Section 25: Locate Site for Military Barracks

Section Objective

This section is intended to provide a basic introduction to the Spatial Modeler adapted to Defence force personnel. The key objective is to analyze an existing area of interest, interpret the environmental conditions and isolate the ideal location for a military barracks.

The area of interest will be reduced down to areas with a slope of 1 degree or less.

This area will then be reduced down to include locations no more than 150m away from the water.

Lastly the desired Landcover for barracks needs to be forest beforehand. This ensures easy clearing and land availability vs other land cover types.

Class Notes

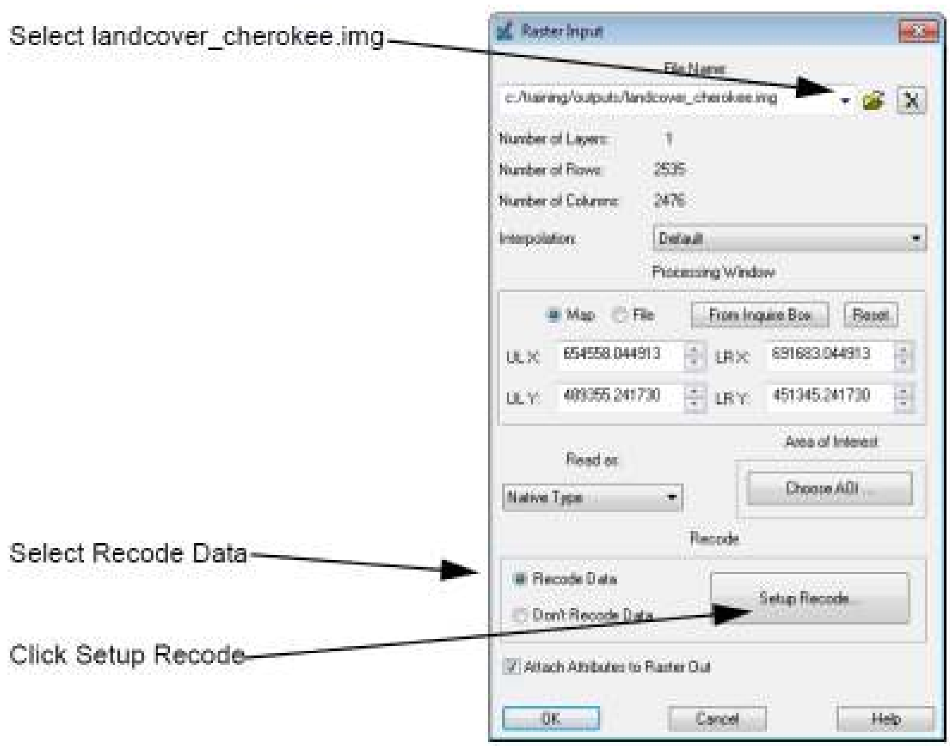
Locate Site for Military Barracks

Objective: Students will locate areas suitable for the construction of military barracks for training purposes. The areas must be; within 150m of water, built on a forested area and built on a gentle slope (less than 1 degree slope)

Task 1: Add and Recode Raster Input

1. Open a new Spatial Model Editor by selecting **File > New > Spatial Model Editor**
2. Drag a **Raster Input** from the Favorites category in the Operators pane into the Editor
3. **Double-click** on the **Raster Input**. Select ***landcover_cherokee.img*** (the output from an earlier exercise) from the File Name pulldown menu

   If you did not complete this earlier task, an example landcover_cherokee.img is available in the examples output folder



4. In the Recode section of the Raster Input dialog, select the **Recode Data** radio button and click **Setup Recode**

There are two different classes that we need to identify in the landcover image, Water and Forest. We will recode the input image, assigning new class values to these classes, grouping all of the forest classes together and grouping the unused pixels into background values

5. To select those rows containing Forest, right-click in the **Value** column and select **Criteria**
6. In the Selection Criteria dialog, construct a criteria statement, which reads: **$"Class_Names" contains forest**

7. Click **Select** then **Close**

You should see rows selected in the Recode dialog

8. Ensure **New Value** is set to **2**, then click the **Change Selected Rows** button
9. **Right-click** in the Value column and select **Invert Selection**.
10. **Shift- click** on **Row 1** (the Water class) to **remove** it from the selection set

11. Change the New Value to **0** and click **Change Selected Rows**. Click **OK**
12. Click **OK** on the Raster Input dialog

Task 2: Search from Water and Identify Forest Pixels

Now we will take the input raster that we have recoded and eliminate all the pixels which do not meet the first two requirements. First, we identify all of the pixels which are within150 meters of water.

