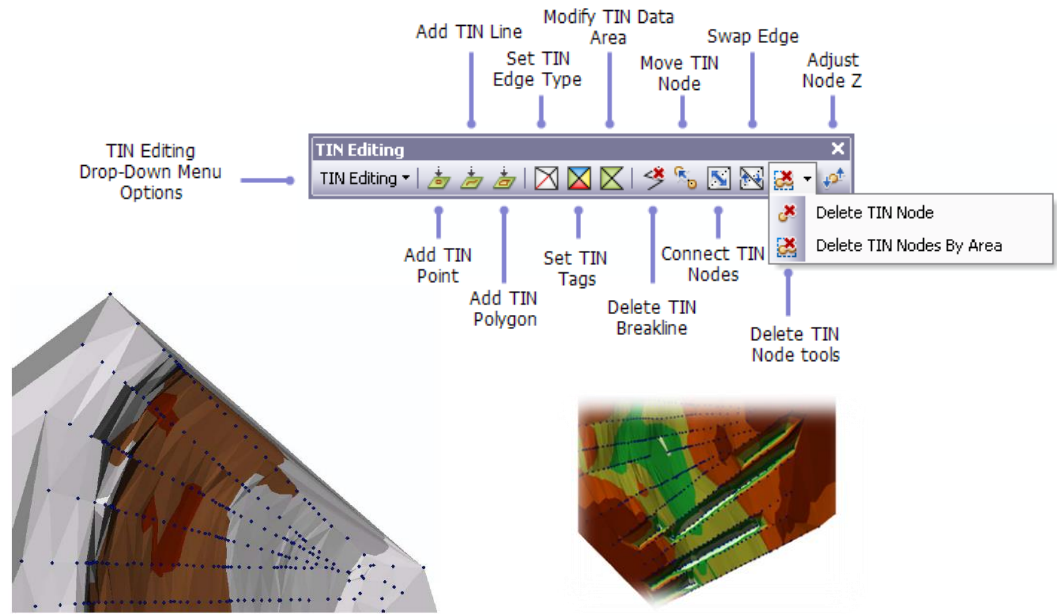
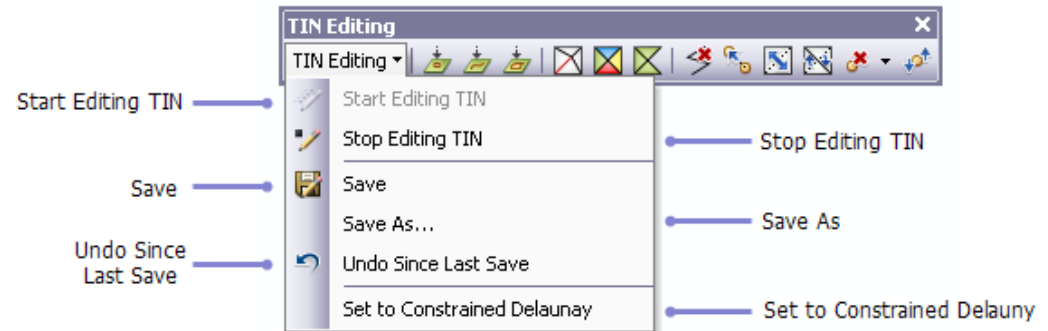
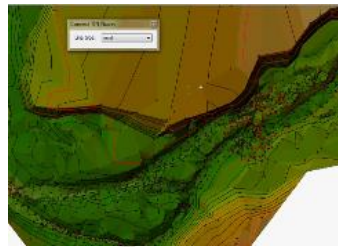
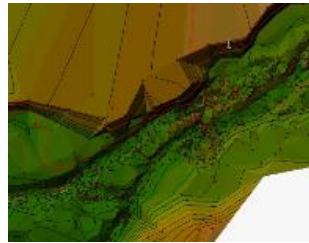
From Portugal et al. (In Prep)



**Figure 2.** LiDaR TIN of Lemhi River sample reach without hydraulically enforced breaklines detailed in cross-section (A) and at reach-scale planform view (B). LiDaR TIN with the addition of hydraulically enforced breaklines in cross-section (C) and at the reach-scale planform view (D). Addition of breaklines greatly reduce effects of artificial dams and facets.

