

Lesson Title: Oak Savanna Ecology

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Lessons Summary: Students will study the oak Savanna ecosystem in Oregon to determine the environmental conditions that support this specific ecosystem. Students will gather data for the Willamette River Basin, including current species prevalence and rain fall, as well as historic data from the original plats of cadastral surveys to determine optimum and historic oak distribution.

Lesson Objectives: Students will utilize data queries to select subsets of data. Students will analyze patterns of oak disbursement in the Willamette Basin, determining patterns of distribution and correlations between rainfall and species prevalence.

Extension: Students will compare historic records to current GIS vegetation maps and student-conducted vegetation field reports.

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 or working through the tutorial. The tutorial video, student activity, and Web-based GIS Tutorial Viewer can be found at <http://gis.lanecc.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.

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

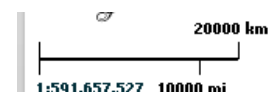
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- Begin by connecting to the Lane GIS web page at <http://gis.lanecc.edu/>
 - Click on the **Modules** link.
 - Click on the link to Oak Savanna.
 - Click on the Link to Web-based Map. This will open up a map in a new window.



*The page will take a minute or two to load. The base map will load first then the other data layers. If it stalls at 55%, just click the **refresh** button on your browser.*




Look in the lower left corner of the map, and you will find two scales for this map. One is a bar scale the other is a ratio scale.



The ratio scale is about 1: 591,657,527.

1. What is the length of the scale bar when you first open the map?

► Use the **Zoom** tool  to focus the map on the state of Oregon.

► Just above the map you will see three menu options.
File | Bookmarks | Selection




► Choose **Bookmarks**, and then **Create**. You will get a pop-up on your computer screen.
Name your bookmark Oregon and press OK.

This creates a reference for the map to zoom to if you want to look at the entire state again. It will save you time later in the exercise.

*You may need to turn on the **Ocean** and **Country** layer to see the scale. Turn them off after you record the scale information.*

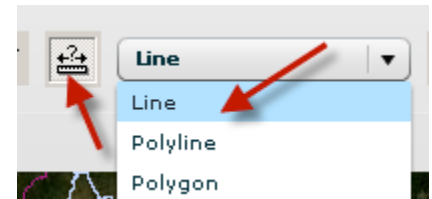
2. What is the ratio scale of the map and the length of the bar scale when you are zoomed into Oregon?

► Turn off the People 2000 Census layer. Uncheck the box. Use the **Identify** tool  and click in the different purple watershed basin areas until you find the Willamette Basin.

3. What is the area of the Willamette Basin? Describe where the basin is located in Oregon.

► Click the Measure tool and choose line from the list of options.

► Click and drag a line the length of the Willamette Basin.




4. What is its length?

► Click the Pencil to erase the line. Now measure the width of the basin.

5. What is its width?

► Use the Zoom tool to focus the map on this watershed.

► What is the length of the scale bar and the ratio scale now that you are focused on the Willamette Watershed?

► Use the Identify tool  to find the basins that border the Willamette Basin.

► What are the names of these four basins?

- ▶ Turn on the Precipitation layer and turn off the Ecoregion layer.

This represents the average precipitation for the state of Oregon in centimeters.

6. Compare the amount of precipitation found on the floor of the Willamette Valley (in the Willamette Basin) to the surrounding hills/mountains?

The total size of the Willamette Basin is approximately 11,460 square miles. To locate the stands of oak in the Willamette Valley, we can create a query.

- ▶ Turn off the Precipitation layer and turn on the Vegetation layer.

Make sure your map is zoomed to the Willamette Basin.

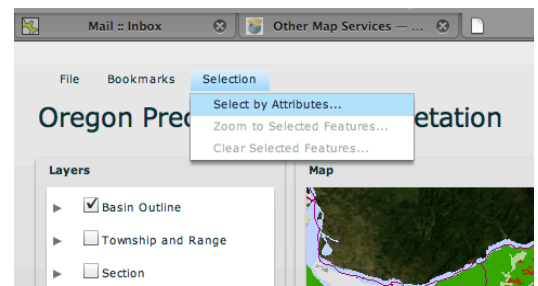
- ▶ Expand the legend

This gives you an overview of the vegetation in the Willamette Basin. To locate all oak stands ONLY in the Willamette Basin we will perform a query.

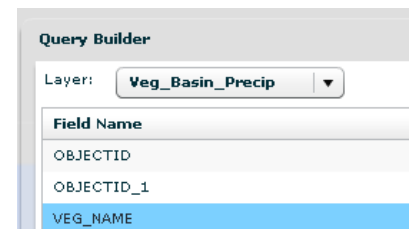
A query is a way to select specific information from a large amount of information.

- ▶ Click the **Selection** link at the top of the page.
- ▶ Choose **Select by Attribute**

You may need to position the Query Builder window so you can see the entire window. To do this left-click the mouse and click at the top of the window and drag it so you can see all of the OK buttons at the bottom.



