

FIRE GIS LAB#6

Raster Data Models and development of inputs for FARSITE fire behavior analysis:

Objective: To develop raster inputs for FARSITE

Necessary inputs are:

Elevation
Slope,
Aspect,
Fuel model
Canopy cover

Optional inputs include:

Canopy height
Canopy base height
Crown bulk density

In this lab exercise we will use the spatial model tool in ArcMap Spatial Analyst to create the required inputs for FARSITE from the initial datasets provided in your c:\NR506\data\Craig mountain folder.

The layers you have in hand are: *(see attached for definition of CT & SS code #s)*

ele (Arc grid format Digital Elevation Model)

craig_veg (Arc grid land cover classification prior to the Maloney Creek fire)

canopy (Arc grid of GAP vegetation canopy cover)

Add the elevation, vegetation and structure to a new ArcMap project.

PART 1. TOPOGRAPHY

Step 1. Generation of Slope raster

- a) Define the working directory and set the mask to be the elevation dataset under the Options tab in Spatial Analyst. Define extent and cell size.
- b) Use ArcMap Spatial Analyst use it to generate slope and aspect grids from the elevation grid.

PART 2. FUEL MODEL GRID

Step 1. Create a Fire Behavior Fuel Model layer using a criteria table

- a) open the attribute table for the craig_veg grid, or look at the table below.

| ObjectID | Value | Count | Cover2 |
|----------|-------|--------|--|
| 0 | 2001 | 1672 | Agriculture |
| 1 | 3101 | 237571 | Foothills Grassland |
| 2 | 3102 | 136341 | Disturbed Grassland |
| 3 | 3103 | 5332 | Herbaceous Clearcuts |
| 4 | 3104 | 1121 | Montane Parklands and Subalpine Meadow |
| 5 | 3201 | 8185 | Mesic Upland Shrubs |
| 6 | 3202 | 44868 | Warm Mesic Shrubs |
| 7 | 4206 | 26047 | Ponderosa Pine |
| 8 | 4212 | 78330 | Douglas-fir |
| 9 | 4221 | 96132 | Mixed Mesic Forest |
| 10 | 5000 | 2825 | Water |
| 11 | 6101 | 7243 | Neddleleaf Dominated Riparian |
| 12 | 6102 | 5421 | Broadleaf Dominated Riparian |
| 13 | 6201 | 14700 | Graminoid or Forb Dominated Riparian |
| 14 | 6202 | 16430 | Shrub Dominated Riparian |
| 15 | 7300 | 46044 | Exposed Rock |

b) In this step you will classify each vegetation type on Craig Mountain into an Anderson fuel model category. Suggested assignment of fuel model to cover type can be found on page 3 in this document. – these suggestions were made by the UI school forest manager Harold Osborne. Use Harold’s suggestions or use your own expertise in the fuel model assignments.

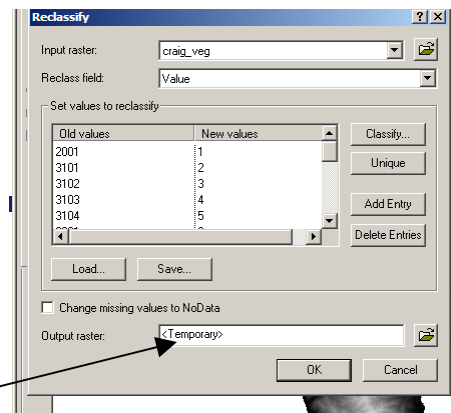
Select Reclassify in the Spatial Analyst menu.

Make sure you are reclassifying the craig_veg dataset using the ‘Value’ as the reclass field.

Click unique to ensure that each unique vegetation category is assigned a fuel model.

Define an output name for the fuels layer.

When you have assigned a fuel model to each veg category, press OK.



Step 2. Add colors & make a fuels map

- Use the layer properties to change the color scheme of your fuels map. Save the map as a jpg file and email the fuels map to Eva (evas@uidaho.edu)

PART 3. CANOPY COVER

The last required item for operation of FARSITE is a canopy cover grid. This grid can be categories (1-4) or percentage values (0-100). We will use the cover code values.

