

**Lab #4 – Working with FireAtlas Regions in ArcInfo and ArcGIS**  
 NR506 – Advanced GIS Applications in Fire Ecology and Management

Objectives

- Understanding the Regions concept in GIS
- Learn a few regions commands in ArcInfo
- Query and analyze an existing regions dataset
- Analyze the Selway-Bitterrot Wilderness area to explore fire frequency patterns and fire rotations through time
- Add new regions to an existing regions dataset

**Set up the ArcMap project**

All data for this lab is located in folder **c:/NR506/data/selway**

All data in this folder is in projection: UTM, Zone 11, datum NAD27, map units meters

**IF YOU SAVED THE ArcMAP PROJECT FROM LAB#2 – OPEN IT!**

1. Open ArcMap with a new map:                – *Programs - Start – ArcGIS – ArcMap – OK*
2. Select *File – Add data*. Add the following datasets:

<b>dataset</b>	<b>description</b>	<b>data type</b>	<b>scale/resolution</b>	
sbw_pvt	Potential Vegetation Types (PVTs) for the Selway-Bitterrot Wilderness	grid	30 m pixels	
sbw_ele	Elevation for the Selway-Bitterrot Wilderness	grid	30 m pixels	
firestarts_selway_1986-1992.shp	Fire start locations year 1996-1992. ICRB project (USFS + BLM)	shapefile		
sbw_atlas_clp	Fire atlas for the Selway-Bitterrot area	coverage	1:24,000	
Fires2000	Fire perimeters burned in year 2000	coverage	1:100,000	
idahobnd	Idaho state boundary	coverage	1:100,000	
Selway_bnd	Selway study area boundary	shapefile		
Pvt.dbf	PVT code look-up table	DBASE		

Build pyramids for the grids (increases the display speed when zooming in or out).

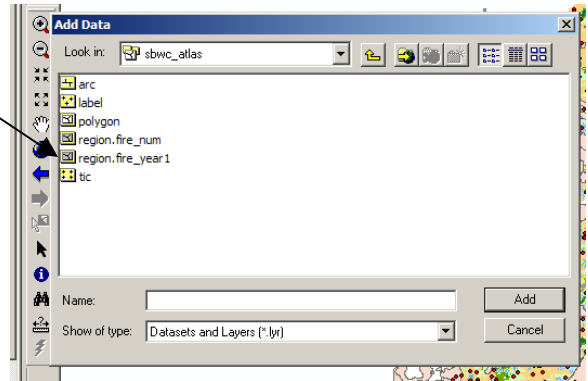
Order the datasets in the layer table by moving them up or down. Layers can only be moved when *Display* in the lower left corner is selected.

Add extensions: Select *Extensions* in the *Tools* menu on top; Check *Spatial Analyst* and *Xtools*; Close the *Extensions* dialog box. Display the toolbars for *Spatial Analyst* and *Xtools* by selecting them under the *Toolbars* option in the *View* menu.

When you add the fire regions coverage (sbw\_atlas\_clp) select the region.fire\_year1.

Polygon shows all polygons in the regions dataset. Polygons may overlap. You can also add the polygons – they will be used later in this lab.

Region.fire\_year1 is a regions layer (or subclass) where fire perimeters are organized according to the year the fire burned. SAVE the ArcMap project!



*Question #1: How many layers are there within the regions coverage sbw\_atlas\_clp? What are the names of the layers?*

*Question #2: Compare the attribute tables for the 'polygon' layer and the 'region.fire\_year1' layer. How are they different?*

### 3. Become familiar with the regions coverage

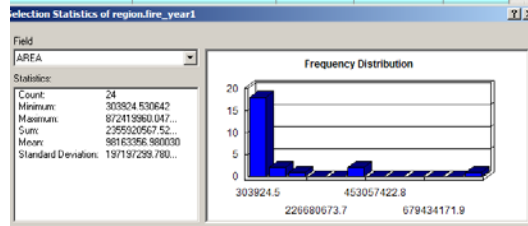
*Question #3: How much area burned in the Selway-Bitterroot area and surroundings in 1910?*

Open the attribute table for the layer *sbw\_atlas\_clp region.fire\_year1* and notice the area in square meters for the 1910 record. If you select the 1910 record (click on the gray bar to the left of the line, the line color turns turquoise) you can see on the map where the burned areas are.

