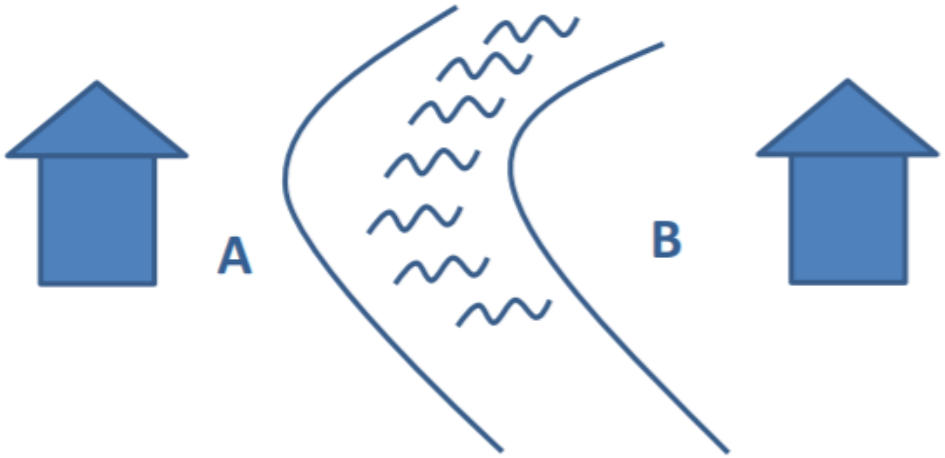
TeachEngineering

Flood: Causes and Mitigation Strategies for Civil Engineers

Introduction

- Read through the following scenario.
- Discuss the question with a partner and determine who you agree with and why.
- Be ready to share with the class.

Down By the River



Brad recently bought some land to build his dream house. A river runs through the middle of the land. He asked some friends their opinion on the placement of the house.

- Dustin told Brad to build on Side B because the river would eventually move towards Side A.
- Anthony told Brad to build on Side A because the river would move towards side B.
- Grant thought either side was good because the river won't ever change direction.

Who do you agree with and why?

River Anatomy

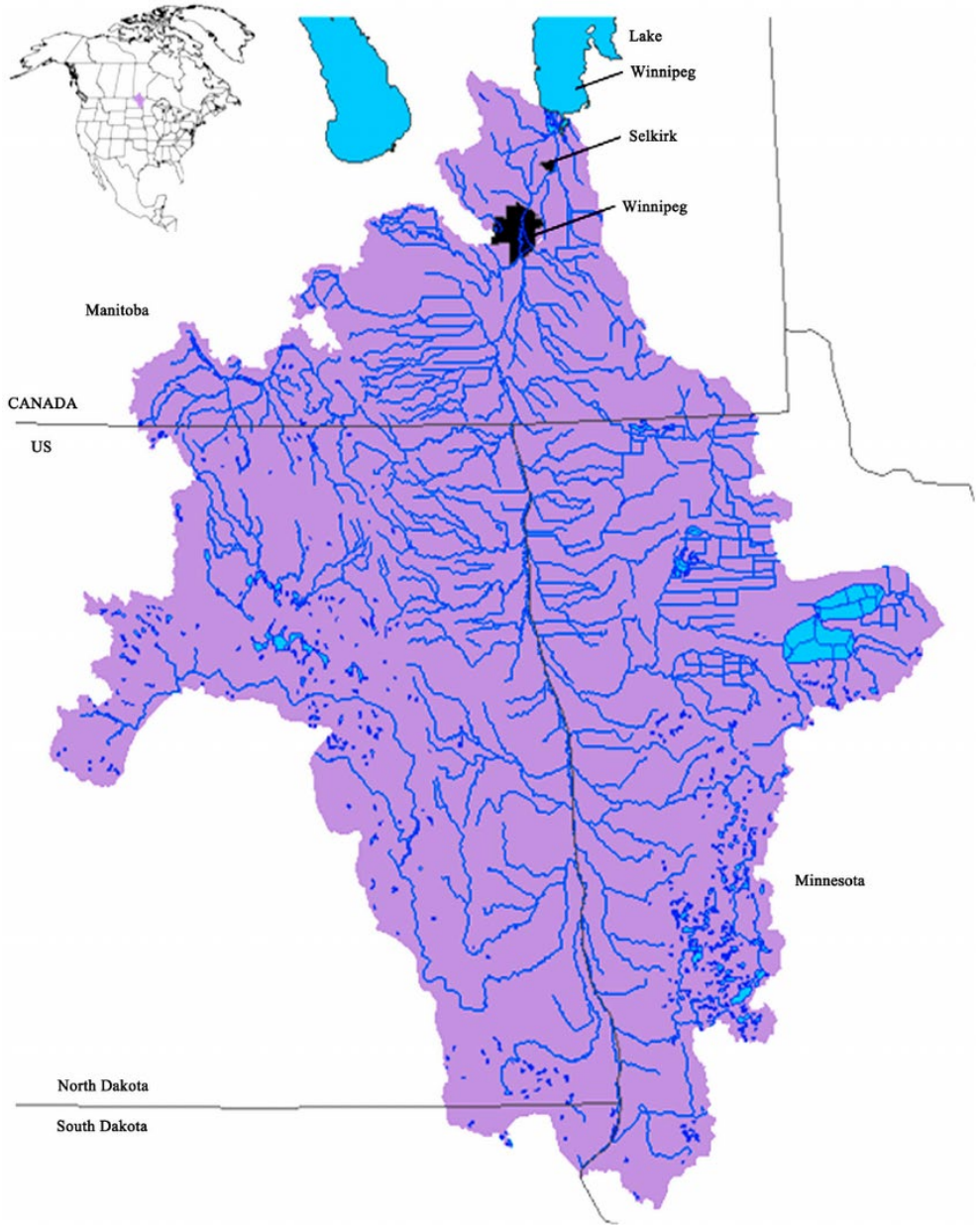
SWBAT identify and describe the parts of a river.

