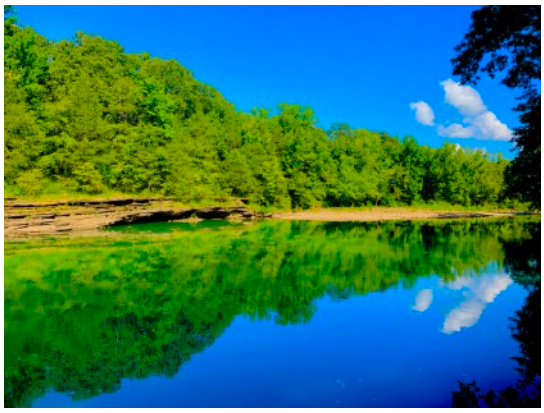
Stream and River: Words to Know



The Wild and Scenic Mulberry River @ Redding Campground
photo credit: Jeff Hayhurst (NE)

Streams are also found on the ground surface in caves and underneath and inside glaciers (large bodies of ice that formed on land by the compaction and recrystallization of snow and that survive year to year). Rivers, creeks, brooks, and runs are all streams. Most sources define a river simply as a large stream; creeks, brooks, and runs are simply small streams. For this discussion, stream will be used to refer to all of these bodies of running water.

When water flows down a slope, it tends to gather in small depressions on the surface along the way. This concentration of moving water stimulates the process of **erosion**, which is the gradual wearing away of Earth surfaces through the action of wind and water. As the water erodes rock and other material in the depression, it forms a channel. The stream channel is the landform, not the water carried in it. The sides of the channel are known as the stream's banks. The bottom is the stream bed.

A stream's velocity, or speed, determines its ability to erode, transport, and deposit sediment. Sediment is rock debris such as clay, silt, sand, gravel, or even larger material. Alluvium (pronounced ah-LOO-vee-em) is the general term for **sediment** deposited by running water. A fast-moving stream carries more sediment and larger material than a slow-moving one. A stream that is **turbulent**, with water whirling through the channel and not flowing in a steady and straight manner, can also lift and carry more rocks and sediment than one that flows gently. Turbulence is due to the friction caused by rocks and steps in the stream's channel.

Stream Definitions

Alluvial fan:
A fanlike deposit of sediment that forms where an intermittent, yet rapidly flowing, canyon or mountain stream spills out onto a plain or relatively flat valley.
Alluvium: The general term for sediment (rock debris such as gravel, sand, silt, and clay) deposited by running water.
Base level: The level below which a stream cannot erode.
Bed load: The coarse sediment rolled along the bottom of a stream.
Channel: The depression where a stream flows or may flow.
Cut bank: A steep, bare slope formed on the outside of a meander.

Delta: A body of sediment deposited at the mouth of a stream where it enters an ocean or a lake.
Dissolved load: Dissolved substances, the result of the chemical weathering of rock, that are carried along in a stream.
Distributaries: The channels that branch off of the main stream in a delta, carrying water and sediment to the delta's edges.
Erosion: The gradual wearing away of Earth surfaces through the action of wind and water.
Floodplain: An area of nearly flat land bordering a stream that is naturally subject to periodic flooding.
Graded stream: A stream that is maintaining a balance between the processes of erosion and deposition.
Groundwater: Freshwater lying within the uppermost parts of Earth's crust, filling the pore spaces in soil and fractured rock.
Levee (natural): A low ridge or mound along a stream bank, formed by deposits left when floodwater slows down on leaving the channel.
Meander: A bend or loop in a stream's course.
Oxbow lake: A crescent-shaped body of water formed from a single loop that was cut off from a meandering stream.
Point bar: The low, crescent-shaped deposit of sediment on the inside of a meander.
Rapids: The section of a stream where water flows fast over hard rocks.
River: A large stream.
Stream: Any body of running water that moves downslope under the influence of gravity in a defined channel on Earth's surface.
Suspended load: The fine-grained sediment that is suspended in the flow of water
Waterfall: A steep drop in a stream bed causing the water in a stream channel to fall vertically or nearly vertically.

GEOMORPHOLOGY ACTIVITY

This activity can be done around your neighborhood if you have creeks, streams, rivers nearby. It starts with video and pictures in our Watershed section of Water, Woods, Wildlife. Habitat assessment is a virtue of any investigator going out into the field to observe and categorize what is present in nature or the stream. It is also much like forensic science for criminal investigators to understand the natural processes that happen in many environments and habitats.

This activity will focus on several of the terms related to Geomorphology of Streams.

Video 1 and Photo's 1-3 = Erosion processes

Please view the video and photos on Erosion, Sedimentation, and Embeddedness on Native Expeditions webpage.

