

Forest Fire Ecology

Introduction to Geographic Information System Use in Forest Ecology

Before you begin using this module, you will need to know about using a Web-based GIS viewer. You can do this by watching the tutorial video and working through the hands-on tutorial. The tutorial video, student activity, and Web-based GIS Tutorial Viewer can be found at <http://gis.lanecollege.edu> → “Modules” tab → “Tutorial” link. The activity works best with a high speed Internet connection.

Prior Skills: You will need to know how to turn layers on and off, use the ID tool and, zoom in and out of the map, toggle from layers to the legend, and perform a search (Boolean) query.

Objectives: You will be able to describe the spatial pattern species distribution and the physical characteristics of a forested landscape.

Remember, computer steps are indicated by a ► symbol and questions you need to answer are numbered.

Please provide answers on answer sheet

Introduction:

Now that you have worked through the tutorial on GIS, you have been introduced to Geographic Information Systems (**GIS**) and some of its uses. It is a software program that allows a person to make maps and interact with those maps with questions called “queries.” It is also a sophisticated data analysis tool. GIS is used extensively in forest ecology. For example, it is used to design reserves, or areas of land, for endangered species such as the Northern Spotted Owl. It is also used to determine areas to plan forest harvesting and restoration in forestry. Most of the natural resource agencies such as the US Forest Service, Bureau of Land Management, and private consulting firms use GIS on a daily basis in their land management practices. Ecologists also use the tool to look at the landscape from a broader view than has ever been previously possible. This has allowed the newer field of landscape ecology to emerge. You will be introduced to this exciting tool today in the laboratory exercises below. The skill you develop today will serve you well in your future or current work.

Objectives

- Refer to completed tutorial to learn the use of GIS
- Use GIS to learn about forest stand characteristics in the Western Oregon Cascades.
- Familiarize yourself with the Bedrock Creek Roadless area we will visit on our all day field trip.

Work in teams of two to complete the following activities on your computers. It is

essential to complete the tutorial first:

Refer to the GIS tutorial you completed as homework. This tutorial hopefully will allow you to become familiar with the some of the functions available in a GIS.

▶ Access the forest ecology base map at:

<http://arctgis.lanecc.edu/website/fireeco>

or

by going to <http://gis.lanecc.edu> and navigating to the **Modules** page, and then selecting the **Forest Fire Ecology** link.

The map we will be using is web-based GIS so you can also do some of the work at home if you do not finish by the end of the lab.

This is a map of the Bedrock Creek roadless area (East of Lowell, Oregon off Fall Creek Road). We will visit and conduct surveys in this area for our all day field trip. The roadless area is an uninventoried roadless area as established by the Roadless Rule. We are adopting this roadless area as a class. The information we collect in this roadless area may assist in its future conservation of this area in Willamette National Forest.

▶ **Familiarize yourself with the map and data**

The general organization of the screen should look like:

<i>Toolbar</i>	<i>Map Area</i>	<i>Layers/ Legend</i>
	<i>Selection/Table Display (blank at start-up)</i>	

▶ Look at the layers available on our Bedrock Creek roadless area map.

▶ Uncheck “streams” then click the “**Refresh Map**” button.



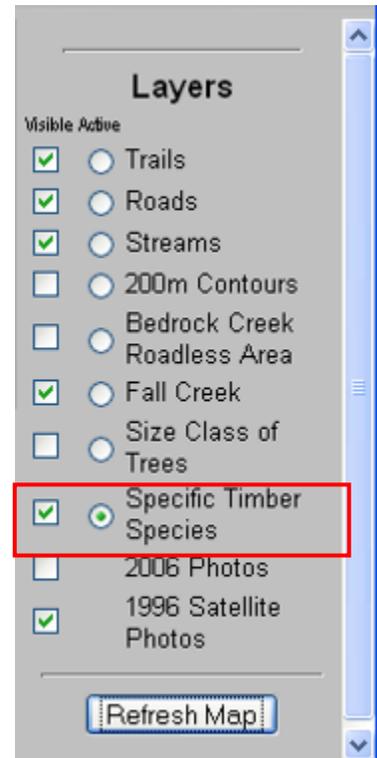
1. What happens to the streams? (Use **answer sheet**)

▶ **Look at the legend** - You will use the **legend tool**  and the **identify tool** .

