



MTBS **Exercise: Habitat Management**

Introduction

The U.S. Fish and Wildlife Service requires every Federal fire program to conduct an annual assessment of the impacts of any fire which burns in the habitat of a Nationally listed threatened or endangered (T&E) species. Grand Canyon National Park has several T&E species which it must provide for while managing its fire program. An integral part of the fire program is determining the annual impact to Mexican Spotted Owl restricted habitat, also called restricted mixed conifer.

This exercise will show you how to use MTBS data to determine the impacts of two fires on Mexican Spotted Owl (MSO) restricted habitat. The first fire, Vista, burned in 2001 while the second, Aspen, burned in 2009. Both fires burned across the same area.

Required Software

ArcGIS 10.x

Updated: April 2018

Assumption

This exercise will be performed with MTBS burn severity data that has been converted to a polygon feature class, field verified with composite burn index (CBI) plots and re-thresholded based on the field CBI scores.

Required Data

- 1 year post fire, extended assessment MTBS data for the 2001 Vista and 2009 Aspen fires
- Mexican Spotted Owl restricted habitat (restricted mixed conifer) feature class data for burned area
- 1:62,500 Topographic Map

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Part 1: Load Geospatial Data

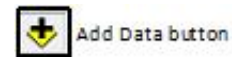
We won't be using too many files in this exercise because a bit of preprocessing has been done for you, including re-thresholding and attributing the MTBS severity data. We will just focus on how to integrate the MTBS severity data with natural resource data.

A. Start ArcMap

1. Start ArcMap by clicking on the **Start** button and navigating to **All Programs | ArcGIS | ArcMap10**.
2. If prompted with a dialog box asking whether you would like to open a new map or an existing map, choose **New Maps | Blank Map** and click **OK**.

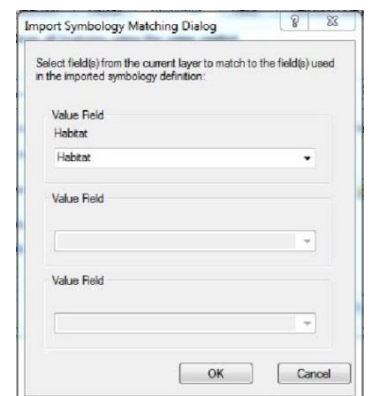
B. Add the Data

1. Click on the **Add Data** button.
 - If you don't see the drive letter where your course data is saved:
 - In the Add Data dialog, click the **Connect to Folder** button
 - Navigate to the drive letter where your data is saved, select it and click **OK**
 - Navigate to C:\Temp\MTBS_Workshop\Exercises\HabitatManagement\TrainingData\Grand_Canyon_Data.gdb\ and load the following feature classes:
 - MSO_Restricted_Mixed_Conifer
 - Topo_Map
 - Vista_Severity



C. Symbolize Data

1. Zoom to area of interest: Right click on **MSO_Restricted_Mixed_Conifer** and choose **Zoom to Layer**.
2. Symbolize data: Right click on **MSO_Restricted_Mixed_Conifer** and choose **Properties...**
 - **Symbology | Import | Click Browse Folder** (see graphic at right)
 - Select MSO_Restricted_Mixed_Conifer.lyr and press **Add**, then **OK**
 - A dialog box will appear (see right)—make sure Value field is **Habitat**
 - Press **OK**
 - Click **Display** tab and set **Transparent** to 60% | Click **OK**
3. Right click on **Vista_Severity** and choose **Properties...**
 - **Symbology | Import | Click Browse Folder**
 - Select **Severity.lyr** and press **Add**, then **OK**
 - A dialog box will appear—make sure Value field is **Severity**
 - Press **OK**
 - Click **Display** tab and set **Transparent** to 50% | Click **OK**
4. Zoom to Vista_Severity: Right click on Vista_Severity | Click **Zoom to Layer**.