Faster-moving water has more kinetic energy. Therefore, it can carry larger particles. It can also carry more particles. What causes water to move faster? The steeper the slope, the faster the water flows. It's just like a toy car rolling down a ramp. It will roll the fastest when the ramp is steep. It will roll slower when the ramp is less steep. If the ramp is flat, it may have no motion. The slope of the land causes water to move faster. If a stream or a river is flowing down a mountain, it will move more quickly. If it is flowing across a flat area, it will move slowly.

Some minerals dissolve in water. The minerals are then carried along in the solution. Small particles, such as clay and silt, are carried in **suspension**. They are mixed throughout the water. These particles are not dissolved in the water. Somewhat bigger particles bounce along the bottom. Particles, such as sand, move in little jumps near the stream bottom. They are nudged along by moving water. The biggest particles move in a different way. They are too big to hop. Instead, they roll along the bottom. Gravel and pebbles move in this way. These particles roll or drag along the bottom of the water.

Erosion by Mountain Streams

Streams often start high in the mountains. Their slopes of mountains are very steep. As a result, the streams flow very quickly. You can see an example in **Figure** below. The quick speed of the water causes a lot of erosion. The fast moving water carves deep into the rock and soil it flows over. Mountains streams cut narrow V-shaped channels

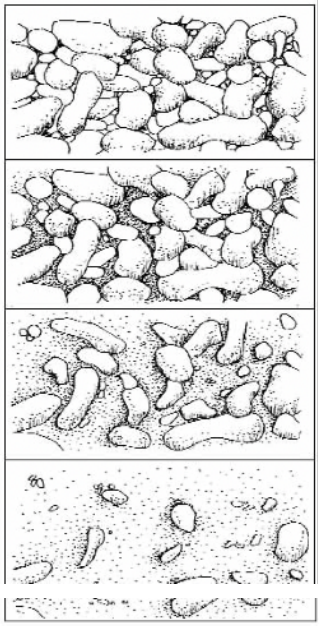
Photos = Sedimentation

A river transports, or carries, its load in **three** different **ways**: in solution, in suspension, and in its bed load. Mineral matter that has been dissolved from bedrock is **carried** in solution. Common minerals **carried** in solution by rivers include dissolved calcium, magnesium, and bicarbonate. When soils erode, sediments are washed into waterways. Sediment in a stream is natural, but if sediment levels get too high, it can disrupt ecosystems

Excess sediments can cause damage by blocking light that allows algae (an important food source) to grow, harming fish gills, filling up important habitats, and stopping fish from seeing well enough to move around or feed.

Sediment delivery to waterways can be reduced by catchment rehabilitation measures such as stream bank planting, exclusion of livestock from riparian areas, space-planting of poplars/willows, and afforestation of eroding pastoral land.

Embeddedness is the extent to which rocks (gravel, cobbles, and boulders) are sunken into the silt, sand, or mud on the stream bottom. Generally, the more rocks are embedded, the less rock surface or space between rocks is available as habitat for aquatic macroinvertebrates and for fish spawning. Excessive silty runoff from erosion can increase a stream's embedded-ness. To estimate embeddedness, observe the amount of silt or finer sediments overlying, in-between, and surrounding rocks.



Level 1 - No sediment covering rocks, easy to see multiple colors of stones, no slimy covering.

Level 2 - Some sediment covering smaller rocks, rocks may appear to have a “coating” on them to disguise color differences of rock types

Level 3 - Sandy, silty covering of smaller rocks in stream.

Level 4 - Nearly all smaller rocks are covered with silty/sand, algae may be present

EROSION, SEDIMENTATION, AND EMBEDDEDNESS ….. AFFECT BIODIVERSITY!
Macroinvertebrates prefer where groundwater and surface water mix and rocks are not covered in sediment or algae. Benthic species spend most of their life cycle in bottom sediments, such as algae, rocks, or woody debris. Examples of benthic organisms include mayflies, caddisflies, and dragonflies. Both habitat types play important roles in the aquatic ecosystem.

Some aquatic macroinvertebrate species can tolerate wider fluctuations of pH, dissolved oxygen, and temperature, and can survive in a range of stream and water quality conditions. Others have very narrow tolerance ranges, and large fluctuations in pH and temperature can threaten their survival. Food sources for aquatic macroinvertebrates range from aquatic plants and algae to riparian vegetation and woody debris and leaves. Diversity in food sources can promote a rich aquatic community.

Lesson Review Questions

Recall

1. Define how erosion affects biodiversity in a stream?
2. How does sediment affect macroinvertibrate populations?
3. What happens to the sediment eroded by runoff, where does it end up?
4. What level of embeddedness makes it hard for some macroinvertebrates to move along rocks?
5. What color is a river when it has suspended sediments after a heavy rain event?

Apply Concepts

6. Make a drawing that relates soil erosion in a Cut Bank.

Think Critically

7. Explain why mountain streams erode V-shaped valleys.
8. How do trees affect the stream channel during erosion events/flooding?
9. What might be pros and cons of living on the floodplain of a river?
10. How is particle size of soil vs. rock transported by flowing water?