Channel Mapping

Lesson Author: Leslie Williams

School or Agency: St. Anne Wetland Education Outreach Project

Grade Level(s): 6th though 12th

Science Topic: Effect of water movement on weathering and erosion.

Summary: Students will map out where the water has carved out channels in the wetland, what direction these channels bend, and theorize why and how this is happening.

Core Content: MA-08-2.1.1 MA-07-2.1.1 MA-06-2.1.1 MA-08-2.1.3 MA-07-2.1.4 MA-06-3.1.1 MA-07-3.1.1 MA-08-3.1.1 SC-07-2.3.1 SC-06-2.3.3 SC-08-4.6.5 SC-07-4.6.4

Objectives: Student should be able to create a scaled map of the channels of the wetland, understand how to convey these measurements on to paper, get a handle on direction and angular measurements. This also is an exercise in problem solving skills and erosional forces.

Materials: : Note book, a measuring tape that measure up to 100-200 feet, a compass, a 360° protractor (two paper protractors are included and can be held behind compass for measuring), graph paper, and writing utensils.

Procedures:

1. Students are split into groups of 6 or 8. Within these teams, students are paired up to do different tasks. One pair is in charge of measuring the width and length of channels. This can be split in between 2 pairs if the class is large enough. Another pair is in charge of taking direction measurements and using the protractor, while the last pair is in charge of writing down the gathered information.

2. Each group is assigned an area between stations. Before measuring anything, students should figure out which way is north, and base any directional measurements off this (ex. 20 degrees from north heading east). All groups must agree on a where to start and where to end so that the maps can be connected. Example: The group that is measuring area A and the group measuring area B decide that they want a foot of overlap to help connect the maps when the exercise is over.

3. The pair of students recording data will need a notebook and a piece of scratch paper. The students start to measure out the width, length, depth, and orientation of the channel. The channels will change direction, and each change in direction should be recorded. Angle of slope can be measured by older students, a formula for doing this will be provided in the handout. A good idea for the data recorders is to place landmarks in their notes and for one member of this pair to sketch a basic map during the process. When measuring direction, it should be measured as the number of degrees off from north the channel is going. This will be used for

drawing the map by taking the degrees off of north and using the protractor. Directional measurements should be taken at the center of the channel, so a width measurement should also be taken at every bend of the channel.

Example: If the channel bends in a northwest direction, the students can take compass overlay the protractor and place the 0° (or 360°) mark over where the north needle is pointing. They will the record what number on the compass is is pointing down the channel. The northwest direction would be represented by 315°. It maybe helpful for student to face down the channel while doing this and rather than to face north.

4. Any points of interest should be recorded with a measurement and placed on the final map (ex. The large oak tree in the middle of a channel is 5 feet from the bank, and 20 feet away from the last bend in the channel). If there is a debris pile, direction of flow should be determined. This can be determined by the shape of the debris and placement of objects in the debris. Some braches will line up with the direction of the water; others may create a dam preventing any of the branches from lining up with the direction of the water flow. Water marks on trees should be measured to determine the height of the water when it is in the wetland.

5. After collecting and measuring all data, the entire class determines a scale (ex. One square on the graph paper equals 5 ft) . Then each group starts to draw their maps on graph paper. This may take a few tries. In theory they should connect to create a huge map of the channels of the wetland, and should determine direction of water flow from debris, depth of water by water marks on trees, and depth of channel. Channel depth can be labeled at the draw edges of the channel on the map, and height of water mark on trees can be marked near the inferred area of where the trees are located.

6. Students should write a paragraph or two explaining why these channels formed the way they did. (ex. There is a large tree near the bank which prevented erosion causing the channel to bend in a southward direction). Students should also state all evidence of water movement they found, how extensive is the flood plain (optional for older students), and anything else they noticed. Show students after they are done the Kentucky Wetland Guide Chapter 5 and show them the Apendix 1, which refers to mapping a wetland. They just did the work of scientist! http://www.water.ky.gov/NR/rdonlyres/BC3F4926-1327-4965-A50C-2B1FCE01FDE5/0/Wetland_guide.pdf

Assessment Techniques: The notes should be turned in with the map, how well the notes are conveyed on the map and who accurate the measurements are is what is graded. The map itself is up to interpretation.

