Today

- Ex. 5 solution (interpolation)
- How to use the Model builder
- Notes:
  - No lab Tues. next week - but lecture
  - Midterm March 13 (no lab Mar. 11)
  - Final: Fri., May 9 9:45-11:45?
Ex. 5 - Interpolation from points

- Initial data: bedrock elevation points
- Visualize elevation (same color scheme as interpolation for comparison)
- Shorten labels: use `int([elev])` in label expression (not in attribute table!)
- Where are samples “bunched up”? 
- Kernel density - histogram equalization for smooth color: bring out extremes
- No actual point at max. density!
- What’s the average distance between samples? ~ 1050 m (max: 4500!)
- Good interpolation up to 1050 m
IDW with fixed radius (~2100 m)

NoData assigned for cells beyond 2100 m away from any sample! (“our comfort zone”)

IDW_fx

Value
High : 769
Low : 265
IDW (12 closest points) power 2 vs power 3
- power = 2:
  a sample that 10 m away is “worth” \( \frac{1}{10 \times 10} = \frac{1}{100} \)
- power = 3:
  same sample (10 m away) now is “worth” only \( \frac{1}{10 \times 10 \times 10} = \frac{1}{1000} \)
- result:
  power=2 puts less emphasis on far away samples
- power=2 interpolations “drop off” faster from the sample locations
IDW with break line vs. Tension spline

Close (duplicate?) points with different elevation!

IDW just “averages”, spline tries to “optimize” - and “freaks out”
TSpline - IDW (simple subtraction)

Better: absolute difference
\[ \text{abs}(\text{Tspline} - \text{IDW}) \] or
Root-Mean-Squared (RMS)

Or: difference of the total sum of all cell values (How?)

Equivalent to comparing averages of \[ \text{abs}(\text{TS} - \text{IDW}) \]

Shows smooth (spline) vs IDWs “linear patterns” (why?)

Better measure of interpolation quality: subtract each from the true values and compare (compare residuals)
true - IDW (non-abs avg. = -12.1)

both methods heavily over/under estimate when extrapolating

true - Spline (non-abs avg. = -14.1)

sample error not handled very gracefully

large underestimation
5 min pause
Model Builder

- Sequence of geoprocessing tools
- Flowchart story of geoprocessing operations
- Allows parameters for flexible models
- Allows to show a process (on a poster)
Elements in the model:

- Input variable: Hydrants
- Tool: Buffer
- Derived data variable: Output Featureclass

Process:

1. 100-Year Flood Boundary
2. Land Parcels
3. Intersect
4. Land Parcels inside the 100-Year Flood Boundary

Input Elevation Dataset

- Aspect
- Slope

Output Aspect

Output Slope Dataset

Output Elevation Dataset
Creating a new toolbox and Model

Add data
drag layer from TOC
drag tool
Validate & Run

Model
Model Edit View Window
Run
Run Entire Model
Validate Entire Model

Model
Model Edit View Window
Run
Run Entire Model
Validate Entire Model

Executing (Select): Select wetland_polygons C:\temp\selected_polygons.shp
""""VEGTYPE"""" In (2, 8, 15, 18 )"
Start Time: Mon Dec 27 16:46:47 2004
Executed (Select) successfully.
End Time: Mon Dec 27 16:46:49 2004 (Elapsed Time: 2.00 secs)
Connect graphically

Add to display and TOC
• Need New Toolbox for your tools
• Tools must be saved/loaded from a Toolbox (folder)
• Open (2 x click) runs the tool (like internal tool)
• tool window Parameters (P) in graphic
• To change the internal program, use Edit
• ESRI support web help (Model builder)
• “What I wish I had known about ModelBuilder before I started using it”
Model Builder: practical case

- create a Modelbuilder folder in your student folder, add pollution points shape file
- change location for storing your tools in your folder (Tools > Options > Geoprocessing > My Toolboxes)!
- check: “overwrite output of geoprocessing operations”
- new ArcToolbox, (MyTools)
- new Model (Name: Interp_tool, Label: My Interpolation Tool, Store Relative path names!)
- Interpolate from bedrock_elevation points (different schemes and parameters) (call: samples)
- Spatial Analysis Tools > Interpolation > IDW
- Connect Samples to IDW
- configure IDW tool, make sure output is saved locally (call IDW_result)
• output > Add to display (show changes). Save Tool and run model

• play with different IDW parameters (will overwrite!)

• Sp.A.Tools > Math > Minus Tool

• connect to IDW result

• add dem_stEEP, subtract IDW result from it

• check order: 2. input - 1. input

• Add result of subtraction to display

• Next: zonal statistics: sum of differences ( = thickness)