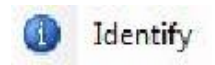


Part 2: Prepare MTBS Data for Vista Fire

In this part, we will simplify MTBS severity from its pixel (cell) data format, to a generalized polygon file. This makes analysis of the data much faster and provides intuitive results.

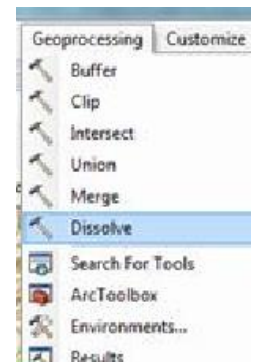
A. Examine MTBS Data

1. Move the Vista_Severity layer to the top of the **Table of Contents** pane (Left Click and hold on Vista_Severity | Drag to top).
2. Use the **Identify** button from the **Tools** tool bar (see right) to examine the Vista_Severity file. Note: as you query the data you will see a GridCode attribute, which is the actual dNBR value, along with a Severity attribute for each pixel. Close the identify window when finished.
3. Open the table for the Vista_Severity layer (**Right click on layer | Open Attribute Table**). You will find there are 16,292 records for this file. Each record is an individual pixel from the satellite imagery.
4. To make processing faster and more intuitive, we will dissolve this feature class based on Severity.
5. Close the Vista_Severity attribute table.



B. Simplify MTBS Data

1. Click on **Geoprocessing | Dissolve** (see right).
 - Input Features: Vista_Severity (pick from drop down list in dialog box)
 - Output Feature Class:
C:\Temp\MTBS_Workshop\Exercises\HabitatManagement\Outputs\Student_Answers> Name: Vista_Dissolved > Click **Save**
 - Dissolve Field > Check Severity
 - Click **OK**
 - Note: The dissolve operation may take several seconds to complete



C. Symbolize Simplified MTBS Data

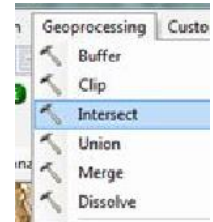
1. Notice the dissolved data no longer has 30 meter pixels. It now has larger polygons of each severity class.
2. Open the Attribute Table and you'll find only 5 records. Close the Attribute Table.
3. Re-color the dissolved Vista severity:
 - **Right click on Vista_Dissolved layer | Properties | Symbology | Import | Click Browse Folder**
 - Select **Severity.lyr** and press **Add** then **OK**
 - A dialog box will appear and make sure Value field is **Severity**
 - Press **OK**
 - Click **Display** tab and set **Transparent** to 50% | Click **OK**

Part 3: Analyze Vista Fire Data

In this part, we will combine the MTBS data with the MSO habitat. This will enable us to compute acreages of the various severity classes within the fire perimeter as well as the effects to MSO habitat.

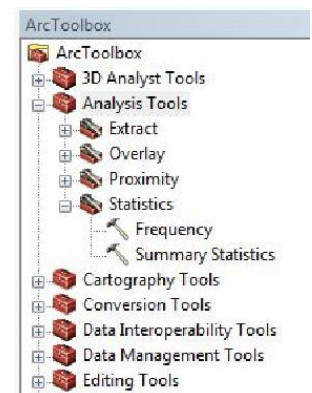
A. Intersect Severity and MSO Data

- Click **Geoprocessing | Intersect** (see right)
 - Input features are Vista_Dissolved and MSO_Restricted_Mixed_Conifer
 - Output Feature Class:
C:\Temp\MTBS_Workshop\Exercises\HabitatManagement\Outputs\Student_Answers > Name: Vista_MSO_Intersect
 - Click **Save**
 - Click **OK**

