

A Quick Introduction to GIS For Using the Oregon Coastal Marine Viewer

Introduction: In this next series of lessons we are going to be exploring some large scale ocean processes using Satellite images coupled with data that was collected from a research ship during cruises conducted by the US GLOBEC project. Our region of study is the Pacific Ocean right off the Coast of Oregon.

In order to view both the satellite imagery and the biological data collected from the research vessel at the same time we will be using an Internet Map Service (IMS) which is a website that is powered by a Geographic Information System.

What is a GIS?

As stated before a GIS is a Geographic Information System. Basically a GIS is a computer system that stores information that has a geographic location. Since this is a geographic system, all the data that GIS programs deal with have to have a geographic component. An information system is one that organizes data so that it can be searched by the user and relationships can be formed from one data set to another.

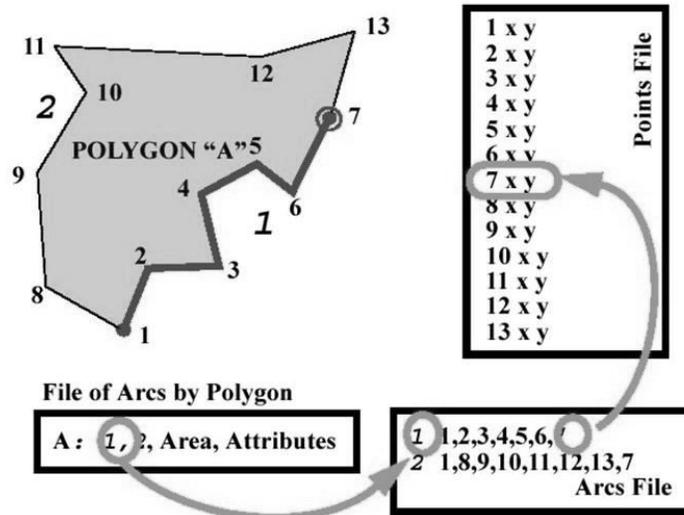
All the data stored in a GIS has a geographical location and therefore users can perform spatial studies. How far is it from the fire station downtown to your school? How much area is within the city limits of your town? These are both spatial questions that using a GIS tool you could find out the answer. The data in a GIS is stored in a spread sheet format. From the information stored there, and in other files, the software can draw a map on the screen. This allows the user not only to store, edit, and make spatial studies, but to view the data in a dynamic environment.

Another key characteristic of a GIS is the ability to make highly accurate and detailed maps. Since the software can store and display data the next logical function is to be able to make a map of the data.

How is Data stored in a GIS?

Data is stored in four basic methods: points, lines, areas, and in a grid (or raster). A point is just that, a point with location coordinates and some information that goes with it (usually called an attribute). For example, one point in the bird data represents all birds (species of birds are not specified) sited from a specific location on a specific date. Lines are simply two points that are connected by a segment. In the GIS world they are called arcs due to the fact that more often than not in the real world lines are curved. In the data the line would be stored as two points and an arc connecting them with the associated attributes stored in a table form. When a user selects the line in the software they can view the attributes to see what the line is representing. Is this road a main highway or just a dirt road?

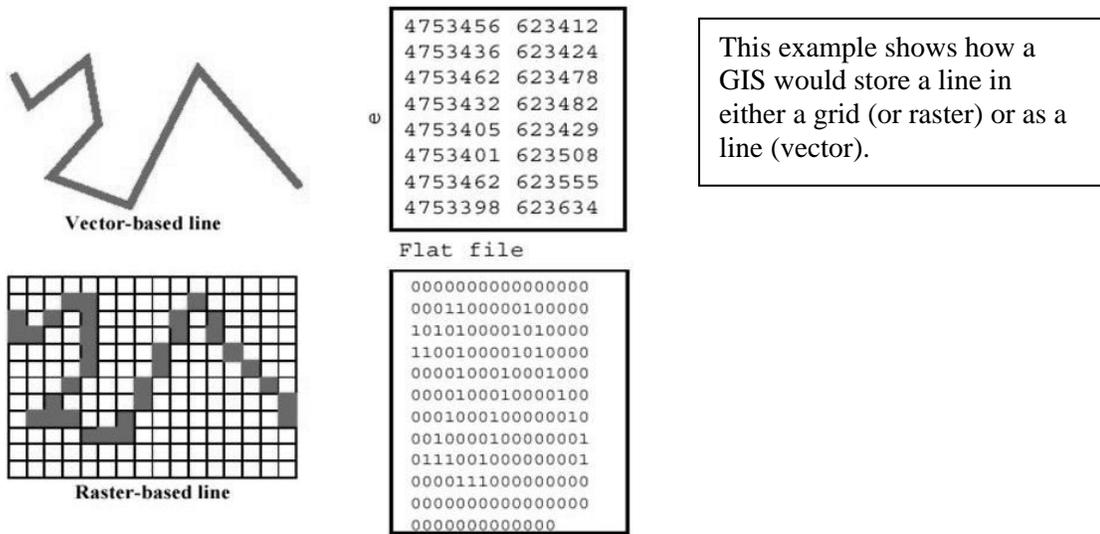
An area is stored by polygons that are a series of points that are connected by arcs in a closed position. Like lines and areas, a table stores the points and lines along with the attributes.