Stream

- Any size channelized body of running water (small creeks to giant rivers).
- Created when overland flow discharges into channels.
  - **Overland Flow -** Water that falls on the land surface and flows downhill (under the influence of gravity) in thin sheets of water in a process.

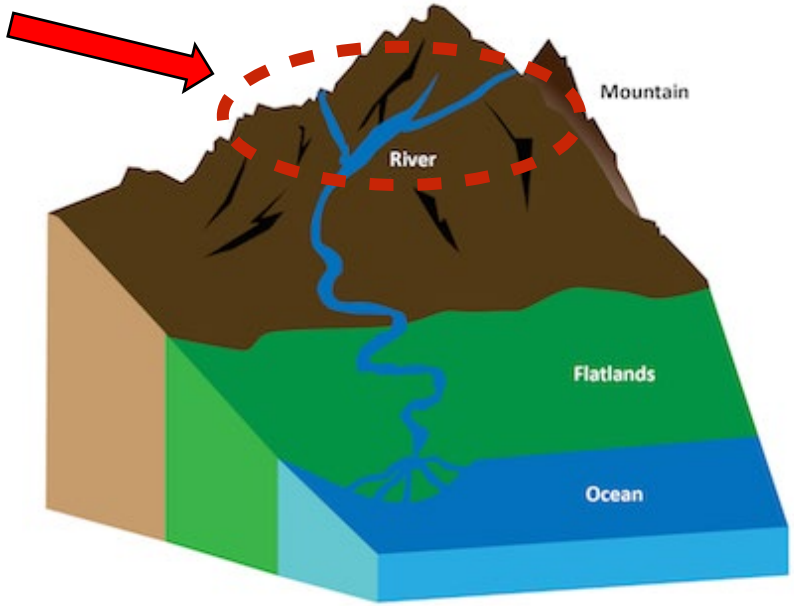
Drainage Networks

- As a stream flows downhill, it merges with other streams. The smaller of the two merging streams is known as a **tributary**.
- A branching network of streams known as a **drainage system** forms where the merging tributaries form progressively larger streams.