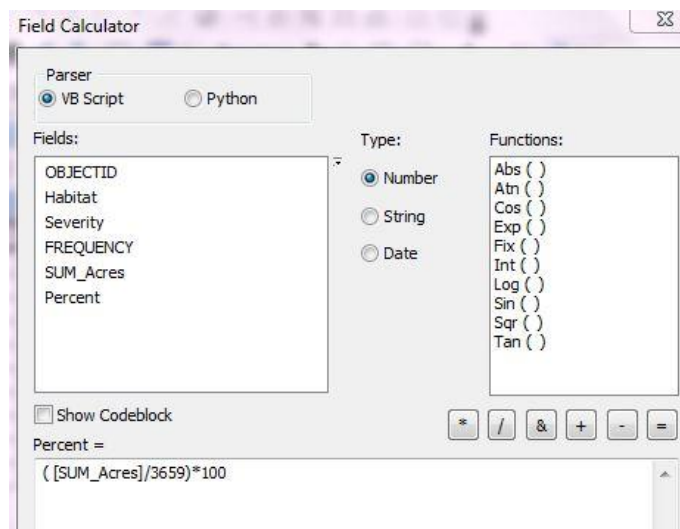
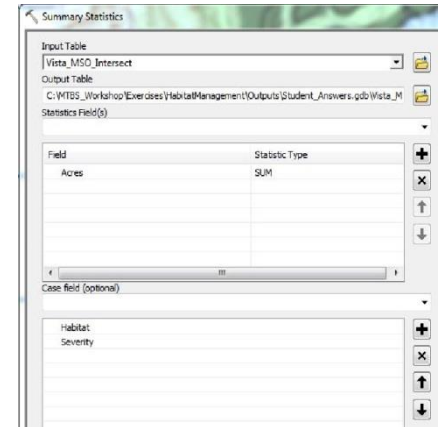


B. Add Acres and Summarize

- Add Acres field to table and calculate
 - Open the attribute table of **Vista_MSO_Intersect** (Right click | **Open Attribute Table**)
 - Click on **Table Options | Add Field** (see right)
 - Name: Acres
 - Type: Double
 - Press **OK** to add the field
 - Right click on the new field and click on Calculate Geometry...** (if you receive a warning message—click Yes)
 - Property: Area
 - Use coordinate system of the data source.
 - Units: Acres US [ac]
 - Click **OK**
- Summarize effects of fire across burn area
 - Open Arc Toolbox (small button with tool box)
 - Navigate to Analysis Tools > Statistics (see right)
 - Double click on Summary Statistics**
 - Input Table > Vista_MSO_Intersect



- Output table: C:\Temp\MTBS_Workshop\Exercises\HabitatManagement Outputs\Student_Answers > Name: Vista_MSO_Acres
- Statistics Field(s) > select Acres (note a red circle with an "X" will pop up — ignore)
- Left click Acres in the table so it is selected. Then click in the Statistic Type column and Select SUM from the pick list (see right)
- Case field > select Habitat, **then** select Severity (see right—you may need to scroll down to view this)
- Click **OK**
- The new table will appear in the Table of Contents
- Right click on new table and **Open**
- Examine the acreage in each severity class for Habitat and non-habitat areas
- To determine the percentage in each class, add a new field to this table (**Table Options > Add Field**)
 - Name: Percent
 - Type: Double
 - Click **OK**
- Right click on the Percent field and select Field Calculator
- In the dialog box type the following formula: $([SUM_Acres]/3659)*100$ (see below)
- In this formula we are dividing the summed acres by the total fire acres
- Click **OK**
- As we can see from the Percent field, most of the acreage in the Vista burn area is MSO habitat with low and moderate/low burn severity
- You can close the table but keep this map open as we will continue working in it



You have finished this section. This is just one example of how MTBS data can be used to determine the effects of fire to Mexican Spotted Owl Habitat. The next example is about a fire that burned across the same piece of land, but gets a little more interesting...

Part 4: Prepare MTBS Data for Aspen Fire

The 2009 Aspen Fire burned across the same area as the Vista fire of 2001. In order to properly determine the effects of the Aspen fire, you will need to take into account the Vista fire's effects on MSO habitat before you can truly determine the Aspen fire effects.