ERDAS IMAGINE searches in pixels, so we need to convert the distance into pixels. To do this, we need to know the spatial resolution of our image.

1. On the Home tab, click the **Metadata** button
2. In the Image Metadata dialog, click the  **Open** button
3. Browse to your outputs directory and select ***landcover_cherokee.img***. Click **OK**

   Note that the input file has 15 meter pixels

   How many pixels equals 150 meters?

4. **Close** the Image Metadata dialog
5. In the Spatial Model Editor, expand the **Distance** operators and drag **Search** into the model
6. **Connect** the **Raster Out** port from the ***landcover_cherokee.img*** input to the **Raster In** port on the **Search** operator

7. Click on the Search operator to select it. In the Properties, enter a Search Distance of 10. Enter 1 for Class 1.

   The Class 1 field is the class that will be searched away from. In our case, we want to search away from Water, which is class 1.

   This file will output a raster with classes 0-11. Class 0 is on Water, class 1 is one pixel away, class 2 is 2 pixels away, etc. Class 11 contains all pixels that are greater than 10 pixels away from the water class.

   Which classes contain values that answer our criterion? Which classes can be ignored as "background"?

8. In the Operators, expand the Relational category and drag **Le** (Less than or Equal to) into the model

   This operator will output a 1 if Input1 is equal to or less than Input2. Otherwise, it outputs a 0.

9. Connect the **Raster Out** port from the Search to the **Input1** port on the **Le** operator

10. Click the **Le** operator to select it. In the **Properties**, enter **10** for **Input2**

   The output of the Less Than or Equal To operator is a binary image; you can think of this as a True/False image. If the pixel was less than or equal to 10 pixels from the water class (had a pixel value<=10) it will be written out as a 1 (True). If the pixel value was <10, it will be written out as a 0 (False)

   Now, let's isolate the Forest pixels and pull these two criteria together into a single branch.

11. In the Relational category, drag **Eq** (Equals) into the model beneath the Search

12. **Connect** the **Raster Out** port from the **landcover_cherokee.img** input to the **Input1** port on the **Eq** operator

   This operator will output a 1 if Input1 = Input2. Otherwise, it outputs a 0

13. Click the **Eq** operator to select it. In the **Properties**, enter **2** for **Input2**

    What does Class 2 represent in this recoded image?

    Now we are ready to tie these two branches together. Since we want to know all of the pixels where both branches are True (or, in computer-speak, equal 1), we will use a Logical And.

    The LogicalAnd operator will output a pixel value of 1 if the pixel values in both input images are 1. If both inputs are 0, or if only one input is 1, this operator will output a 0

14. Expand the Boolean operators and drag **LogicalAnd** into the model
15. **Connect** the Binary from the **Le** operator to the **Input1** port on the LogicalAnd. Connect the Binary from the **Eq** operator to **Input2**

16. Save your model as **barracks_model.gmdx**

Task 3: Calculate Slope from a DEM and Run the Model

The final branch will calculate Slope from the DEM

1. Drag a **Raster Input** into the model beneath the other branch
2. **Double-click** the **Raster Input** operator and select ***dem_nw_ga.img*** *f*rom your input directory. Click **OK** on the Raster Input dialog
3. Expand the Surface category in Operators and drag **Degree Slope** into the model
4. **Connect** the **Raster Out** port from ***dem_nw_ga.img*** to the Raster port on the **Degree Slope** operator