# INTERACTIVE TIN EDITING TOOLBAR

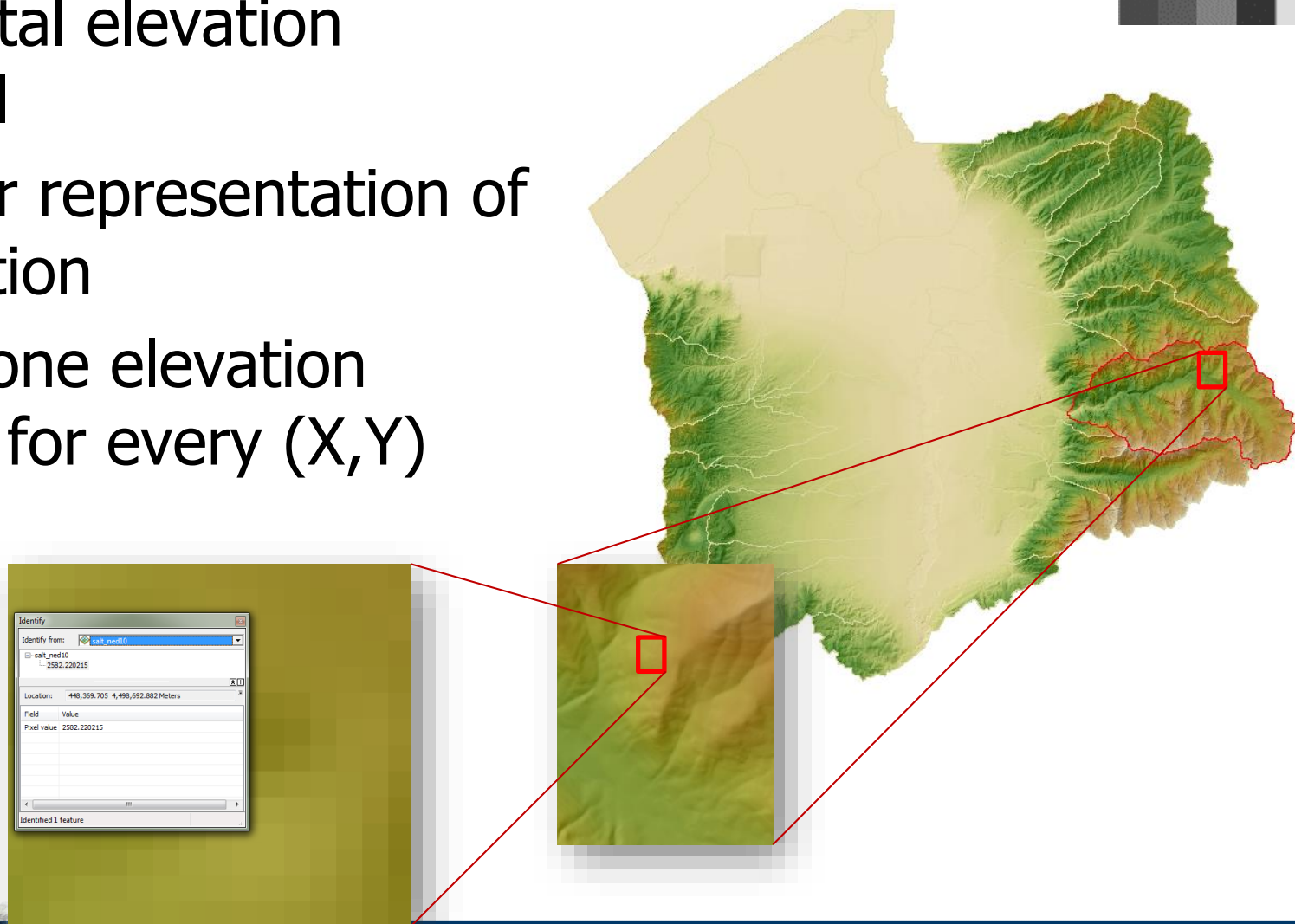
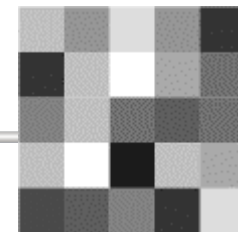
- Remove busts
- Add points
- Add break lines
- Change order



