ArcGIS
Deer Winter Range Analysis

QUICK OVERVIEW:

1. **Issue**: land suitable for **deer winter range** (DWR) is critical to preserve to ensure deer are able to survive harsh winter conditions

2. **Learning Objectives**: to further develop abilities using **raster functions** in GIS

3. **Data**: the only data supplied are **spot heights, forest cover** and **maskdwr** for Bowen Island

4. **Analysis**:
   a. Assemble all "raw data" layers required for the project into a file geodatabase
   b. Create additional map layers as required
   c. Determine the area that suits all criteria needed for DWR
   d. Buffer the DWR areas to create a special management zone

5. **Interpret Results**: be sure you understand all new map layers that you create

6. **Communicate Results**: create a map layout that clearly communicates your results

THE ISSUE

Deer winter range (DWR) is critical for deer survival and, therefore, it is imperative that adequate DWR be reserved from other uses, such as urban development, mining and timber harvesting. The suitability of DWR depends on several physiographic factors and forest cover conditions. The criteria for DWR are:

Physiography	Elevation:	$\geq$ 400 meters (actually it is 600-900m, but we are altering that value for this lab)
	Aspect:	135 – 225 degrees azimuth (inclusive)
	Slope:	40 – 120% (inclusive)
Forest Cover	Forest Age:	$\geq$ 150 years
	Tree Species:	40 – 100 % (inclusive) Douglas-fir

Suitable DWR needs to satisfy <u>all five</u> criteria listed above.

Plus, a 100m special management buffer needs to be created around all suitable DWR.

LEARNING OBJECTIVES
In this lab you will further develop the following ArcGIS skill sets
- **Interpolate** an elevation raster surface from spot heights (vector)

- **Derive slope and aspect** raster surfaces

- **Convert** between vector and raster data formats (vector ↔ raster)

- Further practice use of the **Raster Calculator**

- Use **Distance** and **Reclass** to create buffers in raster

- Create an **effective map layout**

DATA
You are provided with only the following data layers:
- Spot_Hts – (vector) point data that depicts elevations
- Forest – (vector) polygon layer that depicts forest stands with only basic data
- Maskdwr – (raster) logic layer where:
    - 1's = "area of interest" and
    - NoData = area not to be included in the analysis

Note: All the layers are projected in the UTM, Zone10N, NAD83 coordinate system.

ANALYSIS & INTERPRETATION
You are to devise an **analytical model** to determine area that meets all the criteria for suitable DWR and then create a buffer to further protect areas suitable for DWR.

Two required intermediate layers are:
- DWR_phys – which depicts areas that meet elevation, slope and aspect
- DWR_Forest – which depicts areas that meet Douglas-fir% and age

Thus the DWR layer is simply the coincident area of these two layers.

COMMUNICATE RESULTS
You will need to create a map that clearly communicates the results of your analysis. This includes a map that depicts Bowen Island with areas suitable for DWR plus the special management buffer. Additional map layer(s) that provide useful background information should be included. Include map insets (i.e. the physiographic & forest layers) to help your audience understand the criteria used to determine the potential DWR. Also provide an estimation of the area (ha) contained in the DWR and buffer. *Bonus: provide an estimate of the volume of timber contained in the DWR area and buffer.*

Some careful planning is required to ensure the message stands out and required supporting information comprises the background. Include standard map elements, insets, tables and text as required. Your target audience includes ~~both~~ natural resource managers (i.e. colleagues) ~~and is the general public~~ – plan your layout accordingly.

DELIVERABLES
1. The **analytical model** (saved as an emf) – note the model will require enough detail so that somebody else can replicate your analysis exactly.

2. A **map layout** (saved as a jpg or png) that meets the previously described criteria. Be sure to include all necessary map elements. Make sure that your map layout clearly conveys the analysis that you performed; make the symbology is meaningful and visually appealing.

3. A **description of your cartographic design** (in a paragraph or two) - describe how your layout is designed to communicate the analysis conducted (suitable DWR) and the target audience.

   Use the drop box to submit your results.

HELPFUL HINTS
- Project **set-up** – follow the 'housekeeping chores' from the Sorghum lab.
- Extra housekeeping:

   - You need to set a mask and predetermine the output pixel size. The pixel size should be the same as the Mask layer provided. In order to set mask and pixel size …

   - Select Geoprocessing menu, then Environment Settings, then Raster Analysis … that should be enough of a hint.

- Look at the data you have and be sure you understand it.

- **Sketch a draft model** that you plan to follow to create DWR and the buffers. You will need this model before you ask for help. It is understood that edits to the model may (will) be required.

- Be sure to create a toolbox and model that **reside in your DWR geodatabase**

- It would be beneficial if all your **intermediate map layers were added to the TOC** so you can examine them to see if they are correct and make sense.

- **Determine where the forest is suitable (i.e. Fir% and age).**

   - To create raster layers from vector use
   Conversion Tools > To Raster > **Polygon to Raster** … and follow the prompts

   - Then create layers that meet the criteria

- o **Create the "missing physiography data layers"**
    - o To create an elevation raster from spot heights use
      Spatial Analyst Tools > Interpolation > **IDW** … parameters to use:
        - ▪ Elevation for Z field
        - ▪ Power of 2
        - ▪ Search radius: variable
        - ▪ Number of points: 12
        - ▪ Cell size: 25m

    - o To create **slope** and **aspect** from the elevation layer you'll use tools in the Surface toolbox … take note of the units (output measurement) for your slope layer.

- o To **create 100m buffer** (the special management area)
    - o Raster:
        - ▪ First create a **distance layer** (Spatial Analyst Tools > Distance > Euclidean Distance)*
        - ▪ Second **reclassify** to create the buffers

      * When you run Euclidean Distance it is important that ONLY the pixels of interest (i.e. DWR) have a numeric value – all other pixels should be reclassified to **NoData**

Provide meaningful names for all layers generated, examples:
   - o **FirPct** for a layer with pixel values showing Douglas-fir % (note: the file name does NOT have a space, e.g. it is FirPct not Fir Pct)

   - o **DWR_Forest** for a logic layer that satisfies both fir % <u>and</u> age

- o Don't forget on your map layout that it may be beneficial to have a map layer be semi-transparent so that you are able to view 2 layers at once. You can also use "tabloid" map size (instead of letter) to allow a larger scale map.