Geol 588  
-  
GIS for Geoscientists II  
lecture 3  

Today

- HW 1 status?
- vector to raster conversion
- raster attribute tables (VAT) for discrete rasters
- environment settings: extent, mask, cellsize, etc.
- lab: raster calculator
- HW 2 (Lodge planning exercise) will be given on Thursday (due 1 week later)
- Start on Surface analysis tools

Features as raster

- Features lose uniqueness with raster representation (e.g. a line becomes a collection of cells)
- “outside” of feature => Nodata in the raster
- Tools: Conversion Tools - To Raster - Feature to Raster

Raster resolution

- Rasters always generalize spatial data
  - A function of cell size (smaller cells = higher resolution)
  - Impacts accuracy, processing speed, storage space

<table>
<thead>
<tr>
<th>Cell size</th>
<th>Matrix</th>
<th>Lake Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>100m</td>
<td>16 x 16</td>
<td>68</td>
</tr>
<tr>
<td>200m</td>
<td>5 x 5</td>
<td>10</td>
</tr>
<tr>
<td>400m</td>
<td>4 x 4</td>
<td>9</td>
</tr>
</tbody>
</table>

Typically creates discrete rasters - one of the feature class’ field (attribute) will be transferred into the Raster (here NAME). There will always (?) be a VALUE field (int) for discrete rasters.

Angle based resolutions:
- 1 arc second means around 30 m (90 ft) resolution
- 1/3 arc second => 10 m (30 ft) resolution
- 1/9 arc sec => 3 m (10 ft) resolution

How does the error for the lake’s area change as cell size goes up?
Discrete Raster attribute tables

- Single-band, integer rasters have “virtual” attribute tables (VAT)
- “fakes” a feature attribute table
- each line (“feature”) all cells of a certain Value (except NoData?)
- Count: number of cells of this value
- You can add more fields (Add Field..)
- Supports table joining: if you have only the Value field but you know what each value means (in a lookup table) you can create a “translation” of the values
- You can edit values of some user-made fields (needs to be in edit mode)
- Field names can be use in raster calculator expressions: \(<\text{raster}>.\text{<field>}\) geolgrid.COUNT

<table>
<thead>
<tr>
<th>Value</th>
<th>Count</th>
<th>Landcover</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>Rock</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
<td>Forest</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>Water</td>
</tr>
</tbody>
</table>

Environment Settings

- Similar to Spatial Analyst - Options in ArcGIS 9 (now: under raster analysis and processing extend)
- Kick in when a tool is run (write a raster - what extent, cellsize?)
- ArcGIS 10: ArcMap wide settings (“global” settings) via Geoprocessing - Environment Settings
- Most settings have defaults (which cellsize will the tool use if the user did not yet specify anything?)
- Local settings: Globals settings can be overwritten by tools (e.g. globally cell size may be set to 30 but when using the hillshade tool the output’s cell size should be 10)
- (Also: environment can be set per model in Modelbuilder)
- ArcMap env. setting should be saved inside the .mxd file
- ArcToolBox - Save Settings (to file or as Defaults)

Some of the settings needed to create an output raster

- Cell Size
- Extent
- Mask polygon or raster
- Projection
- Cell Size: The output cell size, or resolution. The default output resolution, when a feature class is used as input, is the width or the height (whichever is shorter) of the extent of the feature class divided by 256.
  - Maximum of inputs - The largest cell size of all input datasets. This is the default.
  - Minimum of inputs - The smallest cell size of all input datasets.
  - As Specified Below - Specify the exact cell size value.
  - Same as Layer - Specify an input raster layer or which to base the cell size.
Output raster’s cell size

- You can use input rasters with different cell sizes
- Rasters are internally resampled during processing

Output options:
- Maximum of inputs (default)
- Minimum of inputs
- Same as layer
- Specified directly (30 m)

Processing Extent

- Controls the width and height of the output raster
- Combine extent of input rasters - output another extent

Output options:
- Union of inputs
- Intersection of inputs
- Same as layer
- Same as current display
- Directly specify
- Snap to existing raster
  (Not clear on what the default is in ArcGIS 10)

Masking a raster (analysis mask)

- If a Mask (polygon/raster) is set, any output raster created will be masked
  - Useful for clipping a raster to an irregular shape
  - Each cell of the Raster is compared to the mask
  - Cells inside the mask are not changed
  - Cells outside the mask are set to NoData
  - Can use a polygon or a special Mask raster

- Polygon (shapefile)
  - Anything “outside” of polygon is filled with NoData values

- Raster mask (2. raster)
  - Cells with any non-NoData VALUE counts as “inside”, NoData cells counts as “outside”
  - Not the same as a classic binary (1 or 0), 0 does not count as “outside”
  - Ex: 1 vs NoData, 0,1,2,11 vs NoData
  - Mask from converting another Raster?
    Create NoData values (reclassify) or via Raster Calculator’s SetNull()
• Output coordinates (Coordinate system / Projection):
  • Use existing layer as template (Same as DEM.img or Same as polygon.shp)
  • specify explicitly (As Specified below -> NAD_1927_UTM_Zone_13N
  • Use current Dataframe’s coordinate system: Same As Display (?)

• Workspace:
  • Current Workspace - Default folder or GeoDB for output
  • Scratch: temporary - setting to local folder (C:\temp) could be faster

More on Raster calculator tool (add to Feb. 3 handout)
• Creates a new raster, subject to extent, cell size, mask, coordinate system, etc. set in environment
• given a boolean and relational expression, it will evaluate it and return 0 (if False) or 1 (if True)
• “DEM” > 1400.0 to create a binary raster where 1 is > 1400 m, rest is 0
• “binary_raster” = -1 + 1 What does that expression do?
• “geolgrid” == 7 creates a binary raster with 1 where geolgrid’s value is 7
• (“geolgrid” == 7) | (“DEM” > 1400.0) | => OR & => AND ~ => NOT (must use & | ~ )
• Will always use the VALUE attribute (can’t use “geolgrid NAME” in ArcGIS10, see lookup tool instead)
• SetNull() (see Tool help) - generates NoData (Null) value if a condition is True
• SetNull(<input raster>, <output if condition is False>, <Condition to give True or False>)
• SetNull(“DEM”, 1, “VALUE > 1400”) sets cell’s where DEM’s VALUE is >1400 to Nodata, rest to 1
• SetNull(“DEM”, “DEM”, “VALUE > 1400”), sets cell’s where DEM > 1400 to Nodata, rest to DEM
• SetNull(“DEM”, “geolgrid”, “VALUE > 1400”) sets DEM > 140 to Nodata, rest to geolgrid
• Con( <expression>, <value if true>, <value if false>)
• Con(“DEM > 1400”, 1, 0) Con(“DEM > 1400”, “Geolgrid”, -999)
• IsNull(“raster_w_Nodata”) => 1 where raster_w_Nodata has Nodata, 0 everywhere else
• geoprocessing options: set overwrite the outputs to ON
• scratch workspace -> can be used as default folder for rasters