A. Add the Data

1. Click on the **Add Data** button



- Navigate to C:\Temp\MTBS_Workshop\Exercises\HabitatManagement\TrainingData\Grand_Canyon_Data.gdb\ and load the following feature class:
 - Aspen_Severity
- Notice where this fire is in relation to the Vista Fire

B. Symbolize Data

1. Turn off (uncheck) all the Vista fire related layers
2. Zoom to data: Right click on **Aspen_Severity** and choose **Zoom to Layer**.
3. Right click on **Aspen_Severity** and choose **Properties...**
 - **Symbology | Import | Click Browse Folder |** (navigate to Training Data folder if you don't see this layer—see right)
 - Select **Severity.lyr** and press **Add**, then **OK**
 - A dialog box will appear—make sure Value field is **Severity**
 - Press **OK**
 - Click **Display** tab and set **Transparent** to 50% | Click **OK**



C. Simplify MTBS Data

1. Click on **Geoprocessing | Dissolve**
 - Input Features: Aspen_Severity (select from drop down list)
 - Output Feature Class:
C:\Temp\MTBS_Workshop\Exercises\HabitatManagement\Outputs\Student_Answers > Name: Aspen_Dissolved > click **Save**
 - Dissolve Field > Check **Severity**
 - Click **OK**

D. Symbolize Simplified MTBS Data

1. Notice again the dissolved data no longer has the 30 meter pixels. It now has larger polygons for each severity class.
2. Re-color the dissolved Aspen severity layer:
 - Right click on layer | **Properties | Symbology | Import | Click Browse Folder**
 - Select **Severity.lyr** (verify you have the Aspen_Severity layer), press **Add**, then **OK**
 - A dialog box will appear—make sure Value field is **Severity** > press **OK**

- Click **Display** tab and set **Transparent** to 50% | Click **OK**

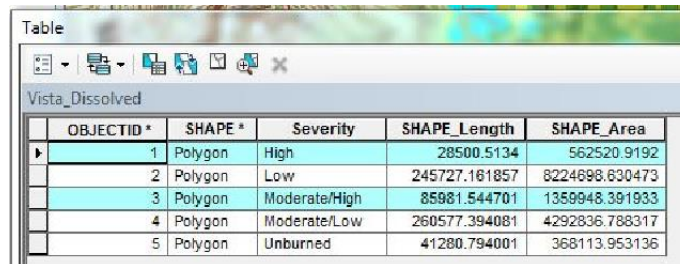
Part 5: Edit MSO Data from Vista Fire

Prior to analyzing the effects of the Aspen fire, we must first account for the effects of the Vista fire to MSO habitat. At Grand Canyon, if MSO habitat burns in High or Moderate/High severity it is no longer considered MSO habitat.

A. Modify MSO Restricted Mixed Conifer Data

- Select the High and Moderate/High severity data from Vista

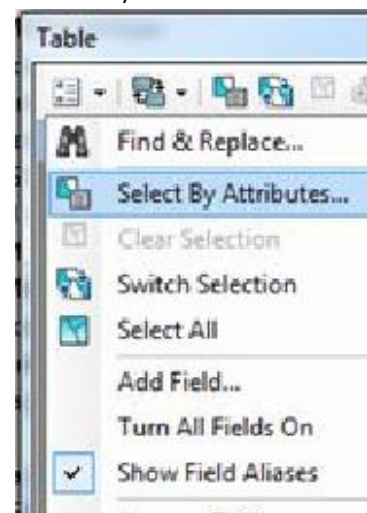
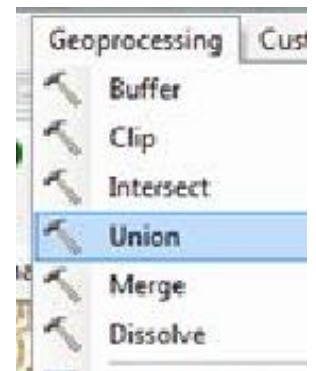
- Open attribute table for Vista_Dissolved (right click on layer | left click on **Open Attribute Table**)
- While holding the “Ctrl” key, select the High and Moderate/High data by clicking on the row header (see below)