5. Double-click on the **Units** port. Select **Meters** from the Units pulldown list. Click **OK** on the Units dialog

6. Back in the Relational category, drag an **Lt** (Less Than) operator into the model to the right of Degree Slope
7. **Connect** the **Output** port from **Degree slope** to **Input1** on the **Lt** Operator. In the Properties, enter **1** for **Input2**

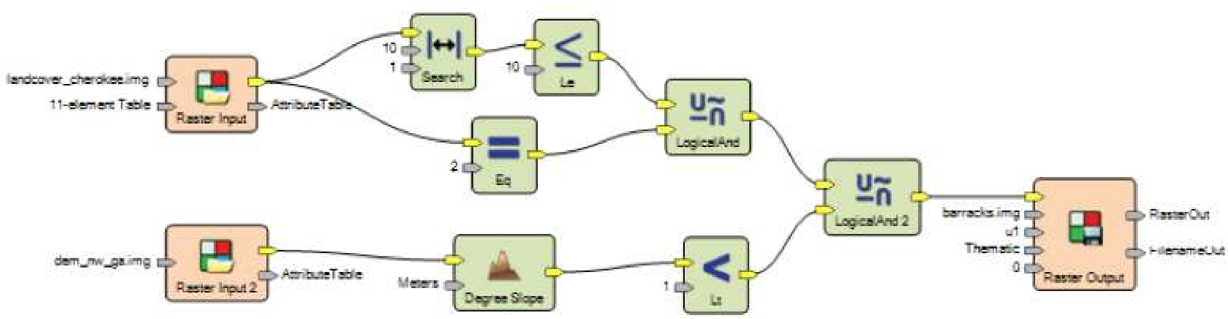
8. Drag another **LogicalAnd** operator from the Boolean category into the model

9. **Connect** the Binary output port from **LogicalAnd** (the top branch) to **Input1**. **Connect** the Binary output port from **Lt** to **Input2**

10. From the Favorites category, drag a **Raster Output** into the model. Double-click the Raster Output operator

11. Name the output file ***barracks.img***

12. Adjust the following parameters, and then click **OK** in the Raster Output dialog:
    - Set the Data Type to **Unsigned 1 Bit**
    - Set the File Type to **Thematic**
    - Enter **0** for NoData Value



13. **Save** the model

14. On the Spatial Modeler tab, click the  **Run** button. The model runs, creating an output file

15. Click **File > New > 2D View** to open a new 2D View

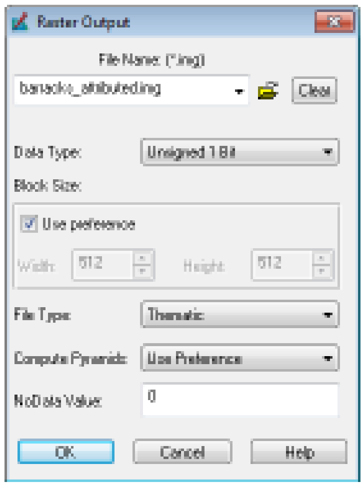
16. Display both ***landcover_cherokee.img*** and ***barracks.img*** in the View.

17. Use the checkboxes in the Contents pane to view the changes by toggling the top layer on and off.
18. Select Table tab > **Show Attributes**
19. Change the Opacity to **0** for **Class 0**
20. Change the Color for **Class 1** to **Yellow** or some other bright color
21. Click the Save icon and click **Yes** on the Attention dialog
22. **Close** the Raster Attributes.
23. Zoom into the image to examine the areas that fit all three criteria
24. **Close** all open Views and Editors, saving any changes

Task 4: Creating Custom Color Tables

Now that we have created the output barracks.img file, we need to label and color the output raster in the model, instead of adding the additional step of opening it in a View and labeling it manually.