This polygon "A" has two line segments, 1 and 2. Line 1 is made up of points (or nodes) 1-7, which all have a location defined in the points file.

Points lines and areas are called vector data because they all define a feature with a point and a line similarly as a vector does in classical physics.

A grid is just as it sounds, a series of square cells that have a value associated with each cell. A grid is also called a raster, from the Latin root of rake. Grids usually represent larger areas and use different values to show different features. A lake may have the value of 10 where a bare soil area may have a value of 2. Grids are commonly used for areas where a continuous gradient of some attribute is being displayed. An example of this we will see is temperature. The satellite data we are using has a range from 0-25.5 degrees Celsius. An area of the ocean, represented by a cell, that has been determined by the sensor to have a temperature of 18 degrees C will have a value of 180 (for 18.0 degrees C, this is the way computers store image formats, we will talk about this later).



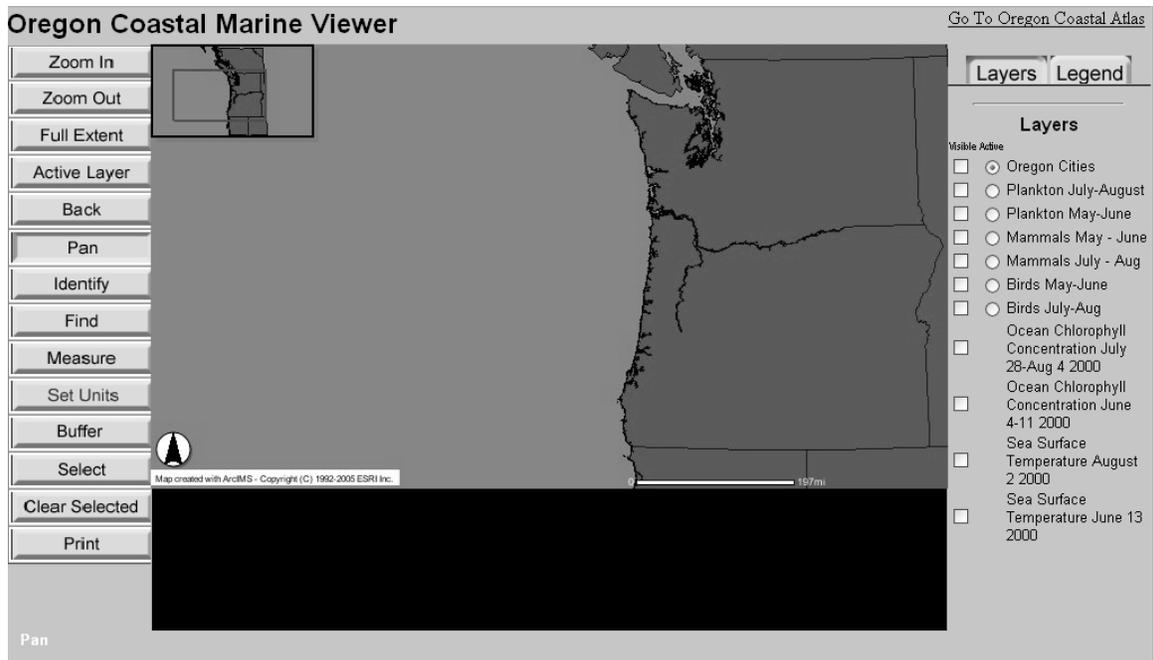
The real power of a GIS is that multiple layers of data can be viewed at the same time. This allows the user to see patterns and answer spatial questions that rely on many different geographical data sets.