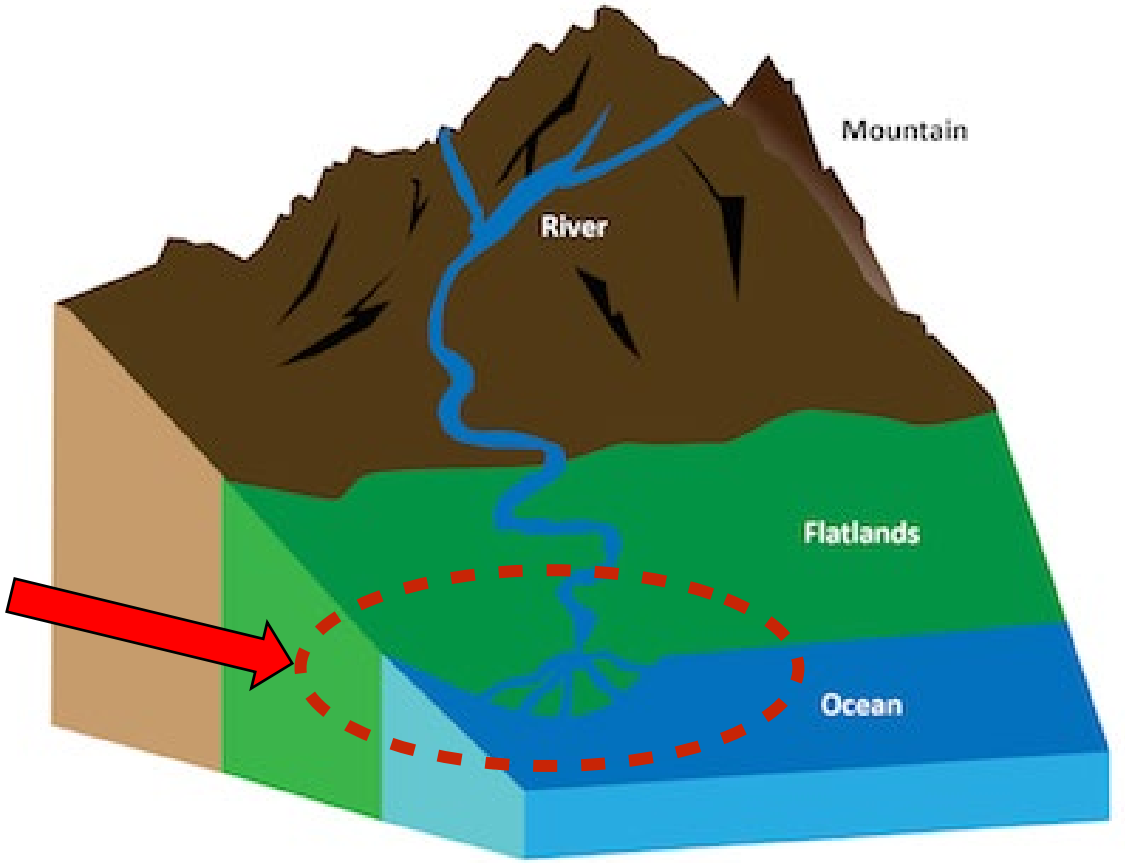
Headwaters / Source

- The upper part or start of the stream.
- Red River of the North
  - At the confluence of the Bois de Sioux and Otter Tail Rivers near Wahpeton, North Dakota.
  - Flows from 943 to 714 ft above sea level.



Mouth

- Where the stream flows into another river, a lake, a reservoir, a sea, or an ocean; the end of the stream.
- Red River of the North
  - Empties into Lake Winnipeg



Think About It: What differences do you notice from the upper reaches to the lower reaches on this river?

