



Activity 9 - Mapping Watersheds, Habitat & Uses of the Coast

<u>PURPOSE:</u>	To help students look critically at a landscape using remote sensing imagery to identify habitats present and develop a classification scheme of natural and human derived land uses.
<u>TIME REQUIRED:</u>	2 class periods (~ 45 minutes each)
<u>SUBJECTS:</u>	Science, Math
<u>MATERIALS NEEDED:</u>	Aerial photos printed or digital from TIDES, tracing paper, tape, magnifying lenses, colored pencils, pencil sharpeners
<u>VOCABULARY:</u>	Analyze, classification, Geographic Information System (GIS), Global Positioning System (GPS), ground truth, interpret, orthographic photo, remote sensing, resolution, scale, spatial.

Outcomes: 1) Students will be able to describe what an orthographic photo is and why it is useful.
 2) Students will be able to explain in simple terms what GIS is and how it can be used to interpret data.
 3) Students will be able to explain what remote sensing is and why it can be useful in understanding estuaries.

Life Science

- Population change in the environment

History and Nature of Science

- How scientists investigate

Scientific Inquiry

- Ask questions to support scientific inquiry
- Design scientific investigation
- Collect data
- Analyze data

Science in Personal and Social Perspectives

- Acting on personal and social issues.

Background: Changes in the landscape, shoreline, and estuary over time are now being studied using tools that were only beginning to be used by cutting edge scientists in the past decade. As computers have become more powerful and the internet has developed into a high speed method for transferring vast amounts of data, the ability to remotely observe and interpret the ecosystems of the earth has improved dramatically. With a high speed internet connection and free software, an internet user can view aerial images of almost any location on earth (visit www.googleearth.com) and attempt to interpret the features included in the image. The resolution of the image or the sharpness of the rendering of the



features depicted will determine to some degree how successful an interpretation can be made. Some features are fairly easy to guess the nature of such as forests, farm fields, roads, bridges, and parking lots. Other parts of the image such as the particular use of a building or group of buildings must be inferred by looking for clues.

Remote sensing imagery has improved greatly over the past decade and the availability of high quality digital images has made the use of these resources for classes much more accessible. However, the difficulty of acquiring specific images at very high resolution still remains somewhat difficult and expensive. For this exercise, we have provided a digital file and a printed color copy for the use of your class.

The activity relies on low cost, low tech items to bring the concept of the Geographic Information System into the classroom in a way that is meaningful to the students and useable for the class. Acquiring tools such as specialized GIS software and sufficient computers and lab space to run this exercise is assumed to be out of reach for most schools at this time, however, the same activities can be conducted using such resources if they are available.

This laboratory activity is designed to help students look critically at a landscape using remote sensing imagery to identify habitats present and develop a classification scheme of natural and human derived land uses. The participants will each work on part of an aerial mosaic of the landscape to identify land use and land cover on an overlay. They will then transfer this information to the large scale map of the study area and discuss the implications of the identified land uses.

Preparation: Print out enough copies of the base orthographic photo of Charleston, Oregon so that each student has a copy. Provide enough tracing paper and colored pencils so that each student has several sheets and access to a full set of colored pencils (these sets may be shared by teams of 2-3 students at a time).

In advance, try the steps in this activity yourself if possible to become familiar with the image features or, at a minimum, consult the key included in this activity.

You may want to review the PowerPoint presentation “Impacts of Land Development on Oregon’s Waters” and “Remote Sensing and GIS for beginners” for yourself to become familiar with the concepts that will be discussed during the analysis of the projects the students generate.

Depending on the time available for preparation, you may want to try to acquire an orthographic photo for the area that your class will be visiting on your field trip. Some possible sources for this imagery are included in the resources for this curriculum.

Activity Description: Describe the nature of the mapping activity that the students will be participating in and how the nature of remote sensing has changed over time. Use the PowerPoint presentation “Remote Sensing and GIS for beginners” to introduce the concept of mapping land use and habitats. Additionally, if you have not shown the class “Impacts of Land Development on Oregon’s Waters”, you may want to do so. Define the vocabulary terms listed for this activity.

Now, engage the students in a discussion of the possible land and water uses of the coast after defining the area of study (for this exercise we are using the Charleston, Oregon image provided). Remember to ask them to think broadly in terms of who comes and goes from the area depicted in the photo and



what the nature of the activities they are involved in includes. List the land and water uses and the types of facilities related to these uses. Students should then identify estuarine habitats present and develop a classification scheme of natural and human derived land uses. (Example - Forest, Meadow, Sand Dune, River, Creek, Reef, Marsh, Tideflat, Channel, Residential, Industrial, Agricultural, Livestock, Commercial, Fishing, Silviculture etc.) Each category should have examples listed within it, but the category should be broad and cover several different examples. These Land Use categories and Habitat Types will then become the classification scheme for the mapping exercise.

Now the students will use the aerial photos to identify on the ground activities which are taking place within the study area through analysis. Encourage the students to observe carefully and use magnifying lenses to look for clues and specific details. Ask the class to think hard about identifying land uses and habitat types but to have proof to defend their assumptions.

Give each student a photocopy of the study area orthographic photo (Charleston, Oregon) to the student with a tracing paper overlay and colored pencils. Each student will label their overlay and base map and then proceed to draw lines on the tracing paper which roughly corresponds to the boundary of the land use/habitat type. A new color will distinguish each area and will be labeled with a code standing for the Land Use or Habitat Type. As a first step, you may wish to have the students mark the boundary of the shoreline for the entire photo so that they can get practice before defining more specific areas for classification.

Post activity analysis: When the students have completed the labeling of the maps, discuss the land uses present. Write the categories on the board in front of the room and ask each group to estimate and report the percentage of their map which is covered by each Land Use or Habitat Type. Total these for the entire class and this will give your class a picture of the natural and human uses of the landscape and seascape within your watershed.

Identify the area where you will be conducting your field sampling on the map. Try to identify watershed uses and habitat which might have an impact on that area. Discuss the idea of positive and negative impacts to the area relating the idea of natural impacts being as significant as human induced impacts and the combination/interaction of impacts.

Follow up ideas: This is a laboratory activity to be conducted in the classroom and may be expanded from one class to three class periods. (Equipment and supplies - aerial photos, USGS topographic map, photocopies of map sections). Students initially list land and water uses of the coast after defining the area of study (suggest crest of the coast range to the nearshore reefs). Students identify habitats present and develop a classification scheme of natural and human derived land uses. (Example - Forest, Meadow, Sand Dune, River, Creek, Reef, Marsh, Tideflat, Channel, Residential, Industrial, Agricultural, Livestock, Commercial, Fishing, Silviculture etc.) Each category should have examples listed within it but the category should be broad and cover several different examples. These Land Use categories and Habitat Types will then become the classification scheme for the mapping exercise.

Develop a full scale map of the watershed defined by the major rivers, streams and creeks and locate the students within the watershed. Now use the aerial photos to identify on the ground activities which are taking place within the watershed through analysis. If possible, use stereo pairs, even one set for each student to have a turn at. Ask students to think hard about identifying land uses and habitat types but to have proof to defend their assumptions. Now have them find the location of their photo on the USGS map (divide this map with a pencil line grid and assign a quadrat to each student) and give a photocopy

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of that area to the student with a mylar overlay and colored pencils. Each student will label their overlay and base map and then proceed to draw lines on the mylar which correspond roughly to the boundary of the land use/habitat type. A new color will distinguish each area and will be labeled with a code standing for the Land Use or Habitat Type.

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