OBJECTID *	SHAPE *	Severity	SHAPE_Length	SHAPE_Area
1	Polygon	High	28500.5134	562520.9192
2	Polygon	Low	245727.161857	8224698.630473
3	Polygon	Moderate/High	85981.544701	1359948.391933
4	Polygon	Moderate/Low	260577.394081	4292836.788317
5	Polygon	Unburned	41280.794001	368113.953136

- Modify MSO data based on selected Vista Fire impacts.

- From the **Geoprocessing** tab select **Union** (see right)
 - For Input Features select Vista_Dissolved & MSO_Restricted_Mixed_Conifer
 - Output Feature Class: C:\Temp\MTBS_Workshop\Exercises\HabitatManagement\Outputs\Student_Answers > Name: MSO_Restricted_Mixed_Conifer_Post_Vista | Click **Save**
- Click **OK**
- Open Attribute table for new layer: (Right click on layer | **Open Attribute Table**)
- Click **Table Options** | **Select By Attributes...** (see right)
 - Select the records where Severity is High or Moderate/High by entering the following expression in the dialog box: "Severity" = 'High' OR "Severity" = 'Moderate/High'
 - 82 records should be selected
- Right click on Habitat | Field Calculator...
 - In the dialog box, enter **"No"** and click **OK**
- Clear selected attribute: (Table Options | Clear Selection)
- Right Click on Severity Attribute | Delete Field | Yes | Close Attribute Table
- Clear selection & color new post-Vista feature class with original MSO scheme (Part 1/C. Symbolize data/Step 2)



- Compare the original MSO habitat layer to the post Vista Fire MSO habitat layer

Part 6: Analyze Aspen Data

In this part, we will combine the MTBS data for the Aspen with the revised MSO habitat data. This will enable us to compute acreages of the various severity classes within the fire perimeter as well as the effects to MSO habitat.

A. Intersect Severity and Revised MSO Data

1. Click **Geoprocessing | Intersect** (see right)

- Input features are Aspen_Dissolved and MSO_Restricted_Mixed_Conifer_Post_Vista
- Output Feature Class:
C:\Temp\MTBS_Workshop\Exercises\HabitatManagement\Outputs\Student_Answers > Name: Aspen_MSO_Post_Vista_Intersect
- Click **Save**
- Click **OK**



B. Add Acres and Summarize

1. Add Acres field to table

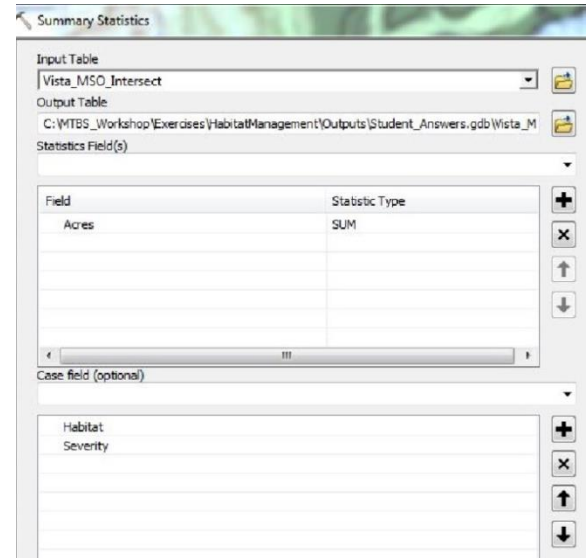
- Open the attribute table of **Aspen_MSO_Post_Vista_Intersect** (Right click | **Open Attribute Table**)
- Click on **Table Options | Add Field** (see right)
 - Name: Acres
 - Type: Double
 - Press **OK** to add the field
- **Right click on the new field and click on Calculate Geometry...**
 - Property: Area
 - Use coordinate system of the data source
 - Units: Acres US [ac]
 - Click **OK**



