



Systematic Editing of The BARC



Using the BARC for BAER Support

Document Updated: March, 2006



These exercises are written for ArcGIS 9.x. Some steps may vary slightly if you are working in ArcGIS 8.x



Often the BARC classes are a close representation of the overall distribution of soil or vegetation burn severity and can be used without edits. In some cases; however, it may show just a bit too much HIGH severity than you have observed, or not enough LOW severity, etc. The BARC classes can be adjusted systematically (affects all cells with the edit class throughout the BARC), and often this will provide an accurate enough burn severity map for the BAER assessment without having to edit specific localized areas (locational edits). Obviously, this is much faster than editing piece by piece, so if this works in your burned area, you are almost done!



Always set up your raster analysis environment before proceeding with any raster spatial analysis!! See Step II for details.

Objective

- Systematic editing of the BARC.

Required Data

- hayman_20020623_30m_utm.img
- hayman_20020623_barcl4_utm.img
- hayman_20020623_barcl256_utm.img
- hayman_per_062302.shp
- hayman_GPS_soil_bs.shp

Introduction and Overview of Procedure Steps

Systematic editing of the BARC is the first of two general phases of GIS editing required to produce your Burn Severity Layers. This exercise will introduce you to systematic editing of the BARC:

1. Load your BARCs
2. Setup your ArcGIS workspace & raster analysis environment
3. Compare the BARC with your burned area observations
4. Adjust the BARC256 if necessary
5. Reclassify the adjusted BARC256

I. Load Your BARCs

1. In ArcMap, add **hayman_20020623_barcl4_utm.img** and **hayman_20020623_barcl256_utm.img** using the **Add Data** button.

II. Setup Your ArcGIS Workspace & Raster Analysis Environment

1. If necessary, enable the **Spatial Analysis** extension by clicking **Tools | Extensions** from ArcMap's main menu.
2. Place a checkmark next to **Spatial Analyst** listed in the **Extensions** dialog.
3. Click **Close** to dismiss the **Extensions** dialog.
4. If necessary, turn on the **Spatial analyst** toolbar by clicking **View | Toolbars** from ArcMap's main menu.
5. Place a checkmark next to **Spatial Analyst** listed in the **Toolbars** menu.
6. Add **hayman_per_062302.shp** to ArcMap (if necessary).
7. Click **Spatial Analyst | Options** on the **Spatial Analyst** toolbar.
8. Select the **General** tab and set the **Working Directory** to your **Outputs** folder.
9. Set the **Analysis Mask** to **hayman_per_062302.shp**.



The BARC4 cannot be systematically edited since the reflectance values have already been lumped into four classes. Sometimes this BARC4 is ready to go as-is, without any further editing. This is more common in densely forested ecosystems, since the ground fuels in such areas are sufficient that if the canopy is consumed and black sticks remain, usually the Soil Burn Severity is HIGH as well. In shrub or grassland ecosystems, where ground fuels are light, the BARC4 will represent the blackened vegetation but often over-classify HIGH Soil Burn Severity, and thus may not be suitable to use as-is.



The BARC256 has up to 256 classes plus NODATA. These 256 classes are lumped by color symbology only (the actual reflectance classes are still in 256 classes) into four colors as we've discussed. It is the breakpoints between colors that you may adjust to refine the BARC for your burned area. Since these breakpoints are based on vegetation reflectance, they are usually a good representation of Vegetation Burn Severity, but need to be adjusted for Soil Burn Severity. It is important to understand what you are trying to map. In this exercise, we will adjust the breakpoints to represent Soil Burn Severity based on GPS observation points.



In reality, you would never edit based solely on someone else's GPS points. You MUST have qualified field observer input to edit the BARC!!!

10. Select the **Extent** tab and set the Analysis extent to **hayman_per_062302.shp**.
11. Select the **Cell Size** tab.
12. Set the **Analysis Cell Size** to **Same as Layer "hayman_20020623_bar256_utm.img"**.
13. Click **OK** in the **Options** dialog.

Now you are ready to proceed with raster analysis. First, let's compare the BARC4 and the BARC256 with our field observation data to decide if we need to do any editing at all...

III. Compare the BARC with Your Burned Area Observations

1. Right-click **hayman_20020623_bar4_utm.img** in ArcMap's **Table of Contents** and select **Properties** from the pop-up menu.
2. Select the **Symbology** tab in the **Layer Properties** dialog and select **Unique Values** in the **Show** window.
3. Select the **NODATA** class (usually a value of zero) in the main symbology window and click **Remove**.
4. Notice the BARC4 only has four classes (plus NODATA) and is color-coded as follows:
 - Very Low or Unburned (**Dark Green**)
 - Low (**Cyan**)
 - Moderate (**Yellow**)
 - High (**Red**)
5. Click **Apply** and then **OK** to apply the symbology change and close the **Layer Properties** dialog.
6. Repeat steps 1-4 for **hayman_20020623_bar256_utm.img**.
7. Add **hayman_GPS_soil_bs.shp** to your ArcMap Document.
8. Setup the **Symbology** tab of the **Layer Properties** for **hayman_GPS_soil_bs.shp** as follows:
 9. **Categories:** *Unique Values*
 10. **Value Field:** *Soil_BS*
11. Click the **Add All Values** button in the **Symbology** tab and symbolize the points with colors to match the four Burn Severity Classes used in the BARC. Choose a symbol that will allow you to see against a background of the same color.
12. Click **Apply** and **OK** in the **Layer Properties** dialog when finished symbolizing **hayman_GPS_soil_bs.shp**.
13. Visually compare the Soil Burn Severity at the GPS points with **hayman_20020623_bar4_utm.img**. Make sure **hayman_20020623_bar4_utm.img** is listed above **hayman_20020623_bar256_utm.img** in the **Table of Contents** and that it is turned on. Also be sure **hayman_GPS_soil_bs.shp** is listed as the top-most layer in the **Table of Contents** and is turned on as well.
14. Inspect **hayman_20020623_30m_utm.img** (the post-fire TM image) for additional clues about burn severity (add it to your ArcMap Document if necessary).