*Question #4: How much land burned within the three eras; pre-modern suppression, modern suppression and wildland fire use?*

	<i>Year</i>	<i>Area (ha)</i>
- <i>Pre-modern suppression</i>	1880 - 1934	
- <i>Modern suppression</i>	1935 - 1974	
- <i>Wildland fire use</i>	1975 - 1996	

Open the attribute table for the layer *sbw\_atlas\_clp region.fire\_year1* and select all records within one time period. Right-click on the column title 'AREA' and select Statistics.



Record the sum of the selected area (expressed in sq meters)

#### 4. Fire Rotations

##### Fire Rotation concept

The Fire Rotation for an area is the number of years it would take to burn an area equal in size to the study area.

$$FR = T / P$$

Where T = length of the time interval in years

P = proportion of the study area burned during this time period

= sum of area burned within interval T / total Selway-Bitterrot area

FR = fire rotation in years

*Question #5: Calculate the fire rotation for each era*

Era	Time period	Area burned(ha)	proportion of total area P	Length of time period (years) T	Fire Rotation (years)
<i>Pre-modern suppression</i>	<i>1880 - 1934</i>				
<i>Modern suppression</i>	<i>1935 - 1974</i>				
<i>Wildland fire use</i>	<i>1975 - 1996</i>				

*Total area of Selway-Bitterrot Wilderness =*

*What do these numbers tell you?*

## 5. Calculate fire frequency using ArcInfo

### A few Regions commands in ArcINFO Workstation

**regionpolylist** creates an INFO file that lists the polygons that belong to each region in the specified subclasses

**regionpolycount** counts the total number of regions, and regions by subclass, for each polygon. The selected polygon belongs to two regions, one from each subclass. This command can be used to spatially display fire frequency.

**regionxarea** creates an output INFO file to describe the overlap relationship between the two regions in area and percent

**regionselect** selects a set for polygons or regions through Boolean selection of attribute values of polygons or regions from multiple subclasses

**regionquery** creates new regions based on the attribute values of input region or polygon layers and aggregates regions according to specified attribute items.

In this exercise we will use the **regionpolycount** command in ArcINFO to calculate the fire frequency within the Selway-Bitterrot Wilderness area.

Open ArcINFO – *Start – Programs – ArcGIS – ArcInfo Workstation - Arc*

Navigate to the selway workspace by typing at the Arc prompt

Arc: *workspace c:/NR506/data/selway*

To read more about the REGIONPOLYCOUNT command please refer to the Arc Documentation (type **help** at the Arc prompt and press enter).

Select *Command references for ARC/INFO prompts*

Select *ARC*

Double click on *R (regionpolycount)*

Double click on *REGIONPOLYCOUNT* – read and learn

The syntax for the REGIONPOLYCOUNT is as follows:

Arc: *regionpolycount <input regions cover> <output file name>*

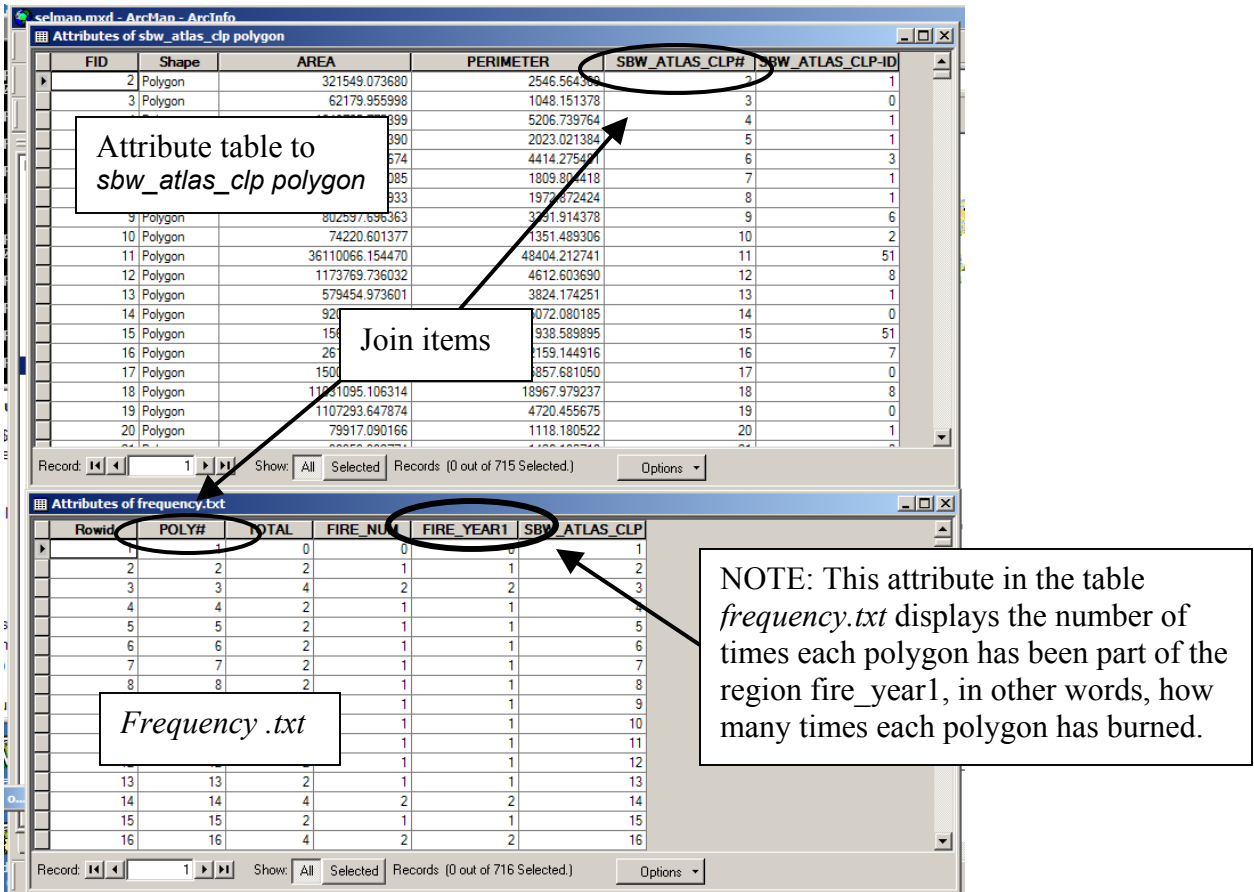
Enter the REGIONPOLYCOUNT command as follows:

Arc: *regionpolycount sbw\_atlas\_clp frequency.txt*

The name of the input regions cover is *sbw\_atlas\_clp*, name the output table *frequency.txt*.

6. Back to ArcMap..... join the created frequency table to the polygons and display the fire frequency for the Selway-Bitterrot Wilderness area.

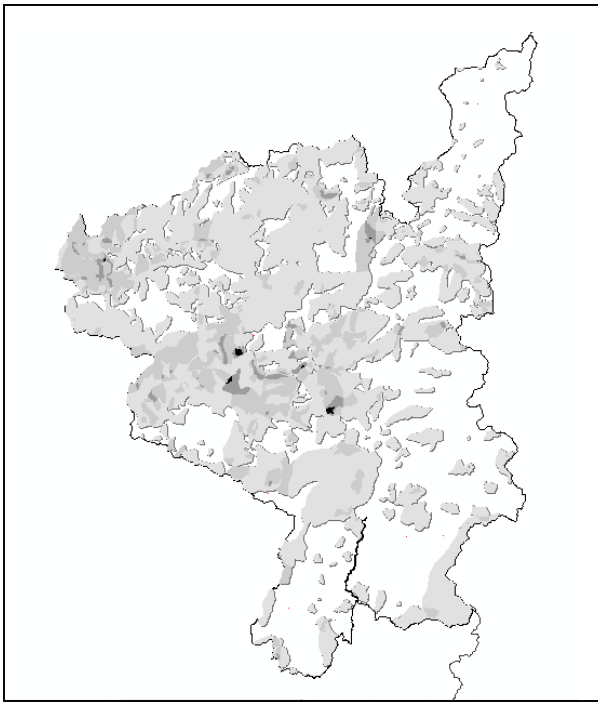
- Add frequency.txt to your ArcMap project
- Open *frequency.txt* and the attribute table to *sbw\_atlas\_clp polygon* (not region fire\_year1!)



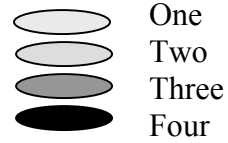
Perform the join by attribute as follows:

- Right-click on the layer *sbw\_atlas\_clp polygon*
- Select Joins and Relates, then Join
- Use the skills from Lab#2 and the information above to join *frequency.txt* to the attribute table for *sbw\_atlas\_clp polygon*.

Use the layer properties (symbology) for the layer *sbw\_atlas\_clp polygon* to display the fire frequency within the Selway-Bitterrot Wilderness. Compare your map to the one on the next page.