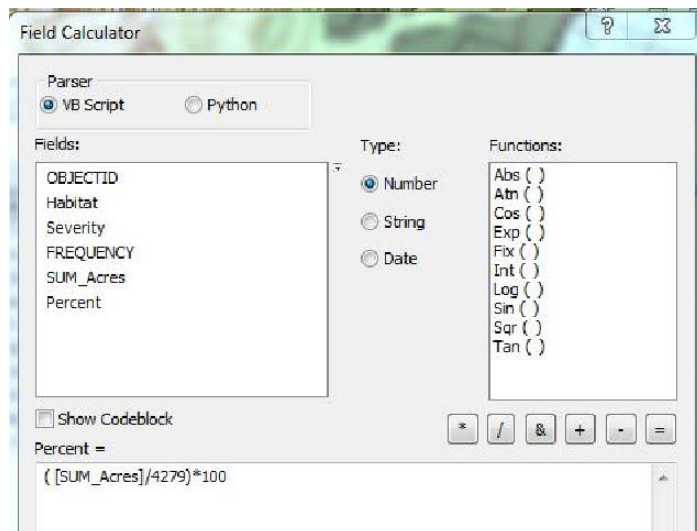
2. Summarize effects of fire across burn area

- Open Arc Toolbox
Navigate to Analysis Tools > Statistics
- **Double** click on **Summary Statistics**
 - Input Table > Aspen_MSO_Post_Vista_Intersect
 - Output Table > C:\Temp\MTBS_Workshop\Exercises\HabitatManagement\Outputs\Student_Answers > Name: Aspen_MSO_Post_Vista_Acres
 - Statistics Field(s) > select Acres (Note a red circle with an "X" will pop up—ignore)

- Left click Acres in the table so it is selected. Then click in the **Statistic Type** column and Select **SUM** from the pick list (see right)
- Case field > select Habitat and **then** select Severity (see right)
- Click **OK**
- The new table will appear in the Table of Contents
- Right click on new table and **Open**
- Examine the acreage in each severity class for Habitat and non-habitat
- To determine the percentage in each class, add a new field to this table (**Table Options > Add Field**)
 - Name: Percent
 - Type: Double
 - Click **OK**



- Right click on the Percent field and select Field Calculator
- In the dialog box type the following formula: $([SUM_Acres]/4279)*100$ (see below)
- In this formula we are dividing the summed acres by the total fire acres
- Click **OK**
- As with the Vista fire, the majority of the acreage in the Aspen fire is MSO habitat with low and moderate/low burn severity



Part 7: Edit MSO Data from Aspen Fire

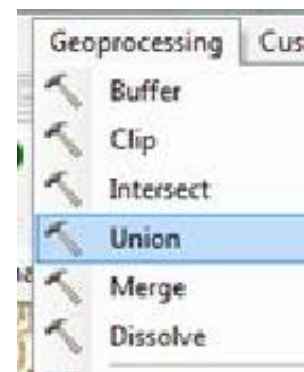
We need to now finalize the MSO habitat layer by editing it again to take into account the effects of the Aspen Fire. Again, at Grand Canyon, if MSO habitat burns in High or Moderate/High severity it is no longer considered MSO habitat.