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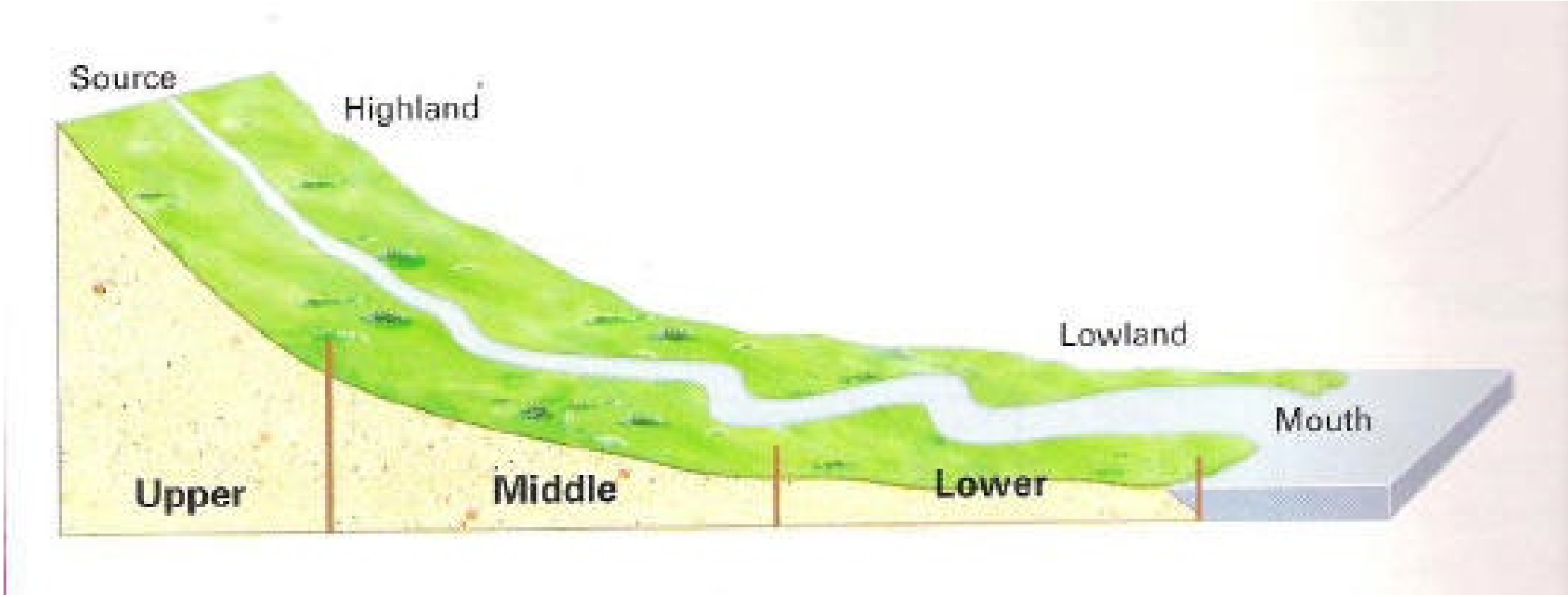
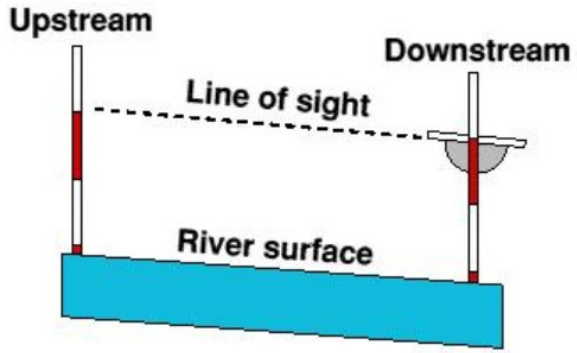
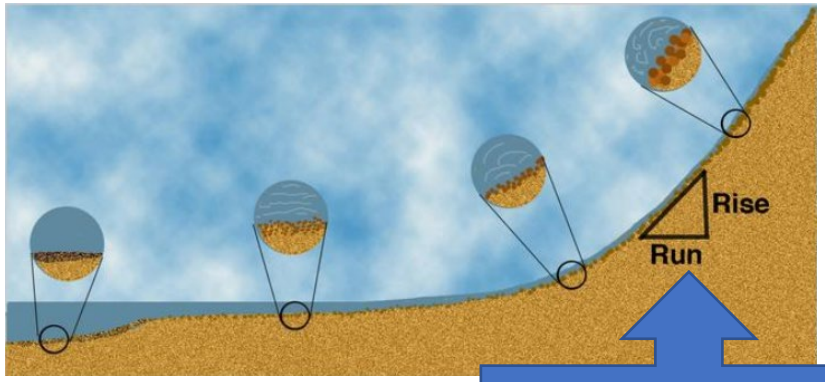


