

Lecture 2—STREAM ECOLOGY

RIVER CHANGE

We don't tend to ask where a lake comes from. It lies before us, contained and complete, tantalizing in its depth but not its origin. A river is a different kind of mystery, a mystery of distance and becoming, a mystery of source. Touch its fluent body and you touch far places. You touch a story that must end somewhere but cannot stop telling itself, a story that is always just beginning. — (John Daniel, Oregon Rivers)

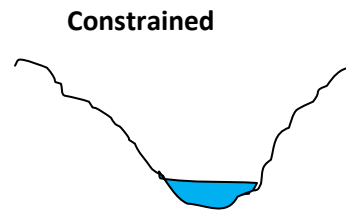
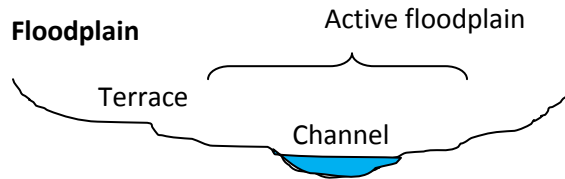
Fluvial geomorphology—the study of river channels, focusing on the dynamics between rivers and landscapes.

Streams shape and are shaped by the surrounding landscape. Thus, streams respond to and are a driver of the shape of watersheds.

One key is whether a stream reach is:

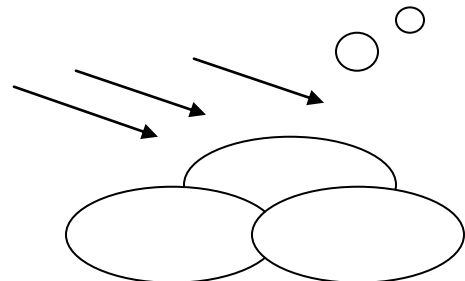
Constrained—reach in a deep valley that doesn't allow a river to move laterally (side to side) and develop a floodplain.

Floodplain—open flat valley, often filled with old stream sediments and showing old terraces. In floodplains, streams often move laterally quite frequently.



Three processes control habitat change in rivers and river valleys

1. Erosion—Removal of material
2. Transport—Movement of material downstream
3. Deposition—Accumulation of material

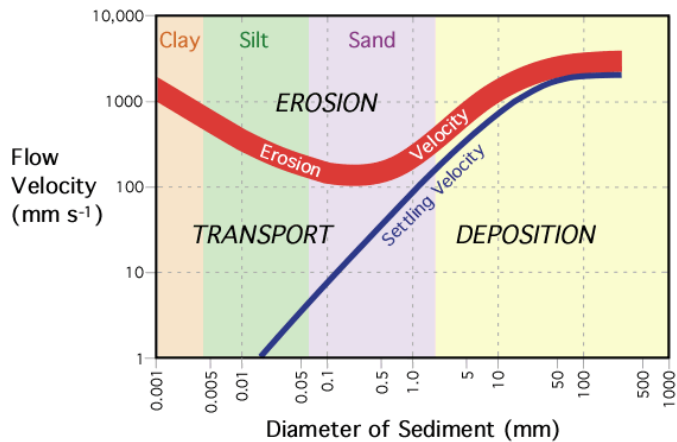


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Sediments are eroded from stream banks and from the channel and then transported downstream, deposited in slow water or up in the floodplain. Over time, sediments will be transported downstream.

These processes are controlled by flow velocity and sediment size size

- Higher flows lead to transport and erosion
- Larger sediments take more flow to move

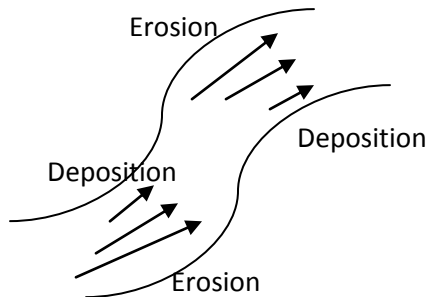


Therefore,

- As flows decrease, smaller sediments will be deposited last.
- As flows increase, smaller sediments will be eroded first.
- In areas with higher flow, only big sediments will remain
- In areas with low flow, small sediments will accumulate

These processes vary at small spatial scales.

- Stream meanders have alternating patterns of deposition and erosion
- Erosion—generally at outside of curves (faster water)
- Deposition—generally at inside of curves (slower water)
 - Thought question: why is water slower on inside of curves?



- Roots, boulders, trees can slow or speed up flow, driving patterns of erosion/deposition

These processes vary at large spatial scales.

- Headwaters are dominated by erosion
- Lower reaches are dominated by accumulation
- Streams carve out valleys and deposit sediments in lower floodplains



Shifting habitat mosaic—Distribution of the habitat patches changes spatially over time. Change driven by erosion, transportation, deposition, debris deposition, growth of riparian vegetation, etc. Phrase coined by Stanford et al. 2005