**Advanced GIS. Lab 3**

**Designing a Raster GIS solution**

The goal of this is a basic, raster site selection analysis – with weights. In short, a project like the one we went over in the last lecture. In short, you pick a business (or, really, anything you want), define location criteria, and then, ultimately, a final location.

Read the whole lab before you get started. Tips abound.

**Procedure:**

1. Decide what sort of business you are going to locate - ski resort, fishing resort, mountain biking, Wal Mart, McDonalds, etc. Anything is cool - you decide.
2. Pick the area. Make sure the scale you are working at is appropriate for your particular project. One caveat - the area must NOT be in Washington State.
3. Determine your criteria (as these will be data dependent, steps 3 and 4 should be done simultaneously). I want you to use ***at least*** 5 different criteria. They could be things like distance, slope, landuse type, zoning, etc... Note, not all need to be (or should be) distance criteria. Some could be attribute selections, etc (i.e. within a certain property ownership type - private, federal, state - however, at some point you will need to convert anything vector to raster to use it in a raster calculator query. And yes, this is a raster lab, so your analyses must be in raster format. Remember to set your geoprocessing environments (analysis tab, environments button) every single time you open Pro to do some work.
4. Get some data! See the below section for details about grabbing data. No more than 2 datasets may come from the same source (ie - you can get no more than two datasets from the USGS, two from the State DOT, etc). Which means your data must come from at least three different sites.
5. Create 5 suitability maps - one for each criteria. Make sure they're reclassified such that values of 1 are not suitable, while values of 10 are most suitable. Note, you don't need to use every number between 1 and 10 - it will depend on your particular data.
6. Determine weights for each of your criteria. Remember, the weights must range between 0 and 1, but sum to 1.
7. Combine your 5 criteria maps and weights in raster calculator to generate a final suitability map. Basically, this analysis ranks every pixel in your study area. You will see areas that are good, ok, and bad. You will then choose your final site on this map.
8. Add some geography to your criteria/suitability maps. Could be roads, rivers, cities... something appropriate to the scale of your area. I do NOT want to see just a bunch of colors - gimme some context!
9. OK. In the end I want you to hand in a single word document which contains
	1. 6 maps (in color) - one of each reclassified criteria map and your final, combined, site suitability map. Be sure to include your final site selection on the suitability map. Make sure you follow all proper cartographic procedures. I do not want screenshots here. Use the full page, landscape or portrait, whichever is appropriate for your study area. Exporting your maps to .jpg and inserting them into the word document is probably simplest.
	2. A writeup which includes:
		1. a description of what you are trying to site
		2. For each criteria, include the data source and every step you used to get the final reclassified raster layer. Include what each suitability value (1-10) means. For example, a 10 might be slopes <2 degrees, a 5 slopes 2-4 degrees, and a 1 slopes over 4 degrees.
		3. A list of your weights
		4. A final paragraph or two which a) justifies your final site selection and escribes how you could make your analysis better (diff criteria, data, etc...).

**Where do you get data?** (note, these links may be a bit old - and certainly, this list is NOT exhaustive)

* <http://www.gisdatadepot.com> (DEMs, DOQ's (digital orthoquads), DRG's (digital raster graphics), Flood zones, etc.)
* [GeoData.gov](http://gos2.geodata.gov/wps/portal/gos)
* Do a google search. Or try some of the below URLs. Some may have useful data, some may not.
* [NRCS](http://datagateway.nrcs.usda.gov/)
* [Open Topography](http://www.opentopography.org/)

[canadian GIS data center](http://geogratis.cgdi.gc.ca/frames.html)

[Cartographic Boundary Files - U.S. Census Bureau](http://www.census.gov/geo/www/cob/)

[Datamall Homepage - Frames](http://www.datamall.com.au/)

[Environmental Information Sources](http://www.environment.gov.au/ps/owa/other_servers.list_servers?cty=-8&cat=)

[Federal Geographic Data Committee](http://www.fgdc.gov/)

[FREE Geodata](http://www.geog.uni-hannover.de/phygeo/geodaten.html)

[GEODE [ USGS GEO-Data Explorer ]](http://dss1.er.usgs.gov/)