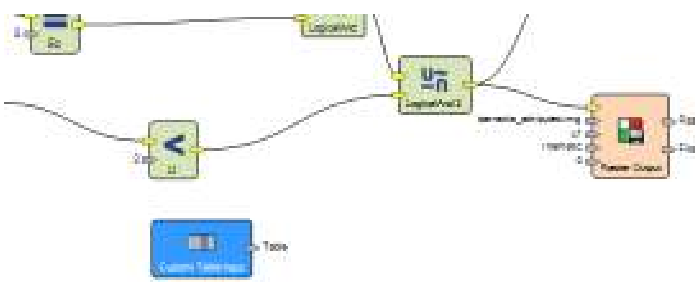
1. Open a new Editor by selecting **File > New > Spatial Model Editor**
2. Click **File** and from the list of Recent Documents select ***barracks_model.gmdx***
3. After the model displays, click **File > Save As... Spatial Model As**... and name the new file ***barracks_labeled.gmdx***
4. Double click the Raster Output operator to open the Raster Output dialog. Change the output File Name to ***barracks_attributed.img***



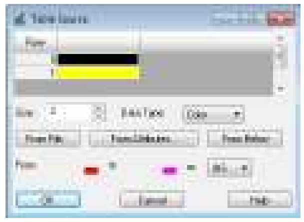
5. Click **OK**

   The output of the barracks model was a 1-bit file, with 1s and 0s, so we want to create a new color table where 1s are a bright color and 0s are transparent

6. From the Input > Table group in the Operators list, drag a **Custom Table Input** operator into the model, somewhere below the Lt operator



7. **Double-click** the **Custom Table Input** operator to open the Table Source dialog. Click **OK** if a Warning appears



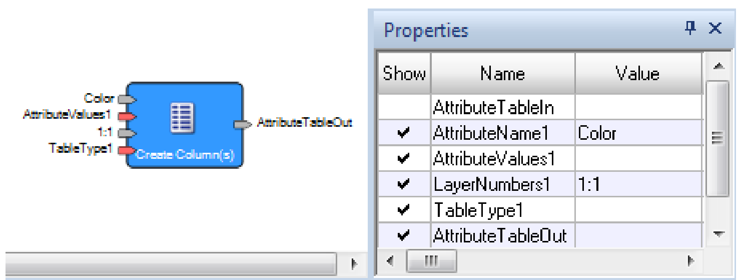
8. In the Table Source dialog, change the **Size** to **2** and the **Data Type** to **Color**

9. Click in the color block for **Row 1** and select a bright color, like **yellow**. Click **OK** on the Table Source dialog

10. Now, it might be a good idea to keep track of these tables, so right-click on the Custom Table Input operator and Rename to **Color**

11. Drag a **Create Column(s)** operator (found in the Data Generation group) into the Editor to the right of the Color table

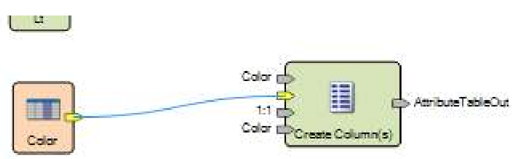
12. Select the **Create Column(s)** operator by clicking on it. The Proper- ties are displayed. In its Properties box, **deselect** the Show column for **AttributeTableIn**



13. Type **Color** for the **AttributeName1** and **1:1** for **LayerNumber1**

14. Back on the Create Column(s) operator, double-click on the **TableType1** port. Select **Color** from the list of TableTypes and click **OK**

15. Connect the **Table** output from the Color operator to the **AttributeValues1** input port on the Create Column(s) operator

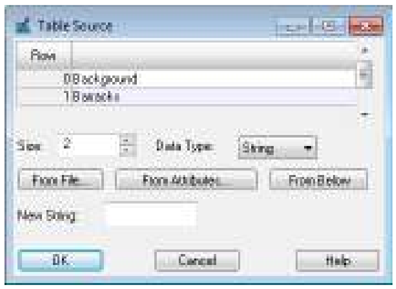


16. **Save** the model

Task 5: Create a Custom Class_Names Table and Column

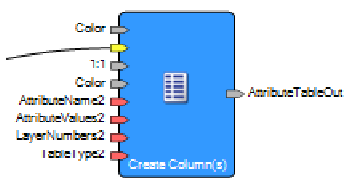
Now we will create a Custom Table to hold the Class_Names and add that table to as a second column in the Create Column(s) operator