You will inevitably end up with points that do not fit the BARC at all (with GPS or other field observation points). You need to decide if the BARC is inaccurate, if the points are inaccurate, or if it is a small area on the ground that did not represent the overall area very well. The more localized edits you decide to make, the more work (and delays) you will create in the production of the Burn Severity Map. Keep in mind the balance between the time required for precision mapping versus the magnitude of how it affects the analysis results in the end.



The most critical areas in determining flood sources and erosion (and therefore threats to life, property, and resources) are the High Soil Burn Severity areas, closely followed by Moderate. So it is the High end of MODERATE and the Low end of HIGH that is very important to try to map as accurately as possible. For BAER emergency assessments, the break between VERY LOW-UNBURNED and LOW is much less critical, since runoff and erosion will not be significantly different as a result of the fire. So don't spend as much time on this breakpoint if time is of the essence—it usually is!

15. In this exercise, we will assume the BARC4 was not a good fit.

IV. Adjust the BARC256 If Necessary

1. Right-click **hayman_20020623_bar256_utm.img** and select **Properties** from the pop-up menu.
2. Select the **Symbology** tab in the **Layer Properties** dialog.
3. Find the existing breakpoints between classes and write them down. They will be in the neighborhood of 0-75 = unburned / very low; 76-109 = low; 110-187 = moderate; 188-255 = high.
4. Using **hayman_GPS_soil_bs.shp** as your field verification, use trial and error to manually adjust the colors at each breakpoint to see if you can bring the BARC closer to the actual burn severity based on the GPS data.
5. If the field observations indicate that the BARC is showing more High Severity (red) than there actually is on the ground, try changing the lowest two or three classes of High (red) to Moderate (yellow).
6. Take a look and see if this fits better. If there is still too much High Severity (red), change a couple more classes to Moderate (yellow). If there is not enough High (red), change some of the top Moderate classes (yellow) to High (red).
7. Continue with the other breakpoints (Moderate to Low, Low to Very Low / Unburned) as needed until the BARC matches the GPS data as closely as possible. Remember, it will not be a perfect fit with ALL the GPS points, but try to get your BARC to match as many points as possible.

V. Reclassify the Adjusted BARC256

1. After adjustments have been made, write down the new breakpoint values (where the colors change). You will need these during the next step. These will vary with each fire, and whether you are mapping Soil or Vegetation Burn Severity. Some example breakpoints might be:
 - 1-133—Very Low or Unburned (**Dark Green**)
 - 134-165—Low (**Cyan**)
 - 166-203—Moderate (**Yellow**)
 - 204-255—High (**Red**)

Your specific breakpoints will be different based on how you adjusted the color classes in the BARC256.

2. Select **Spatial Analyst | Reclassify** from the **Spatial Analyst** toolbar.
3. Set your **Input Raster** to **hayman_20020623_bar256_utm.img**.
4. Set the **Reclass Field** to **Value**.
5. Click the **Classify** button.
6. Set the Number of **Classes** to **4**.
7. Change the **Break Values** to the BARC breakpoints you determined. Start with the number at the



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Spatial Analyst has a 13-character limit on filenames. Try to invent a three or four-letter abbreviation for your fire that you will use for the remaining steps in the editing process. For example: hayman_bs1.

top of the list, and replace it with your new highest value for Very Low or Unburned (dark green). Go to the next number down in the **Break Values** list, and replace it with your highest value for Low (cyan), then the next with the highest value for Moderate (yellow), and the last number with your highest value for High (red). 255 should always be the highest value.

8. Click **OK** in the **Classification** dialog.
9. Place a **checkmark** next to **Change missing values to NoData** in the **Reclassify** dialog.
10. Navigate to your **Outputs** folder and specify **hayman_bs1** as your **Output Raster**.
11. Set the **Save As Type** to **ESRI GRID**.
12. Click **Save**.
13. Click **OK** in the **Reclassify** dialog to reclassify your BARC. You might get an error message about missing values—ignore it.

This produces a new 4-class raster with your adjustments that represents Soil (or Vegetation) Burn Severity. The new grid is also clipped to your fire perimeter.

14. Update the color table for **hayman_bs1** using the burn severity color scheme described in earlier steps.
15. Create a simple **readme_hayman.doc** file (Word or text file) in your working directory (and later copied to a final project directory) that contains your BARC filename, your name, date, and contact information. It should also indicate whether the original unadjusted breakpoints from the 256-class BARC were used, or if the breakpoints were adjusted (include metadata for each adjusted breakpoint), and any other information about the editing of the BARC or perimeter to produce Soil Burn Severity (or Vegetation Burn Severity).

You are finished with this exercise!