**GEOL 308, Oregon/PNW Geology**
**Spring 2014**

**Laboratory assignment #5**: Willamette River

**Due**: Wed, May 14, 5pm.

**Description**: For this lab, you will learn about the patterns and processes of the Willamette River by examining historical imagery and high-resolution topography from lidar. You will make a series of measurements that will allow you to make some interpretation about recent rates of change in our own backyard. You will need Google Earth, Microsoft Excel, and a high-speed internet connection.

**Directions**: As in the previous labs, you will turn in a Word document with written responses and screenshots. You will also save your final work in Google Earth as a KMZ file and turn that in with your word document.

*Examining active channel patterns*
As you may have noticed from biking along the river paths in Eugene or from looking at maps, the Willamette River is not straight, but has many bends. This tendency for many rivers to deviate from a straight line is referred to as "meandering" or "anabranching". On a map, you can quantify the degree of this meandering using the metric *sinuosity*, which is the length of the river channel divided by the length of a straight line with the same endpoints.
1. What are the units of sinuosity?
Download the file "Willamette Path.kmz" from Blackboard and bring it into Google Earth. This path traces a section of the active channel north of Harrisburg. First, you will measure the sinuosity of this section. To do this, draw a path in Google Earth that is straight, but starts and ends at the same place as the path of the river.
2. How long is your path? What is the sinuosity of this river section? Take a look at the elevation profile of the river path. What is its general trend in the downstream direction?
3. Look at the valley floor adjacent to the current channel. What features reveal previous incarnations of the channel? What do these imply about the river's sinuosity in the past? Take a screenshot of one of these features.
Another metric that scientists use to describe rivers is channel width.
4. Make a measurement of channel width somewhere between Corvallis and Eugene. How wide is the channel? What features did you use to serve as the endpoints of your measurement? How do you think the channel width might vary seasonally or on longer timescales?

*Records of past channels*
River channels like the Willamette are not static through time, but migrate. As they migrate, past channels are abandoned but their form is still visible in the landscape. Download the file "Willamette_topo.kmz" from Blackboard and open it in Google Earth. This file shows high resolution lidar of a section of the Willamette just south of Corvallis. Because the topography of

the river is so gentle, we need high resolution data to see the details. Dark blue areas are low elevation; white areas are high elevation.
5. In a couple sentences, describe some of the landforms that you see in this image. Toggle between the topography image and the Google Earth image - what other properties tend to reveal the various fluvial (river-generated) landforms you see in the topography from the aerial imagery in Google Earth? If so, how?

6. Begin by drawing a cross-section path perpendicular to the Willamette across this image. How many channels (active and otherwise) cross the path you have drawn? Take a screenshot of your path.

We can use these abandoned channel forms to infer how the river has evolved through time. Select one of the abandoned channel landforms for further investigation. Mark it with a placemark. Now, plot the elevation profile of your cross section path.
7. What is the elevation of the modern (active) channel? What is the elevation of your abandoned channel form? If the river once occupied the abandoned channel, what does this imply about incision or aggradation over time? How high would the river need to rise above its current level to occupy this channel?

*Flood Hazard in the Willamette Valley*
The Willamette River floods periodically, posing a hazard to nearby populations. In this sections, we'll explore the flood hazard in the Eugene area.

Download the file "Flood_map.pdf" from Blackboard. This is a map issued by the City of Eugene showing the areas most at risk for flood. The dark blue shows active waterways and the light purple shows the flood hazard area.

8. Where do flood hazards tend to occur? Apart from channels, what sorts of landforms do you think the other flood hazards are near? Refer back to Google Earth for hints. Find your house or apartment and determine if it is in a flood hazard zone.
Just like tsunamis on the Oregon Coast, there are websites you can go to in order to learn more about flood hazards along the WIllamette. One such site is the City of Eugene page: http://www.eugene-or.gov/index.aspx?NID=1695 . Go to this site and explore the various tabs.
9. How does Eugene control floods? Take a Google Earth screenshot of one place that's used to control floods in Eugene/Springfield.
10. What is one thing you learned from this site that you didn't know before about flooding in the Eugene area?