- ▶ Set the Query Builder Layer to **Veg_Basin_Precip.**
- ▶ Double click the Field called **VEG_NAME** to add it to the box below.
- ▶ Click the equal sign. =



- ▶ Type **'Oak'** into the box after the = sign including the single quotation marks. This needs to be exactly as written in the window with the single quote on each side of the text.
- ▶ Choose OK

This query shows all the areas that are primarily oak in the Oregon.

7. How many records did your query return? Look at the top of the attribute table.

Now narrow the search to find oak only in the Willamette Valley by adding AND to the Query.

► Selection → Clear Selected Features

Start your new Query.

► Select by attribute

► Layer is **Veg_Basin_Precip**

► Field is Veg_NAME = 'Oak' (Don't select OK yet!)

► Click the **AND** button → Field = "NAME" → GET UNIQUE VALUES → Choose "Willamette"

► Now select OK,



8. Looking at the table, how many sections of the map answered the question that you asked the data? What was the question that you asked the data?

► You can use the "Zoom" button to explore the patterns of oak growth in the Willamette Basin.

9. Looking at the Willamette Basin as a whole, how would you describe the distribution pattern of the oak?

10. What are the predominant vegetation types adjacent to the oak?

11. What other patterns do you see or wonder about?

To find the total area of the oak in the Willamette Basin we can capture the "square mile" data from the Query results.

► First open Microsoft Excel.

► Switch back in your map, and select the "Copy All to Clipboard" button.

Query Results 13 of 2125

Copy All to Clipboard Copy Selected to Clipboard

NAME	RANGE	SCI_NAME	Shape_Area	Shape_Length	squaremile	VEG_NAME
WILLAMETTE	75	Quercus garryan	154314.435371	2792.57481513	0.04228238522	Oak
WILLAMETTE	55	Quercus garryan	23871096.9803	46628.2063201	6.5463379695	Oak
WILLAMETTE	55	Quercus garryan	243556533.207	353456.737413	67.1580864077	Oak
WILLAMETTE	45	Quercus garryan	999202700.759	1348434.09728	275.307121452	Oak
WILLAMETTE	90	Quercus garryan	84818.2347746	1292.43309641	0.02320306922	Oak
WILLAMETTE	80	Quercus garryan	8551427.26618	20009.8003305	2.33957857912	Oak

- In Microsoft Excel → right click in the upper right cell and → “Paste”
- Click in an empty cell (box) at the bottom of the square mile column.
- Highlight the column with square mile by clicking in the column letter

	F	G	H
	squaremile	VEG_NAME	
5	37.02411335	Oak	
2	23.49676637	Oak	

- Then click the AutoSum button.
- Scroll to the bottom of the column to see the total.



12. How many square miles of oak exist in the Willamette Basin? (round to the nearest mile)

To explore the correlation between oak and rainfall in the Willamette Basin you can measure the area of oaks that occur in areas of rainfall in A) less than (<) 50 inches per year, and B) > 50 inches per year AND < 75 inches per year.

A) To find oak in the Willamette Basin AND < 50 inches per year, you need to complete a three-step Query. Use the expertise that you gained in the last section to complete this section.

- Using the Query Builder, setup the same query that you completed where you found Oak in the Willamette basin.

```
SELECT * FROM Vegetation WHERE:
VEG_NAME = 'Oak' And NAME = 'WILLAMETTE'
```

Do not click OK yet!

- Click the **AND** button → under Field Name double click “RANGE” → for the operator choose < → and type in 50. This time do not use quotation marks.

The RANGE field represents the average annual rainfall in centimeters.

- Select OK.

All of the oak, in the Willamette Basin, and growing in less than 50cm of rain per year should be highlighted.

13. Describe in words what the Query you just asked the data represents.
14. Using the same cut and paste method into excel, calculate the number of square miles of oak in the Willamette Basin that occurs in less than 50 inches of rain per year (rounded to the nearest mile):

Using what you have learned, create a query that calculates the **Oak** in (AND) the **Willamette Basin** AND a **Range > 50** AND **Range < 75**.

- ▶ Using the same cut and paste method into excel, calculate the number of square miles of oak in the Willamette Basin that occurs in more than 50 inches of rain per year AND less than 75 inches per year (rounded to the nearest mile):
15. How many square miles of oak are there in the Willamette Basin that receive more than 50 AND less than 75 inches of rain per year?
 16. What generalization (or hypothesis) could you make about the correlation between oak and rainfall in the Willamette Basin?
 17. What other patterns or correlations could you look for (using all the species types and other data available in the map? (Create at least three correlations or pattern questions that you could explore. Use complete sentences.)

(Bonus/Extra Credit) Scale out to a map of the entire state; find the area(s) with significant oak growing in a precipitation range greater than 75 cm per year. What part of the state would you find most of these oaks growing?

Career Extension:

Students will explore the related careers of forest technicians and natural resources.

- ▶ Go to the website <http://www.esri.com/industries/natural-resources/index.html>
- ▶ Find a career from the list that is of interest to you. For example: In the Natural Resources list, there is a link to forestry. In the forestry link, there are several job descriptions.
- ▶ List four ways GIS is used in the career you choose.
- ▶ Conduct an internet search to find information about salary ranges and possible job locations.