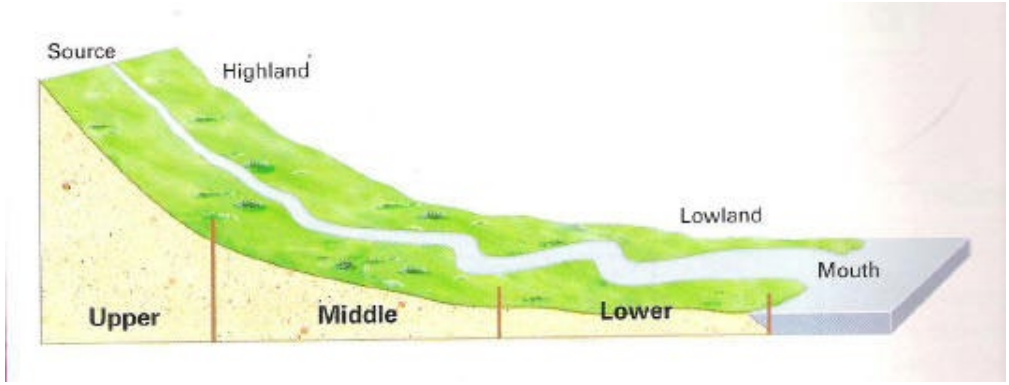
Stream Gradient



- Slope (grade) or drop in elevation of a stream.
- Units: ft/mile or km/meter
- Headwater - steeper slope or higher gradient and a higher water velocity.
- Mouth - lower gradient and lower water velocity.



Math Application
Rise over Run



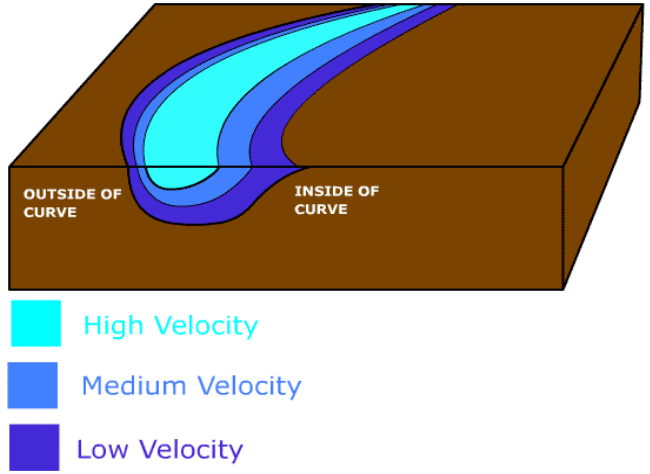
Meander

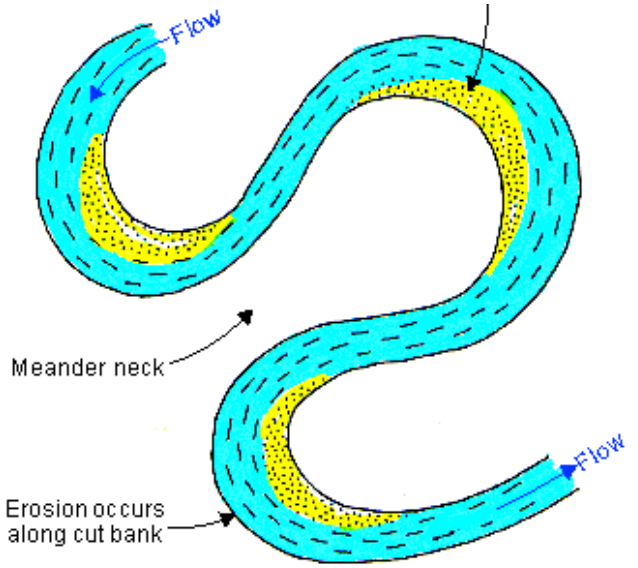
- S-shaped curves that are the result of erosion and deposition on opposite banks of a river.
- Forms when moving water in a stream erodes the outer banks and widens its valley.
- The inner part of the stream has less energy and deposits silt.