[Geography Network](http://www.geographynetwork.com/)

[Landsat4U - Public Domain Satellite Data](http://www.landsat4u.com/Merchant/index.html)

[Mostly Free U.S. Geospatial and Attribute Data](http://www.cast.uark.edu/local/hunt/index.html)

[New Geospatial Data Research Network Home Page](http://keck.library.unr.edu/)

[Spatial Data at the WA State Dept of Ecology](http://www.ecy.wa.gov/services/gis/data/data.htm)

[SSURGO Download](http://www.ftw.nrcs.usda.gov/ssurgo_ftp3.html)

[TerraServer Homepage](http://terraserver.microsoft.com/default.asp)

[TopoZone](http://www.topozone.com/)

[U.S. EPA Geospatial Data Clearinghouse](http://www.epa.gov/nsdi/)

[U.S. Geological Survey](http://www.usgs.gov/)

and many other places. Google is your friend. And you can find data about just about any place in the world. Be creative, have fun, and learn something besides GIS!

**How do I import data?**

Well, that depends on the data format. Let me go over a couple of options (once you get the data saved to your drive). Remember to always keep a copy of whatever you download – just in case you screw something up and need to go back to it. First, take a look using Windows Explorer. If the unzip process made a bunch of folders, your data is probably in an ArcInfo Coverage (or GRID) format. If not, look at the filename extensions.

* First, try calling the data up in ArcMap. If you can, no worries! If not...
* Zipped files - .zip .gz .tar and others - look at the icon for the file in windows explorer - if it's a little C-clamp holding a folder, unzip it using the zip application loaded on all the lab comps (or windows explorer, as it can now handle .zip files). There is a slight chance you will have zipped files within zipped files - unzip 'em twice. Note, windows can’t handle .gz or .tar files – you will need to install the free 7-zip program.
* if the file extension is .e00 - this is an arcinfo interchange file - basically, it's ESRI's old method of zipping a coverage or grid. Breaking news (April 2020). Pro does not have any sort of converter for this. Which is freaking stupid – it’s ESRI’s own file format…. Sigh…. For this lab, you have a couple of options. Probably the best is to find other data and not waste your time. After that, it looks as though there are scripts out there you can install that will do it. Or run old ArcGIS (not Pro), which has an importer.
* if the file extension is .dem, ArcToolbox , conversion tools, to raster, dem to raster.
* The big trick will be coordinate systems and datums... be sure to look at each dataset. Check the metadata. Look for metadata links from wherever you downloaded it from. Chances are very good that you will download data which is projected, but not defined. In other words, the software won't know what coordinate system and datum the data is in. You get to figure this out. Remember the difference between the define projection and project commands - define is just saying what it is in; project will actually change the projection (coord/datum). 99% of the time, all you will need is the define projection command (arctoolbox, data management tools, projections and transformations).
* Remember, datums and projections will be your main issue here. LOOK at the data, look at the coordinates. Compare to USGS quad maps (free downloads: https://viewer.nationalmap.gov/basic/ ). Also note: you cannot do raster distance calculations off things that are in Lat/long. Be sure to check this if you start getting wierd error messages. Actually, check this before you start messing with the data. When doing raster, DO NOT USE anything in lat/long.

So. Main points to check

1. importing the data. See above for the most common formats. Remember, Pro can read coverages, grids, shapefiles, and geodatabases. And a few other things.
2. Projections/datums. Easiest thing to do here is to open the file into a blank, new map window. Then look at the coordinates at the bottom of the page and the properties of the layer. Make sure everything is in either UTM or State Plane. Bad things will happen if you use Lat/Long.
3. Before you do anything, make a copy of the data you downloaded. The chances are good you will screw something up, and you will want a nice, clean copy tucked away somewhere you can go back to, rather than having to redownload, import, etc.
4. Remember that this is a lab. If you can't get a layer to work or can't find exactly what you need, dump it and look for it somewhere else or something different. Don't waste too much time on a single layer.
5. Make sure your maps follow all appropriate cartographic niceties – scale, neatline, n arrow, legend, yada, yada.