MAPS – GIS Lesson: Floodplain Recurrence - Introduction to Geographic Information System Use in Surface Processes

Subject Area: Geology, Environmental Science, Physical Geography, Environmental Models
Designer: Eric A. Sproles

Lesson Description: In this lesson students use results generated by HEC-RAS, a model developed by the US Army Corps of Engineers, to examine the extent of floodplain inundation for floods of various magnitudes. The model results are for a small floodplain on the Coast Fork of the Willamette River near Eugene, Oregon.

For a more basic exercise, students can examine where flooding occurs and does not and try to understand the processes that are happening on the ground.

The lesson provided offers an intermediate approach, where students look at the extent, and are asked to translate the map view into cross-sectional diagrams. Students should be familiar with cross sections before they start on the exercise.

In the lesson provided, students are asked to interpolate a 25-year flood on their cross sections. Instructors may assign any interval they wish, or simply assign a more detailed mapping exercise.

For a more advanced exercise, students can examine discuss issues involved with model accuracy and limited spatial domains. This approach could be implemented as a discussion after the exercise is completed.

ITSE National Technology Standards
1) Research and Information Fluency - Students apply digital tools to gather, evaluate, and use information.
2) Critical Thinking, Problem Solving, and Decision Making - Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
3) Demonstrate Creative Thinking - Students use technology to explore models and simulations of complex systems.

Geography Standards - Geography for Life 9-12th
1) The physical processes that shape the patterns of earth's surface.
2) The characteristics and spatial distribution of ecosystems on earth's surface.
3) The changes that occur in the meaning, use, distribution, and importance of resources.
4) How to apply geography to interpret the past.
5) How to apply geography to interpret the present and plan for the future.

Objectives: The students will be able to:
1) Derive information from a GIS
2) Gain a basic understanding of flood frequency and how floods are expressed on floodplains.
3) Translate map data to cross sections
4) Use information from maps to make basic predictions
5) Improve map skills and problem solving

Prerequisites:
1) Students should have completed the MAPS-GIS Tutorial activity and be familiar with geospatial skill such as viewing data layers, using the measure and identify tool.
2) Students should be familiar with concepts of cross section diagrams.
3) Students should be familiar with the concepts of recurrence intervals.

Materials: Computer access with high-speed internet, student activity sheet
Lesson Estimated Time: Approximately 60 minutes
Lesson Procedure: A basic introduction to the concepts of recurrence intervals and how floods are expressed on the landscape.
Assessment/Evaluation: Will vary depending n breadth of exercise. One hour should be the minimum time budgeted..
References and Citations:

USACE, 2006. HEC-GeoRAS, River Analysis System. US Army Corps of Engineers. Hydrologic Engineering Center, v HEC-GeoRAS 4.1.1, Nov 2002, CPD-68.

U.S. Geological Survey. 2008. Coast Fork of the Willamette River near Goshen Oregon. station number 14157500. US Geological Survey, Portland, Oregon.