

**Lesson Developer:** Toni Taylor, Lowell High School

**Title:** Eco-Oregon

**Subject Area:** Environmental Science (Technology, Science)

**Grade Level:** High School (9-12)

**Lesson Description:** Studying the world's ecosystems is sometimes a challenge as students have no way of connecting the world they live in with these exotic, often-times distant worlds they are learning about. This lesson is meant to be used to show students the ecosystems within their own backyards. At the start of the lesson, students begin by looking at the entire world. The first question asked sets the stage for students to begin looking at geographic patterns in relation to vegetation growth. As students work through the questions they are able to build on their previous knowledge, thus allowing them to be more confident in their explanations of answers. As students zoom in and begin taking a more in-depth look at the ecosystems that are found right here in Oregon, they begin to see that there are many diverse ecosystems closer than they originally thought.

Students are able to utilize their prior knowledge of ecosystems to begin looking at what it would take to support vegetative life in Oregon. This activity takes students through the identification of Oregon ecosystems including locations of major cities within those ecosystems, precipitation levels, types of vegetation and careers found within each ecosystem

This lesson was developed as part of a unit on ecosystems. However one should note that due to the integrated nature of environmental science, this activity could be used for many different lessons. For example, one could use it to determine what careers would be affected by natural disasters such as landslides, low levels of precipitation and possible fire damage. The greatest benefit of this activity is that students are given the chance to see that there are many factors affecting the ecosystems of Oregon. If one of those factors were to change, a chain reaction could be expected. This activity could be adapted to represent many different factors dependent upon the unit at hand.

**Recommended Time to Teach:** GIS lesson: 50 minutes, Career Extension: 50 minutes

## **Education Standards:**

Common Core Standard English Language Arts Standards: English language Arts Standards

»History / Social Studies » Grade 12

CCSS.ELA-Literacy.RH.11-12.7: Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.

CCSS.ELA-Literacy.RST.11-12.3: Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

ITSE National Technology:

3. Research and Information Fluency
  - a. Plan strategies to guide inquiry
  - b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
  - c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks
  - d. Process data and report results
4. Critical Thinking, Problem Solving, and Decision Making
  - c. Collect and analyze data to identify solutions and/or make informed decisions
5. Digital Citizenship
  - b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity
6. Technology Operations and Concepts
  - a. Understand and use technology systems
  - b. Select and use applications effectively and productively

National Geography Standards

- 1) How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information
- 2) How to analyze the spatial organization of people, places, and environments on Earth's surface
- 3) How to apply geography to interpret the present and plan for the future

**Learning Objectives:**

▶ **Geospatial Concepts:**

Students will be able to:

- Use GIS technology to recognize *correlations* in vegetation growth and levels of precipitation.
- Use GIS technology to determine *patterns* in vegetation/precipitation levels and city location.
- Use GIS technology to *locate* areas with precipitation levels high enough to support the growth of Douglas firs.

▶ **Other Discipline:**

Students will be able to:

- Synthesize information gathered to propose possible careers within Ecology.
- ▶ **Career Connection:**
  - Students will explore connections to GIS.

### **Web-based GIS Tools:**

Students will use the following:

- Info tool to identify the ecosystems of Oregon, cities within each ecosystem and plant types within the vegetation layer.
- Zoom tool to focus on Oregon rather than the entire world.
- Query tool to find the areas of Oregon which receive greater than 40 cm of precipitation per year (the amount needed by Douglas firs).
- Draw tool to mark areas so that they are visible even when turning on and off layers.

### **Materials:**

- Computers with high speed connection to utilize Web-based GIS
- Copies of the student lesson, pencils

**Prerequisites:** Successful students will have a prior knowledge of ecosystems, precipitation types and vegetation requirements. In addition, GIS vocabulary should be explicitly taught before the Web-based GIS lesson is attempted. Completing the GIS Tutorial lesson (done during two class periods, 50 minutes each) allowed students to be comfortable using the GIS maps and tools.

### The Lesson

#### **Anticipatory Set**

Any of the following questions would be useful to draw student's attention:

- "How many ecosystems would you say there are in Oregon?" *Various responses*
- "What do you already know about the differences in the west side of the state versus the east side?" *The east side tends to be dry, desert like while the west side of the state is lush and green.*
- "What do we remember about ecosystems and their relation to latitude and longitude?" *It gets hotter as you get near the equator, therefore more plants and animals are found.*

#### **Developing the Lesson**

This lesson utilizes the foundational understanding of ecosystems and how the living organisms found in them have particular requirements such as precipitation levels for vegetation.

#### **Career Connection**

Students will explore jobs with connections to ecosystems and natural resources that use GIS. All students can be required to complete this exploration, or students who finish

early can report their findings to the class. The links in the student lesson provide job descriptions and salaries.

### **Assessment/Evaluation**

The initial use of this lesson includes the administration of a pre-test and post-test to assess students understanding of geospatial thinking. In addition, after the vocabulary is taught in the classroom, students will be evaluated on their answers to the questions in the Web-based GIS lesson. Answers to the questions on this lesson will be used to assess student understanding.

Students can additionally be assessed informally simply by listening to their discussions as they work through the lesson. While moving around the room, listen for vocabulary and connections being made. It was my experience that students were talking with each other and working through the patterns that they were seeing on their maps. This quick, informal assessment allows the teacher to determine where the lesson should go next.

### **Extensions**

- Research the precipitation requirements of other large trees and determine their locations based on this information by completing a self-directed query.
- Research precipitation levels based on ecosystem and location. Most students are aware that the eastern portion of Oregon is much drier, but many would be unable to answer how different the precipitation levels really are. Have them make a table/chart showing the differences in precipitation throughout the nine major ecosystems of Oregon.

### **Resources**

Forest Ecosystems and Society; Oregon State University

<http://fes.forestry.oregonstate.edu/>

Oregon Department of Forestry; Oregon State Government

[http://www.oregon.gov/ODF/STATE\\_FORESTS/FRP/RP\\_Home.shtml](http://www.oregon.gov/ODF/STATE_FORESTS/FRP/RP_Home.shtml)

Natural Vegetation of Oregon and Washington; Pacific Northwest Research Station (US Forest Service)

<http://www.treearch.fs.fed.us/pubs/26203>

Snow and Precipitation data for Oregon; Natural Resources Conservation Service (US Department of Agriculture)

<http://www.or.nrcs.usda.gov/snow/data/>