What is an IMS?

For these two lessons we will not be using a typical GIS software program because they require advanced training and many hours of practice. With more advances in internet technology the development of Internet Map Services (IMS) has been a new method to allow wider audiences to view data in the same way that a professional GIS user can. The benefits of using an IMS are that the user can view data, do simple spatial analysis, and print a map of the information they are interested in by using a web-based browser.

Let's Get Started!!!

Ok first bring up the IMS site from the website: <http://scallywag.science.oregonstate.edu/website/OcIMS/viewer.htm>. The first thing you will notice is a large map located in the center with a smaller view in the upper left-hand corner. The main map is the working map and the one in the top left corner is the overview map, which shows the zoomed-in area of the working map. Now let's look at the right panel. This is the Layers and Legend panel, which acts like a Table of Contents.



As discussed earlier, the true power of a GIS is to be able to look at multiple layers of data at the same time. The right hand side is where the layers the user selects become visible or invisible. This is also where the user selects which layer becomes “active”. Only active layers can be manipulated.

On the left side of the window you will see a number of buttons that have text in the center. This area is the tool bar and by selecting the buttons we can make the IMS perform different tasks.

Helpful hint: only click one layer on and off at a time. You will get an error message if you click more than one button at a time.

ZOOM IN

The Zoom In button allows the user to drag a rectangle around and select an area you want to look at more closely.

ZOOM OUT

The Zoom Out button allows the user to draw a box, expanding the area of view on the screen.

FULL EXTENT

The Full Extent button when pressed will reset the map to its default size.

ACTIVE LAYER

Pressing Active Layer draws a window around the data in the active layer.

BACK

The Back button returns to the most recently viewed area of the map. This is a handy button if you accidentally click some where you didn't mean to or if you want to go right back to the last place you were looking without having to scroll around.

PAN

The Pan button allows the user to move around the working map at the current scale you are using.

IDENTIFY

The Identity tool is used to learn about the data behind map features. When you click on a point, line or area the data in the spreadsheet table becomes visible in the information window and allows the user to view all the attributes of a single point or points.

FIND

The Find tool allows you to search for data by typing in a value of an attribute that you know. Let's say you used the identify tool and found out in the mammal data that one of the data points represents a humpback whale. If you are interested in seeing where the other humpback whales were sited you can type humpback whale into the box under the find command and the appropriate data points will automatically be highlighted.

BUFFER

The buffer tool is a great tool for answering spatial questions. For example let's say that we know during the winter months a certain species of bird flies less than 2 miles from its nest to find food. If we did a survey and found a bird's nest we could then buffer the nest at two miles and an area on the map would be highlighted at a 2 mile radius from that point. We can also buffer line and areas, if the 50 ft on either side of a railroad track is owned by a railroad we can determine how much area that would take up. The same would happen if you buffered an area polygon.

SELECT

This tool only works on the layer that is set to the active layer, which can be done with the button located next to the layer button. Once you have selected the active layer you want use the select tool to drag a box around the point(s) that you would like to have selected. If a point or a number of points are selected, the first 25 records will show up in the information frame located underneath the main map window.

MEASURE

The Measure tool allows the user to draw points connected by segments that automatically calculate distance. In the upper left hand corner a total distance of the line you construct will be displayed along with the length of the next segment if you clicked where the pointer arrow is resting.

SET UNITS

When the Set Unit button is selected, a menu appears allowing the user to choose the units the map and measure tool will display. The default on the Oregon Coastal Marine Viewer is set to miles.

CLEAR SELECTION

If a selection or action is made with the identity, selection, buffer, or measure tool, the Clear Selection tool will erase that selection.

PRINT

This button will print a copy of the current view of the map.

Example IMS Sites:

The Oregon Coastal Atlas: <http://www.coastalatlasc.net/maps/index.php>

This IMS site was developed for Oregon Coastal Managers. It has many options to add data layers, along with aerial photos, shaded terrain, roads, cities and many other data that can be added to view.

Terra Server: <http://terraserver-usa.com/default.aspx>

At this site, you can type in an address and see an aerial photograph of anywhere in the USA. Although it looks different than the IMS site we have looked at, it is still running GIS software in the background to be able to work properly.