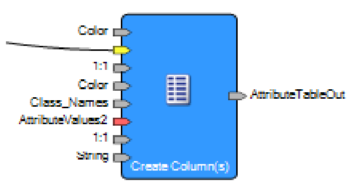
1. Drag a new **Custom Table Input** operator into the Editor below the Color operator
2. **Double-click** the new **Custom Table Input** operator

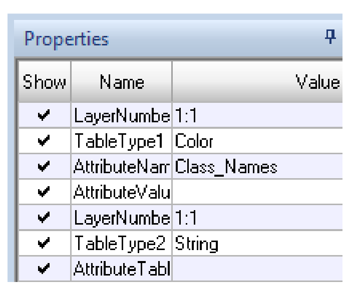


3. Change the **Size** to **2** and the **Data Type** to **String**. If you get a Warning, click **OK**
4. In text field for Row **0**, enter **Background**. Enter **Barracks** for **Row 1**
5. Click **OK** on the Table Source dialog
6. Rename the Custom Table Input operator to ***Class_Names***
7. Select the Create Column(s) operator by clicking on it. Right-click and select  **Add Port**

   Ports for creating a second column are added to the Create Column(s) operator







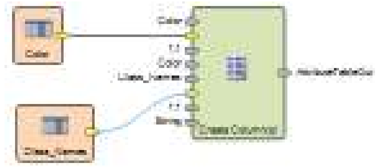
Properties

Show	Name	Value
✔	LayerNumbe	1:1
✔	TableType1	Color
✔	AttributeNam	Class_Names
✔	AttributeValu	
✔	LayerNumbe	1:1
✔	TableType2	String
✔	AttributeTabl	

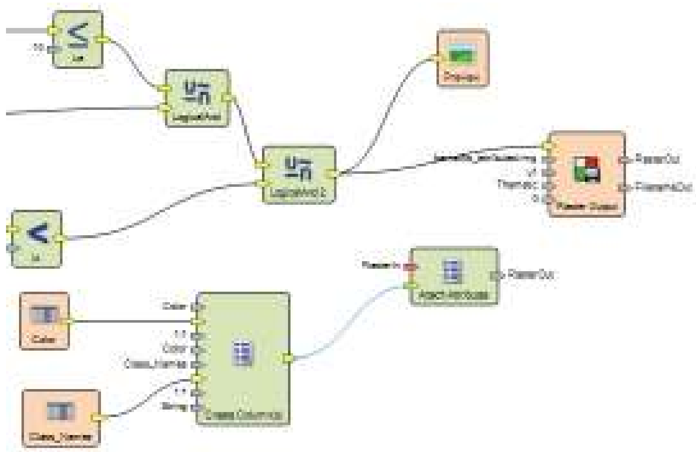
8. Enter the following settings:

- AttributeName2: **Class_Names**
- LayerNumber2: **1:1**
- TableType2: **String**

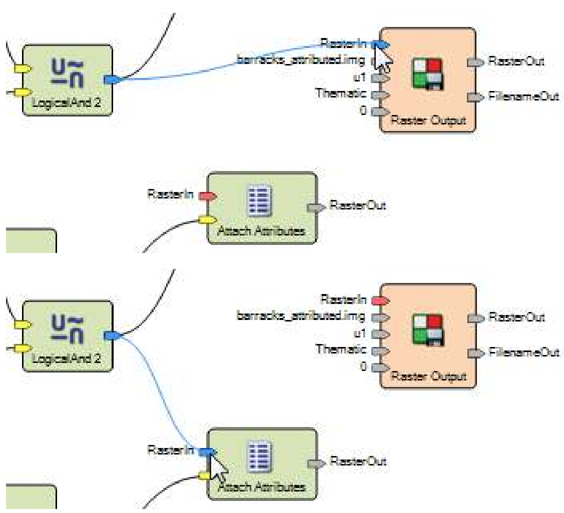
9. **Connect** the **Table** output from the **Class_Names** operator to the **AttributeValues2** input port on the Create Column(s) operator