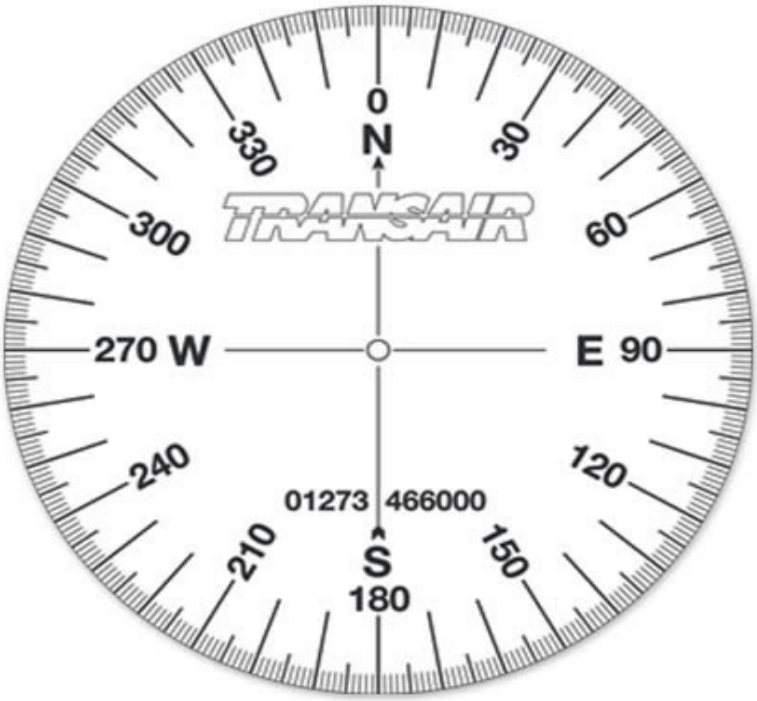
Adapations: Averages of any measurements taken can be done it cover math core content.

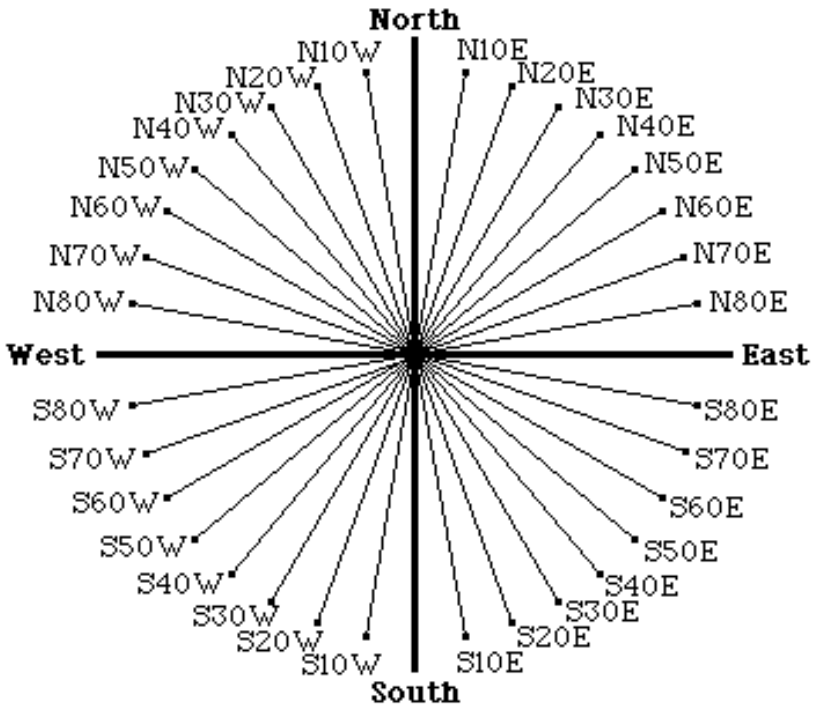
Resources: http://www.uwsp.edu/geo/faculty/ritter/geog101/textbook/mass_movement_weathering/water_erosion.html