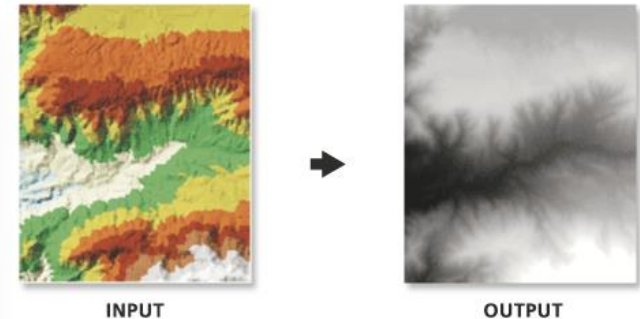
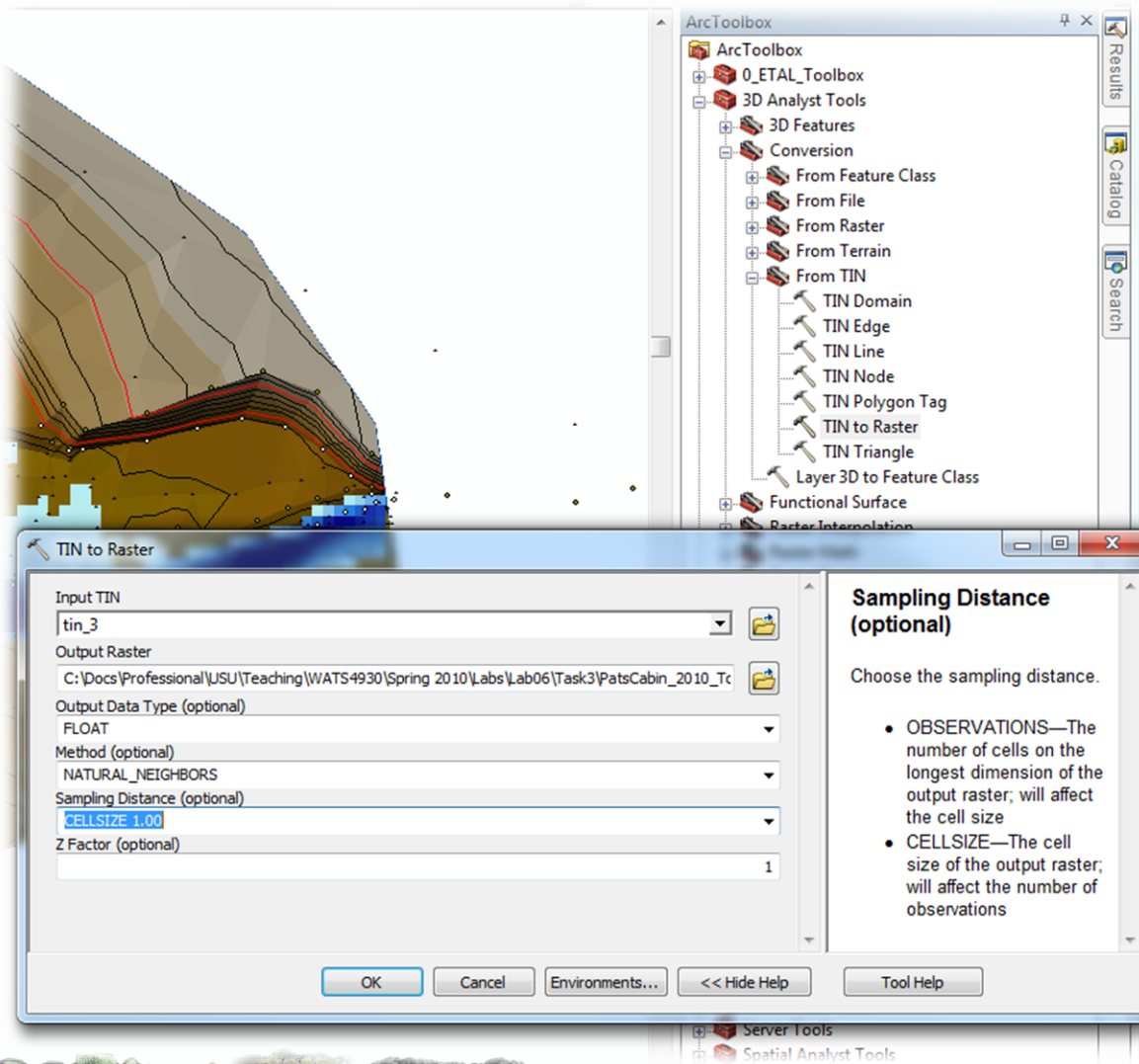


# RASTER DEMs

- A digital elevation model
- Raster representation of elevation
- Only one elevation value for every (X,Y)



