

CHAPTER 1

Lesson 1: Streams - Erosion & Deposition

Purpose

Streams are a major part of the erosion process. Along with weathering and mass wasting, stream erosion and deposition controls the surface landscape

Objective

Students will predict and then model changes when variables, such as load, slope, amount of water, or the composition of a stream bed are changed through erosion or deposition.

Each student team will generate a problem, hypothesis, and corresponding investigation dealing with water erosion and/or deposition.

Arkansas Framework Correlation

Language Arts

8th Grade

OV.1.8.2 Use standard English in classroom discussion and presentations

OV.1.8.6 Contribute appropriately to class discussion

OV.3.8.1 View a variety of visually presented materials for understanding of a specific topic

Science

8th Grade

NS. 1.8.1 Justify conclusions based on appropriate and unbiased observations

NS.1.8.3 Formulate a testable problem using experimental design

ESS.8.8.4 Synthesize and model the result of both constructive and destructive forces on land forms: deposition, erosion, weathering, crustal deformation.

ESS.8.8.8 Demonstrate an understanding of the agents of erosion: gravity, water, ice, wind, and animals including humans.

ESS.8.8.9 Using models of rivers, predict changes when variables, such as load, slope, amount of water, or the composition of a stream bed, are changed through erosion or deposition.

Social Studies

8th Grade

G.3.8.5 Analyze methods and consequences of environmental modification on world *regions* and populations (e.g., acid rain, erosion, clear cutting, desertification, global warming, ozone depletion, strip mining,)

Problem Question

This will vary by student group. (This activity is a high level, inquiry based science lesson requiring students to generate the problem and investigation and carry through.)

BACKGROUND INFORMATION

- A stream is a body of water that carries rock particles and dissolved ions and flows down a slope along a clearly defined path, called a channel.
- Running water is the major agent for shaping much of the Earth's surface.

- The amount of rock and soil that a stream can transport depends on the speed of the moving water and its discharge (volume of water flowing past a certain point at a given unit of time. m^3/sec or ft^3/sec).
- The speed of a stream is dependent on its slope and discharge.
- Streams may vary in width from a few centimeters to several kilometers.
- Billions of tons of sediment are carried by streams to lower elevations.
- Streams carry most of the water that goes from the land to the sea.
- Streams carry dissolved ions from chemical weathering, into the oceans and thus make the oceans salty.
- Streams are a major part of the erosional process. Along with weathering and mass wasting, stream erosion and deposition controls the surface landscape.
- Streams are a major source of water and transportation for the world's human population.
- Most population centers are located next to streams.
- Stream load consists of suspended load made up of particles that are carried along with the water in the main part of the stream.
- Bed load consisting of coarser, denser particles that stay on the bed of the stream most of the time, but move (jump) when particles collide or there are turbulent eddies.
- Dissolved load made up of ions from chemical weathering that have dissolved in the water.

Keywords

Coagulation: Adding chemicals that cause the dirt and other particles to clump together.

Flocculation: Process using gentle stirring to bring suspended particles together to form larger particles (floc) that will settle out.

Sedimentation: The heavier clumps settle to the bottom (based on density).

Filtration: The substance (water) is poured through a filtering system (made of layers of materials) designed to trap the contaminants that did not settle out during sedimentation.

Disinfection: Chlorine is added to the water to kill germs that may cause disease.

Timeline

Two (2) class periods.

Materials

Sand
Potting soil
Other soils as available
Gravel
Dishpans or Al foil pans (or stream tables if available)
Paper or foam cups
Metal spoons or hand shovels
Water
Other containers or materials that students request (within reason).

Teacher Preparation

Make materials/supplies available.

Assign student groups of 3-4 the variable that they are to design an investigation and test (load, slope, amount of water, or the composition of a stream bed).

Additional Resources

Resources for materials not included:
UA Center for Math & Science Education
<http://www.uark.edu/~k12info/>
479.575.3875
Northwest Arkansas Education Co-Op
<http://starfish.k12.ar.us/web/>
479.267.7450
Beaver Water District
www.bwdh2o.org
479.717.3807
Know of other resources? Please let us know!
education@bwdh2o.org or 479.756.3651

Elicit

Observation Charts:

- Post pictures of stream load, slope, amount of water, stream bed composition, and deposition (can be found and printed with search at Google images) around the room with chart paper at each.
- Give each set of student partners a marker.
- Have the student partners rotate around the room to each picture and write on the chart paper
 - What they observe.
 - What they think is happening, happened before, or is about to happen.
 - What questions they have.

Engage

At their tables, have student groups discuss each of the following animations/clips.

Modes of Sediment Transport animation: http://highered.mcgraw-hill.com/olcweb/cgi/pluginpop.cgi?it=swf::640::480::/sites/dl/free/0072402466/30425/10_14.swf:Fig.%201.14%20-%20Modes%20of%20Sediment%20Transport

Flood Plain and Stream Terrace: http://highered.mcgraw-hill.com/olcweb/cgi/pluginpop.cgi?it=swf::640::480::/sites/dl/free/0072402466/30425/10_27_10_43_10_45.swf:Figs.%2010.27,%2010.43,%2010.45%20-%20Flood%20Plain%20and%20Stream%20Terrace

Meander Cut-offs and Oxbow Lakes:

http://highered.mcgraw-hill.com/olcweb/cgi/pluginpop.cgi?it=swf::640::480::/sites/dl/free/0072402466/30425/10_22_10_23.swf:Figs.%2010.22,%2010.23%20-%20Meander%20Cut-Offs%20and%20Oxbow%20Lakes

River Flows into Lake:

http://www.classzone.com/books/earth_science/terc/content/visualizations/es0604/es0604page01.cfm?chapter_no=visualization

Streambed Load Transport: http://www.weru.ksu.edu/new_weru/multimedia/movies/dust003.mpg

The Graded (sloped) Stream:

http://www3.interscience.wiley.com:8100/legacy/college/strahler/0471238007/animations/ch17_animations/animation3.html

Explore

Procedure:

1. State your problem, hypothesis, then have approved by teacher.
2. Design an investigation using the materials and equipment provided to test your hypothesis. Have approved by the teacher.

3. Conduct the investigation, record results, analyze and draw conclusions.
4. Report to class.

Explain

Revisit the *Elicit* pictures and charts. Have student groups of 4 discuss each picture and the information on the charts from earlier.

Revisit the animations/clips from the *Engage* section. Have the students once again discuss each.

Elaborate

3 minute video clip from discoveryeducation.com: *How Does the Force of Streams and Rivers Shape the Earth?*
<http://player.discoveryeducation.com/index.cfm?guidAssetId=E38503D9-6681-4F11-A83E-954692198165&blnFromSearch=1&productcode=US>

Make it Relevant: Students research and share information about well-known landforms and waterways in Arkansas and the rest of the United States that serve as examples of the changes brought about by water erosion and deposition.

Evaluate

Students will be evaluated

- As each stage of the inquiry activity is approved and observed.
- As student teams discuss and fill out charts (*Elicit*) and discuss animations/clips (*Engage*).
- On journal write-ups of analysis and conclusions based on investigations.

Extensions

Field trip to a local stream to

- Observe streambed, stream banks, surrounding landforms, etc.
- Test water quality, water velocity at the surface and below the surface, etc.
- **Play Beaver Water District's Watershed Jeopardy Challenge for 8th Grade. Download from the Beaver Water District website at www.bwdh2o.org.**