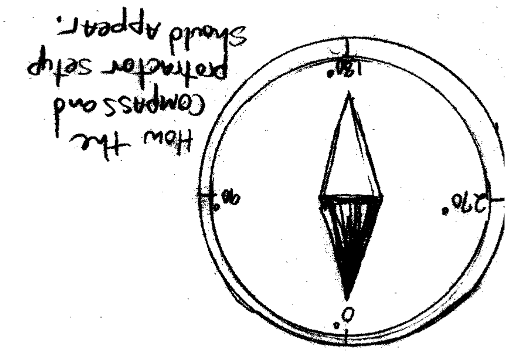
http://www.kidsgeo.com/geology-for-kids/0074-erosion-rivers-lakes-streams.php

http://www.water.ky.gov/NR/rdonlyres/BC3F4926-1327-4965-A50C-2B1FCE01FDE5/0/Wetland_guide.pdf

Handouts: Here are two templates for protractors. Another hand out is included for assisting students in the field.







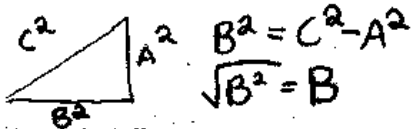
Measurements to take: Width, deepth, length at all bends, why a bend occurs, the slope of the channel,any trees in channel, debris piles, water marks on trees, personal observations, and what direction the water took

Channel Mapping

How to determine angle of a slope using trigonometry:

1. Have one student stand at the top of the channel (they should also have a yard stick for step 2) and one student at the bottom of the channel wall. Measure the channel walls vertically with a tape measure, this is the slope of the channel. This is also the hypotenuse of the right triangle (C^2 in the figure to the right) so that the angle can be determined later.

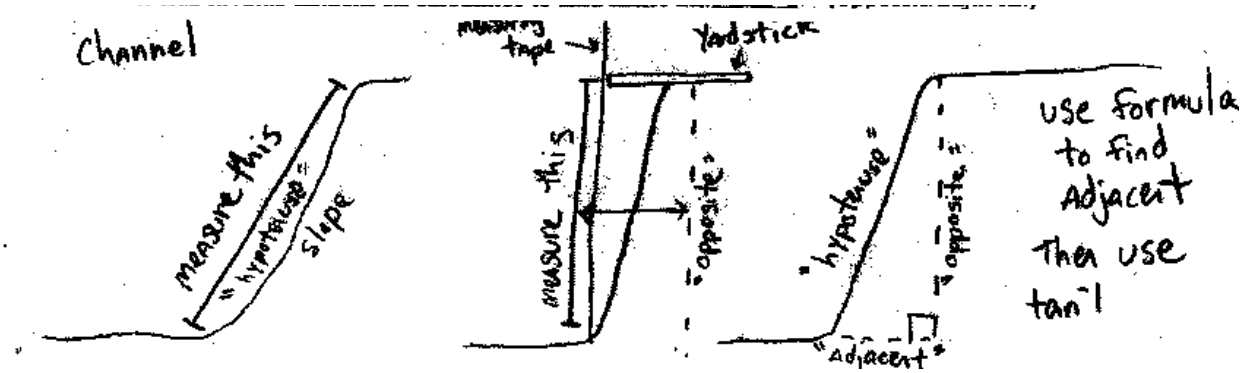
2. Have the student on the top of the slope hold the yardstick to extend out of the edge of the channel (student on the top of the slope can stand on the yardstick) then the student in the channel should measure from the yardstick to the bottom of the channel. The is the depth of the channel and opposite side of the right triangle required for finding the angle of the slope.



3. Use the Pythagorean Theorem to find the adjacent side of the triangle. $A^2 + B^2 = C^2$ *or*

$$B^2 = C^2 - A^2$$

4. Use the inverse tangent button on you calculator to find the angle of slope. Tan^{-1} (opposite/adjacent)=angle of slope



Determining direction of a channel:

Please note: Compass should be held flat in your hand, parallel to the ground and away from anything metal (rings, bracelets, and belt buckles are enough to give a false reading).

1. Place see-though protractor over compass, or tape print side up to back of compass, and align the north pointing arrow with the 0° line on the compass. The 0° mark should always meet with the north pointing arrow.

2. Measure the width of the channel and find the center. Stand there, face down channel, and record the degree marker pointing down channel..