▶ Click on the “**Specific Timber Species**” to make it visible and active. (to be active you click the radio button next to the layer)

▶ Next, click the legend tool. The layer menu changed to a legend. This legend shows the range of species present in our study area. (To return to the view of all layers, just re-click the **legend tool**). There is also a printed legend on page 7 of this document.

2. What are the two most common tree species in the Fall Creek roadless area? (List common and scientific names)
3. What is an uncommon tree species in the area?



CHECK IN POINT - Up to this point you should be comfortable turning on and off layers and using the identify tool to identify features in the active layer. If not work through the last section again.

We will use the **identify tool** to find where you can expect to find temperate coniferous old growth or late successional forest along the creek we will visit.

▶ Make the **Size Class of Forest** the active layer by clicking on the round radio button and checking the **condition class square to select** it. Click refresh.

▶ Use **the zoom tool** to get a closer look at Fall Creek. Now use the **identify tool** (by clicking on it) to identify where you have Size Class 5 or above along Fall Creek.

4. Will you find old growth temperate forests next to Fall Creek on our field trip? If so, then how extensive will they be? Describe in words.

Using some basic tools:

Now, practice using some of the basic tools you learned in the tutorial to address questions regarding Bedrock Creek Roadless Area:

- ▶ Try using the following tools: full extent button, zoom in, measure, zoom out, zoom to active layer, legend, pan and options.

Use the measure tool

- ▶ Click on the measure tool . **Do not make quick clicks!** Click once, and wait for the red dot, and then click once more. You are going to measure the road less area. Click the north most part of the roadless area, then click the south most part of the roadless area.

5. Approximately how far is it from the north most to the south most boundary of the roadless area?

- ▶ Now use the erase tool  to clear your measure line.

6. Think of **two** more questions you can answer using the basic tools you have learned so far. Write down your questions, your answers and the steps you used to obtain the answer.

Conduct a query

A query asks the data a question (such as “Select areas with Douglas Fir”) and gives you the results both graphically and in a table. Queries are quite sensitive to typos, so you need to

make sure and be specific. Use the query tool  to answer the following question:

- ▶ Make the layer “**Specific Timber Species**” active and visible. Click refresh.
- ▶ Activate the query tool by clicking on the  icon.
- ▶ At the bottom of the screen you will now create the query.
- ▶ For **Field** select SPECIES1. This will designate which data field to use.
- ▶ For **Operator** use =. This will select all areas that are the same as the designated field.
- ▶ Press **Get Samples**
- ▶ For Sample Values select “TSHE” . This is the designation for Western hemlock (*Tsuga heterophylla*).
- ▶ Push the **Add to Query String** button. Your screen should look like the example below.



- ▶ Press execute

Look at the where there is Western Hemlock present.

- ▶ Zoom into the Bedrock Creek Roadless Area.

7. Is there Hemlock in the Bedrock Creek Roadless Area?

CHECK – IN - Remember GIS has data tables associated to locations in maps. You used the data tables of the map layers to create queries for the Specific Timber Species data layer. The results were displayed as both a table and in the map.

We will now make a bit more complicated query that will selecting older stands of Douglas Fir.

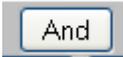
- ▶ Clear the results of the first query by selecting the eraser.
- ▶ Make **Size Class of Trees** visible and the active layer.

- ▶ Begin a new query  with Species1 for the Field and “PSME” as the Sample Value. PSME is the code for Douglas Fir.



- ▶ Add to your query string **SPECIES1 = "PSME"**.

Now you will add a second component to your query.

- ▶ Press the **And** button  next to the sample values. This allows you to insert the second component of the query.