Erosion and Deposition

- **Erosion** – occurs on outer bank, caused by high velocity water flow on the outside bend of the channel.

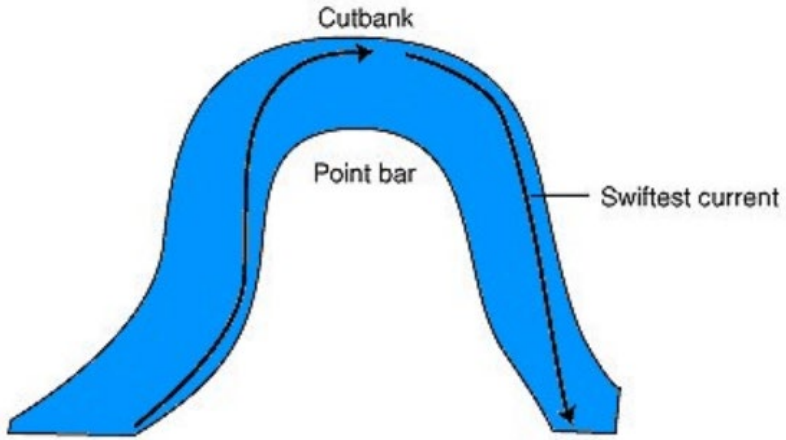
- **Deposition** – occurs on inner bank, where low velocity allows sediment to settle out.