Number of times burned 1880 - 1996



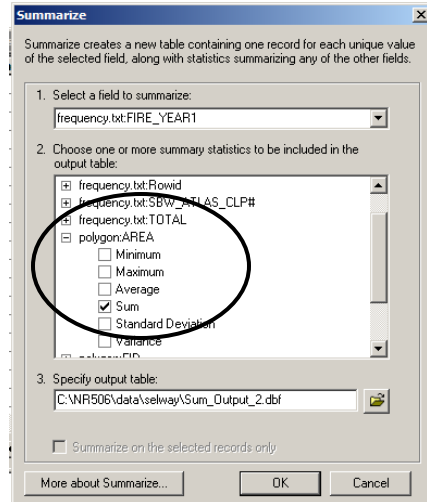
Question #6: How much area has burned 0, 1, 2, 3 and 4 times within the Selway-Bitterroot Wilderness area?

Number of times burned	Area (hectares)
Zero	
One	
Two	
Three	
Four	

You can use the summarize table option to answer Question #6:

- Open the table for layer *sbw\_atlas\_clp polygon* (with the *frequency.txt* table joined).
- Right-click on the attribute *frequency.txt:FIRE\_YEAR1*
- Select *Summarize.....*

- check 'Sum' under polygon:AREA to specify that you want to summarize the area by fire frequency (number of times burned).
- Name the output table (the output table contains the answer to Question #6)



*Question #7: What conclusions can you draw about the fire frequency patterns in the Selway-Bitterroot area using the above information? How could you improve the analysis to look at fire patterns within the three fire management eras (pre-modern fire suppression, modern fire suppression and wildland fire use)?*

## Extra – if you have time and interest

### Advanced topic – add new fire years to the existing regions coverage

#### More information about regions:

ArcInfo Help Documentation

Chang K., 2002. Introduction to Geographic Information Systems, McGraw-Hill Companies Inc.

#### The following procedure can be used to add a new fire year to a regions coverage:

- Start ArcInfo Workstation
- Go to appropriate workspace (type *w c:\nr506\data\selway* at the Arc prompt, assuming that this is the folder where you data is located)
- Start ArcEdit (type *ae* at the Arc prompt)
- Select edit cover (type *ec atlas* at the ArcEdit prompt, where ‘atlas’ is the name of your fire atlas regions coverage)
- Set the edit feature (type *ef poly* at the ArcEdit prompt)
- Use the GET command in ArcEdit to add the new polygons to the regions coverage (type *get fire2000* at the ArcEdit prompt, ‘fire2000’ is a coverage that contains the fire perimeters for the fires from year 2000). The new polygons will automatically be given polygon id numbers starting at the next free poly id. If the highest poly id number in the regions coverage was 100, the new polygons will be numbered 101, 102, 103....etc
- Select the polygon numbers for the newly added polygons (type *sel polyid > 100* , in this case)
- Run the MAKEREGION command in ArcEdit to make a region from the newly added polygons (type *makeregion fire\_year1* at the ArcEdit prompt, assuming that the region name is *fire\_year1*)
- Save (type *save* at the ArcEdit prompt)
- Quit (type *q* at the ArcEdit prompt) and exit ArcEdit
- Add your updated fire atlas regions coverage to ArcMap, open the region.fire\_year1 attribute table and enter the correct year for the newly added fire region. Display and make sure everything looks OK.

If you are adventurous, use the above procedure to add the coverage *fire2000* (contains fire perimeters for year 2000) to the Selway-Bitterrot fire atlas.

Both the fire atlas (*sbw\_atlas\_clp*) and fire perimeters for year 2000 (*fire2000*) are located in the folder **c:\nr506\data\selway**.



**Lab #3 – Working with FireAtlas Regions in ArcInfo and ArcGIS**  
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*Question #1: How many layers are there within the regions coverage sbwc\_atlas? What are the names of the layers?*

*Question #2: Compare the attribute tables for the 'polygon' layer and the 'region.fire\_year1' layer. How are they different?*

*Question #3: How much area burned in the Selway-Bitterrot area and surroundings in 1910?*

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*Question #5: Calculate the fire rotation for each era*

Era	Time period	Area burned(ha)	proportion of total area	Length of time period (years)	Fire Rotation (years)
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Total area of Selway-Bitterrot Wilderness =

*What do these numbers tell you?*

*Question #6: How much area has burned 0, 1, 2, 3 and 4 times within the Selway-Bitterrot Wilderness area?*

Number of times burned	Area (hectares)
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Two	
Three	
Four	

*Question #7: What conclusions can you draw about the fire frequency patterns in the Selway-Bitterroot area using the above information? How could you improve the analysis to look at fire patterns within the three fire management eras (pre-modern fire suppression, modern fire suppression and wild land fire use)?*