The canopy cover theme is necessary for computing shading and wind reduction factors for all fuel models. Canopy cover is the horizontal percentage of the ground surface that is covered by tree crowns. It is a stand-level descriptor.

Coverage units can be categories (1-4) or percentage values (0-100). Categories are assumed to be the following:

- 1: 1-20%
- 2: 21-50%
- 3: 50-80%
- 4: 81-100%

The existing GAP canopy cover grid is classified from 0-3. Use the reclassify function in Spatial analyst to reclassify 0-3 into categories 1-4 (needed by FARSITE).

Cover type code definitions and fuel model assignments

| Value | Cover_type | FBFM |
|--------------|--|-------------|
| 2001 | Dry-land crop type | 2 |
| 2002 | Irrigated crop type | 2 |
| 3101 | Foothills Grassland | 1 |
| 3102 | Disturbed Grassland | 1 |
| 3103 | Herbaceous Clearcut | 1 |
| 3104 | Montane Parklands and Subalpine Meadow | 1 |
| 3201 | Mesic Upland Shrubs | 5 |
| 3202 | Warm Mesic Shrubs | 5 |
| 3400 | Shrubland | 5 |
| 4203 | Needleleaf Forest | 8 |
| 4206 | Ponderosa Pine | 9 |
| 4207 | Grand Fir | 10 |
| 4212 | Douglas-fir | 8 |
| 4221 | Mixed Mesic Forest | 10 |
| 5000 | Water | 98 |
| 6101 | Needleleaf Dominated Riparian | 10 |
| 6102 | Broadleaf Dominated Riparian | 8 |
| 6201 | Graminoid or Forb Dominated Riparian | 8 |
| 6202 | Shrub Dominated Riparian | 8 |
| 6203 | Mixed Non-forest Riparian | 8 |
| 7300 | Exposed Rock | 99 |

PART 4 – Modeling burn severity using the Delta NBR index.

All data for this part of the lab is located in C:\NR506\data\NBR_lab. The images show the Maloney Creek fire that burned about half of the Craig Mountain Wildlife Management Area in August of year 2000.

In this lab you will:

- 1) View Landsat images before and after fire
- 2) Calculate the delta NBR index using band 4 and 7 before and after fire
- 3) Create a BARC (Burned Area Reflectance Classification) map

Step 1: Start a new ArcMap project. Add the landsat 7 images before and after fire (p42r28_072700_ref100.img and p42r28_082800_ref100.img). These images are radiometrically corrected, i.e. the digital numbers have been converted to at sensor reflectance values, a pre-processing step necessary for computation of the delta NBR index.

Step 2: Add band 4 and 7 for pre and post fire (pre-fire_4, pre-fire_7, post-fire_4 and post-fire_7) to the ArcMap project. These bands have been exported from the Landsat images using the ERDAS Imagine software.

Step 3: Use the Raster Calculator in Spatial Analyst to compute the delta NBR index according to the formula:

$$dNBR = 1000 * ((pre_fire_4 - pre_fire_7) / (pre_fire_4 + pre_fire_7)) - ((post_fire_4 - post_fire_7) / (post_fire_4 + post_fire_7))$$

Alternative: you can calculate NBR pre and post fire first, and then subtract postNBR from preNBR to compute delta NBR.

Step 4: Use the classification scheme on the Delta NBR cheat sheet to reclassify your delta NBR map to a BARC map. The NBR-cheat-sheet is available in the NR506 folder: C:\NR506\readings\LA v3_BR Cheatsheet.pdf

Assignment:

- 1) Create a BARC map with legend, scalebar, north arrow etc .
- 2) Write a 500 (max) word essay commenting on your initial reaction to how BARC maps are created. Include advantages, disadvantages of this methods.

Useful web documents: http://burnseverity.cr.usgs.gov/pdfs/LAv4_Intro_def.pdf
http://burnseverity.cr.usgs.gov/pdfs/LAv4_dNBR.pdf