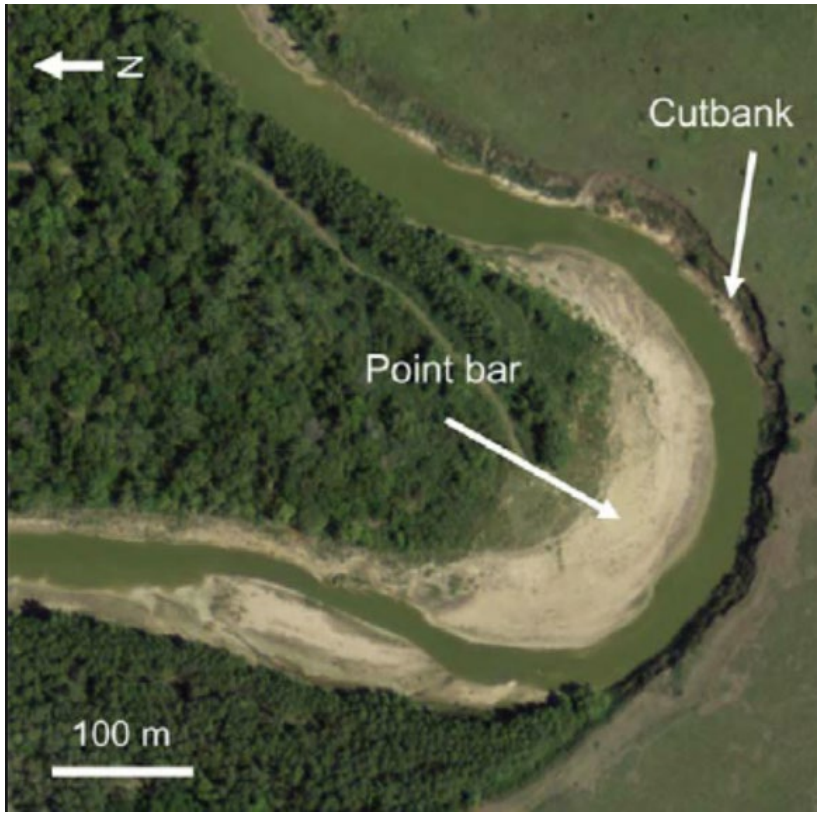




Cutbank

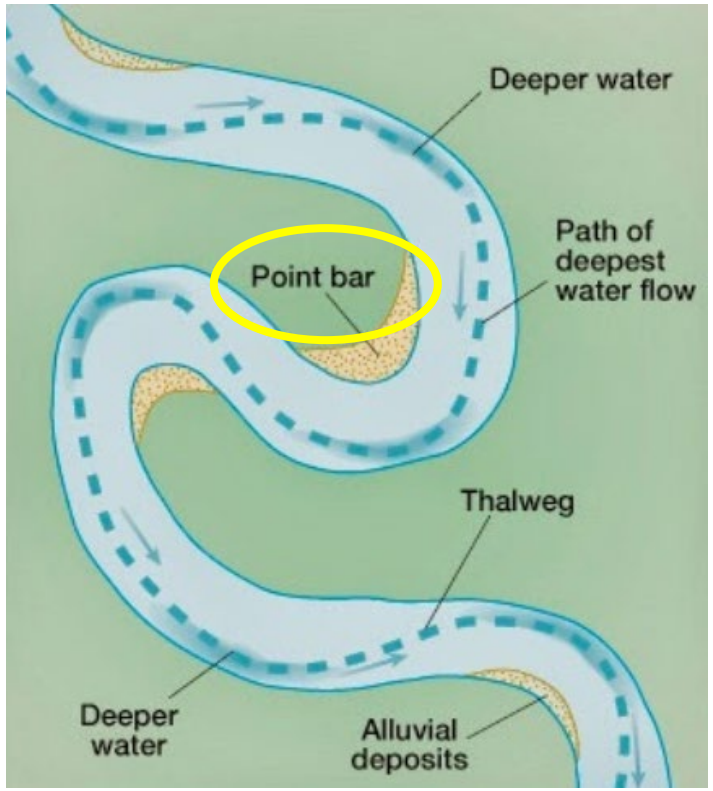
- Bank where erosion is occurring the fastest.
- Usually steep.

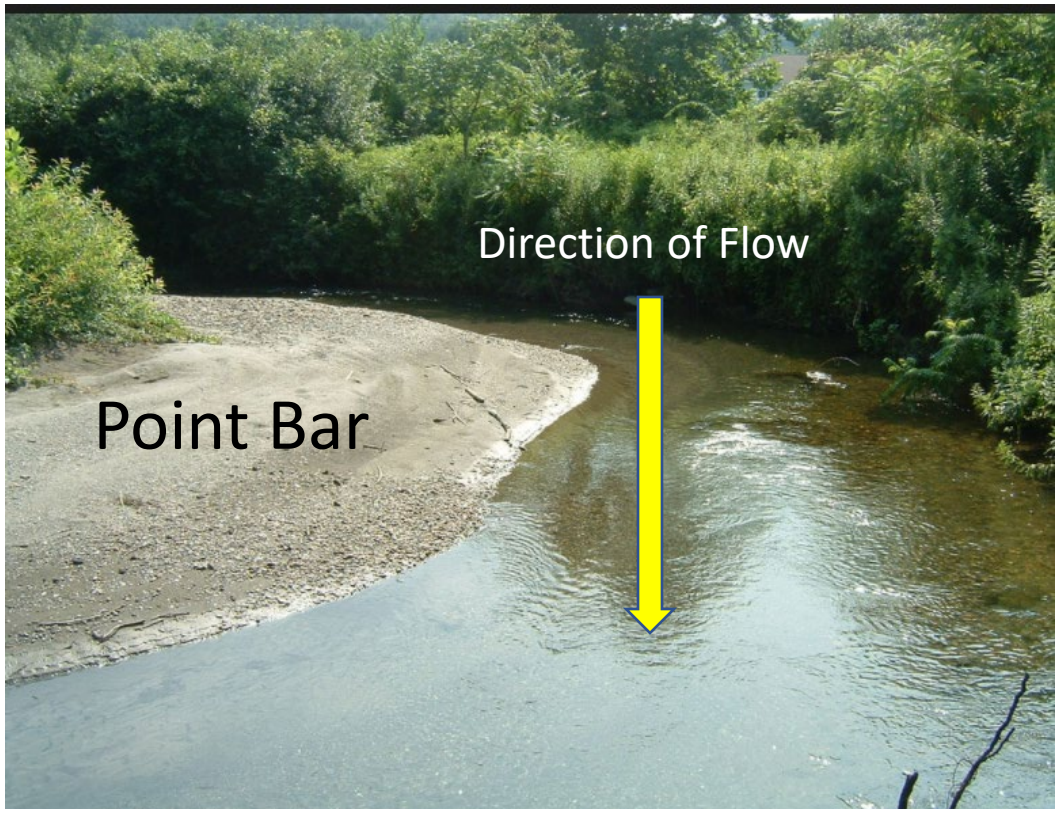




Point Bar

- Deposits that form on the inside curve of meanders.
- Water velocity is lower, and sediment settles out.