The second component of the query looks at the size of the trees. We want to include all trees that are larger than 32.0 inches at diameter breast height (d.b.h.) Below is the classification that the US Forest Service uses for the **SIZE_CLASS** field:

Code	Description
0.0	No data. Includes nonforest, private, stands without trees, natural stands with no size class data and most managed stands.
1.0	Seedlings, trees less than 1.0 inch d.b.h. at least 6.0 inches tall and in mineral soil
1.5	Seedlings and saplings mixed
2.0	Saplings, trees 1.0 to 4.9 inches d.b.h.
2.5	Saplings and poles mixed
3.0	Poles, trees 5.0 to 8.9 inches d.b.h.
3.5	Poles and small trees mixed
4.0	Small trees, 9.0 to 20.9 inches d.b.h.
4.5	Small trees and medium trees mixed

- 5.0 Medium trees, 21.0 to 31.09 inches d.b.h.
- 5.5 Medium trees and large trees mixed
- 6.0 Large trees, 32.0 to 47.9 inches d.b.h.
- 6.5 Large trees and giant trees mixed
- 7.0 Giant trees, 48.0 or greater inches d.b.h.

In order to select all Douglas Fir larger than 32 inches we would want our query to look like:

SPECIES1 = "PSME" AND SIZE_CLASS >= 6.0
(you will need to manually edit your query to get the 6.0)

8. Talk your way through this query and explain in words the role of each component..

- ▶ Once you get your query setup correctly **EXECUTE**  the query.
- ▶ **DO NOT CLEAR YOUR RESULTS**

Again look at the Bedrock Creek Roadless Area.

9. Are there any areas of larger Douglas Fir in the Bedrock Creek Roadless Area?

We are now going to find trails that intersect the stands of larger Douglas Fir using a buffer.

- ▶ Select the buffer tool 
- ▶ Select **Trails** in the dropdown for *Highlight features from*
- ▶ Within a distance of 0 miles (intersecting) around the selected features of **Size Class of Trees**.
- ▶ Turn off the **Size Class of Trees** layer and refresh the map



You should see all of the trails that intersect the Douglas Fir stands that meet the specifications that you entered.

If necessary go back and redo the query:

SPECIES1 = "PSME" AND SIZE_CLASS >= 6.0

You should see all of the trails that intersect the Douglas Fir stands that meet the specifications that you entered.

Construct your own query

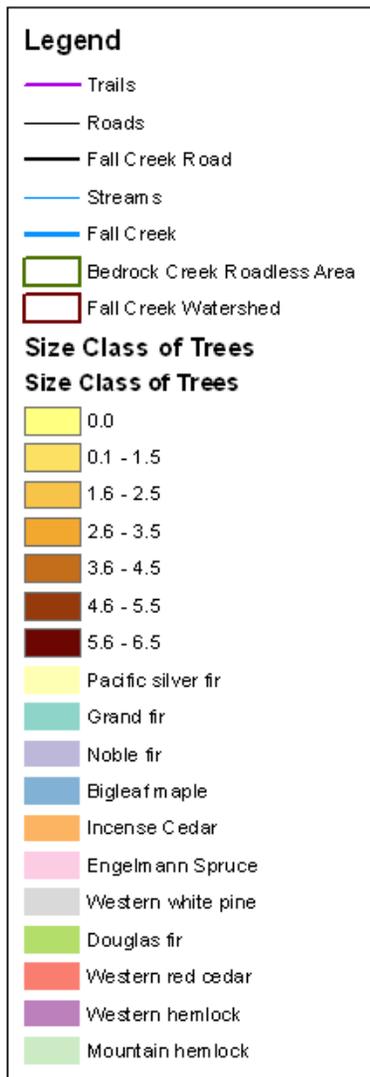
You will now use your new found knowledge to create a query of your own.

- Write down a question that you would like to ask the map and data tables in words AND as a GIS query. Work through those steps and record the answer., record the answer.

Aerial Images

Look at the aerial images and compare the 2005 photos (postfire2005) to the 1996 Satellite images (landsat1996).

- Comment on the pattern of the fire. Can you tell a difference from the two images? Can you see the burned area?



References:

The following data layers were provided by:

United States Forest Service

Fall Creek Road
Roads
Streams
Trails
Condition of
Forest Class
Size Class
Timber Type
Specific Timber
Species
Fire Regime
2004 Aerial
Imagery

Oregon Wild

Bedrock Creek
Roadless Area

United States Geological Survey

Contours (derived
from elevation
data)