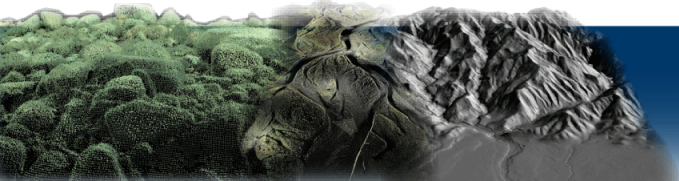
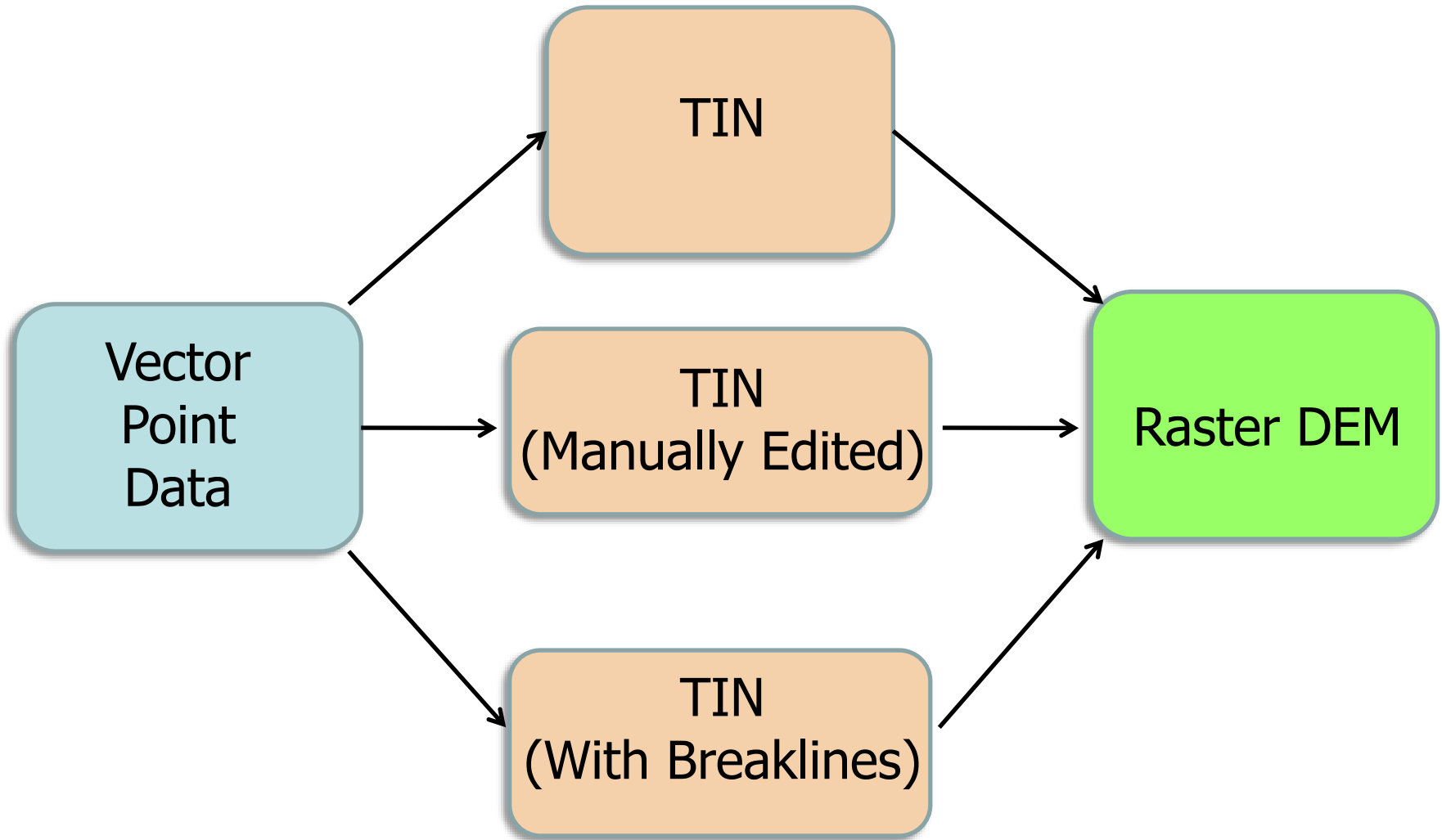
# DEMs FROM TINs



- Simple conversion...
- Three Key questions:
  - Float/Integer
  - Method
  - Resolution

# TODAY

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# EXERCISE D STEPS...

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1. Import context photo (optional)
2. Import survey points
3. Create TIN
4. Re-Create TIN w/ boundary imposed
  1. Manually edit to add breaklines
5. Re-Create TIN w/ breaklines
6. Convert to DEM @ 10 cm resolution