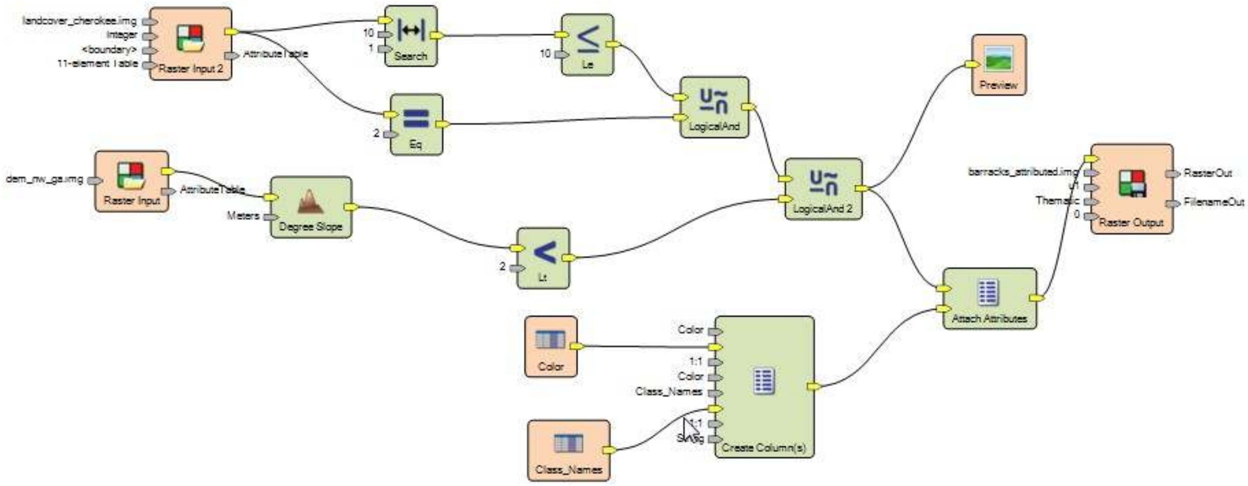
10. Drag an **Attach Attributes** operator (located in the Data Generation group) into the Editor to the right of LogicalAnd2 and the CreateColumn(s) operators



11. Connect the **AttributeTableOu**t from the Create Column(s) operator to the **AttributeTable** input port on the **AttachAttribute** operator
12. Grab the connector from as it goes into the **Raster Output** operator and drag it down to the **RasterIn** port on the **Attach Attributes operator**

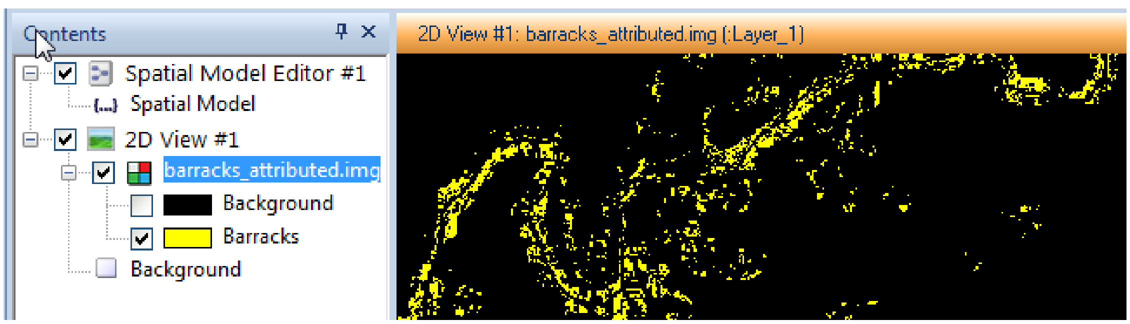


13. **Connect** the **RasterOut** from the **Attach Attributes** operator to the **RasterIn** port on the Raster Output operator



14. **Save** the Model

15. **Run** the model and View the output in a New 2D View



Class Notes

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