A. Modify MSO Restricted Mixed Conifer Data

1. Select the High and Moderate/High severity data from Aspen

- Open attribute table for Aspen_Dissolved (right click on layer | left click on **Open Attribute Table**)
- While holding the “Ctrl” key, select the High and Moderate/High data by clicking on the row header (see below)

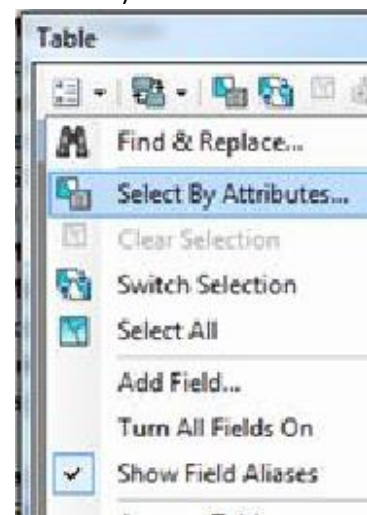
OBJECTID *	SHAPE *	Severity	SHAPE_Length	SHAPE_Area
1	Polygon	High	45050.144964	962361.087877
2	Polygon	Low	250923.837549	7621437.689461
3	Polygon	Moderate/High	118985.399783	2287217.905912
4	Polygon	Moderate/Low	265495.683229	5621614.690943
5	Polygon	Unburned	76200.157922	822614.151002



2. Modify MSO data based on selected Aspen Fire impacts.

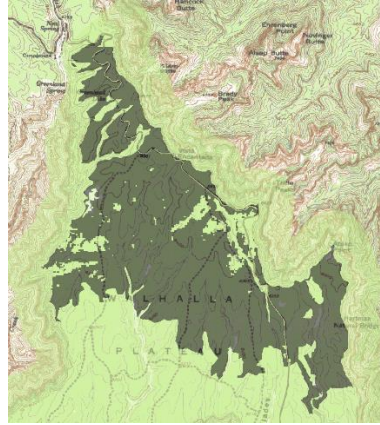
- From the **Geoprocessing** tab select **Union** (see right)
 - For Input Features select Aspen_Dissolved & MSO_Restricted_Mixed_Conifer_Post_Vista
 - Output Feature Class: C:\Temp\MTBS_Workshop\Exercises\HabitatManagement\Outputs\Student_Answers\MSO_Restricted_Mixed_Conifer_Post_Aspen | Click **Save**
 - Click **OK**
- Open Attribute table for new layer: (Right click on layer | **Open Attribute Table**)
- Click **Table Options** | **Select By Attributes...** (see right)
 - Select the records where Severity is High or Moderate/High by entering the following expression in the dialog box: "Severity" = 'High' OR "Severity" = 'Moderate/High'
 - 193 records should be selected
- Right click on Habitat | **Field Calculator...**
 - In the dialog box, enter **"No"** and click **OK**
- Clear selected attribute: (Table Options | Clear Selection)
- Right Click on Severity Attribute | **Delete Field** | **Yes** | **Close Attribute Table**
- Clear selection & color new post-Aspen feature class with original MSO scheme (Part 1/C. Symbolize data/Step 2)
- Compare the original MSO habitat layer to both the post Vista MSO habitat layer and the post Aspen MSO habitat layer

> Name:

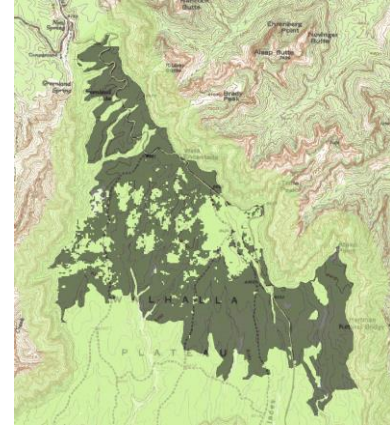




Pre 2001



Post Vista fire 2001



Post Aspen fire 2009

Conclusion

What you just completed allowed you to analyze and observe how fire effects the suitable habitat of the Mexican Spotted Owl. As you can see with your results through multiple iterations, MTBS data can be used in conjunction with other spatial data to gain further understanding of our ever changing landscapes.

Congratulations! You have successfully completed this exercise.