MAPS GIS

Lane Community College NSF #0603492

Flood Recurrence Intervals and Floodplains

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Before you begin using this module, you should have completed the Web-based GIS viewer tutorial video or worked through the tutorial. The tutorial video, student activity, The 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. You should also be familiar with the concepts of floodplains, recurrence intervals, and cross-section diagrams.

Objectives: You will be able to describe the frequency and spatial pattern of flooding.

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

Remember to work through the lab to answer the questions. If you try to just answer the questions they will not make sense. You will write your own answer sheet. Write or draw diagrams to answer the questions.

The learning objectives of this exercise are to:

- Gain a basic understanding of flood frequency and how floods are expressed on floodplains.
- Derive information from a GIS
- Translate map data to cross sections
- Use information from maps to make basic predictions
- Improve map skills and problem solving

Geographic data

Before you jump into the exercise, let's introduce geographic data. Geographic data is much like geometry. It can exist as a point, line, or polygon (shape). Some real world examples would be a traffic light (point), a road (line), and a parking lot (polygon or shape). These examples exist in locations and do not exist continuously.

But geographic data can be continuous. For instance every location on the planet has an elevation. This sort of data is called a raster data and can be thought of as a digital picture.

Information is stored as a pixel. In a picture it is stored as a color, with altitude it is stored as an elevation.

This is a basic introduction to geographic data types, and you will be working with all of these examples during the exercise. Take a few seconds to think through the data layers that you are looking at as you work through the exercise.

Floodplain Mapping

In this exercise you have a range of flooding extents for this section of the Coast Fork of the Willamette River. The lines represent the extent of that predicted flooding based upon recurrence intervals for the river. These extents were obtained using modeling software developed by the US Army Corps of Engineers called HEC-RAS. This software is used to predict floodplain dynamics around the world.

It is important to remember that river systems are continuous. ***The area shown by the flood lines represents the extent of study area that was incorporated into the model. You are looking at them in a map view in the first portion of the exercise.***
Flooding would also occur upstream and downstream.

Familiarize yourself with the map and data

- Open a web browser and go to:

http://gis.lanecc.edu → "Modules" tab → "Floodplain" link → "Link to the Web-based map".

The general organization of the screen should look like:

<table>
<tr><td rowspan="2">Toolbar</td><td>Map
Area</td><td>Layers/
Legend</td></tr>
<tr><td>Selection/Table Display
(blank at start-up)</td><td></td></tr>
</table>

There are five floods mapped in this exercise and you can identify them in the layer list.
Question 1: Please list the five floods on the Answer Sheet that is provided.

The river flows from the lower right corner of the map to top of the map.
Question 2: Please describe the river's flow direction using directions (N, S, E, W, SW, etc). Your answer should read along the lines of the river flows from the ____ to the ___. (Use answer sheet)

Question 3: There are two cross sections on the map, A-A' and B-B'. Which one of these is upstream? (Use answer sheet)

Question 4: Is the area in the flood boundaries primarily on the inside or outside of the bend in the river? Which general region (of the map) describes the point bar (area of deposition) of the river? (Use answer sheet)

- Turn on the elevation layer and refresh the map. Next turn on the map legend using the  icon in the tool bar. The units are in meters.

*Question 5: How would you describe the topography of the **modeled area**? Is it steep, flat, or rolling hills? (Use answer sheet)*

Creation of cross sections

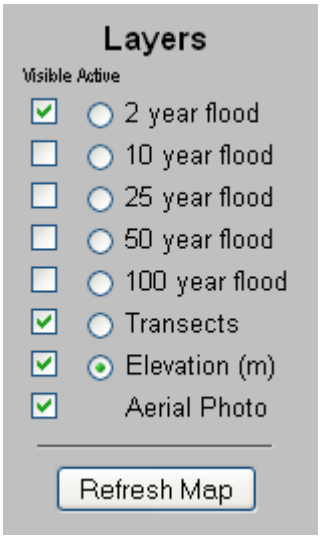
This section is listed in steps. If you skip ahead to the questions you will not have the answers. You will be much more efficient in completing the exercise if you work through the steps and think about what you are looking at on the map.

We have been looking at the information as a map. We will now flip the map to look at the transects as cross sections. To do this we will use the map and to plot the predicted 2, 10, and 50 year flood extents on cross sections. For this we will use the *measure*  and *identify* tool  .

Look at your cross section answer sheet. These plot represents land surface elevations at each cross section.

- We will work through the 2 year flood on the A-A' transect first. Make sure that the elevation layer is turned on and is active. It is easiest to turn off all flood extents except for the one that you are working on.

Your layers should look like the screen shot to the right----------→



- If you do not see the layers, use  to toggle the layers.

It will be easiest if you collect and record all of your data first in the tables on the cross section answer sheet and then plot the data on the cross sections.

- Use the zoom tool to focus on the upstream transect. Now use the measure tool to record the distance from the western end of the transect to the western extent of the

2 year predicted floodplain, the center of the river, and the eastern extent of the 2 year predicted floodplain.

Be patient when you use the tool. It is simple to use, but if you click more than once it will not work properly. The steps are simple.

- CLICK ONCE AT THE STARTING POINT (The western end of TRANSECT A)
- WAIT FOR THE RED DOT
- CLICK ON THE WESTERN EXTENT OF THE 2 YEAR FLOODPLAIN
- IF YOU NEED TO START OVER OR CLEAR, USE THE ERASER TOOL 

You will see measured values in the upper area of your screen. Record that value in your table and move through the measured distances.

- Use the identify tool  to record the elevations for the western and eastern extent of that predicted floodplain.

On the cross section sheet you can now plot out the values you recorded.

- ***Repeat this process for the 10 and 50 year flood AND for the downstream transect B.***

Make sure to label your elevations on the cross section sheet.

On the plot on the answer sheet, predict draw the 25 year flood on the plot. An important consideration is whether or not water levels increase in a linear fashion.

What you have plotted is the predicted elevation of the water surface at each of the flood events.

Question 6: Are the water surface elevations the same at each cross section? Which is higher? Does this make sense and why?

Question 7: The predicted floodplain does not extend to the east nearly as far at B-B' than at A-A'. Explain.

Question 8: Is the water moving faster at A-A' or B-B'? Explain.