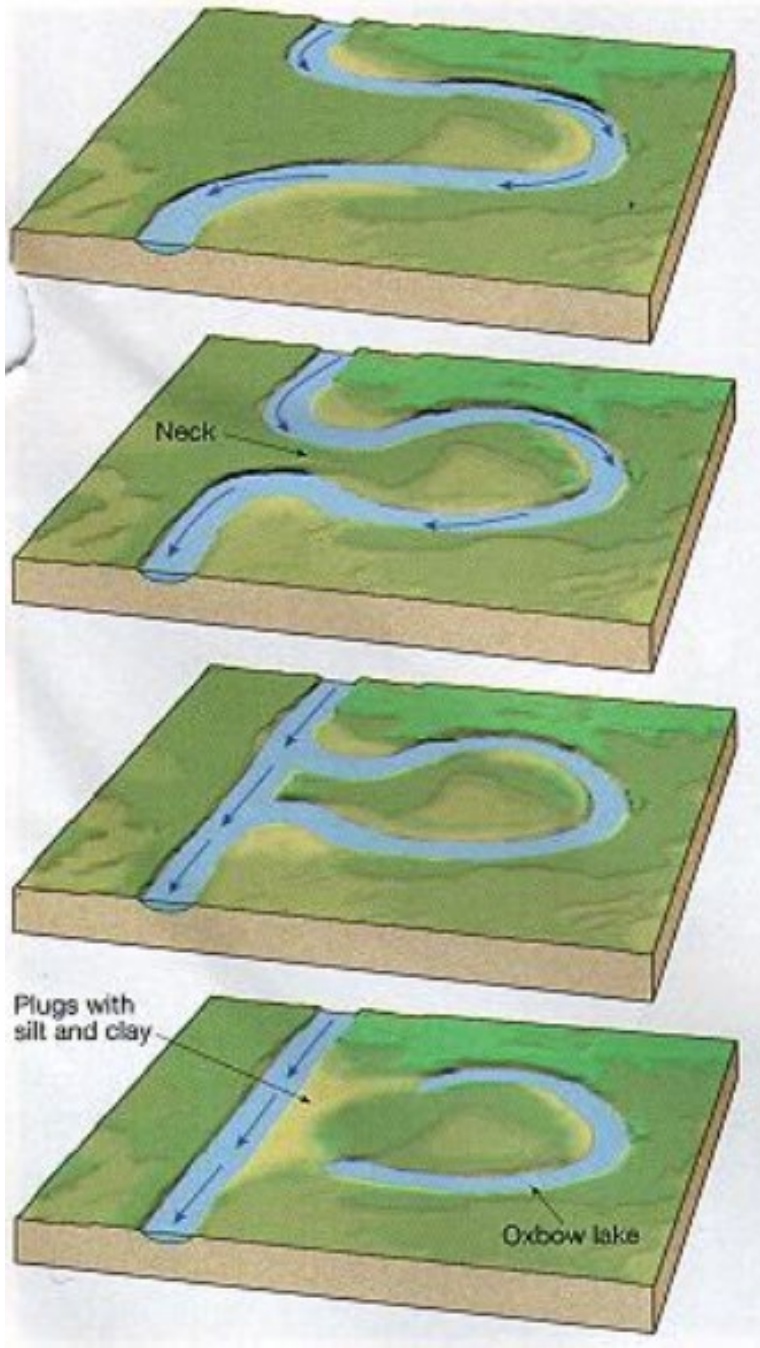


Think About It: The community of Oxbow, North Dakota, is located along this body of water.

This body of water used to be part of the Red River. How do you think it formed?

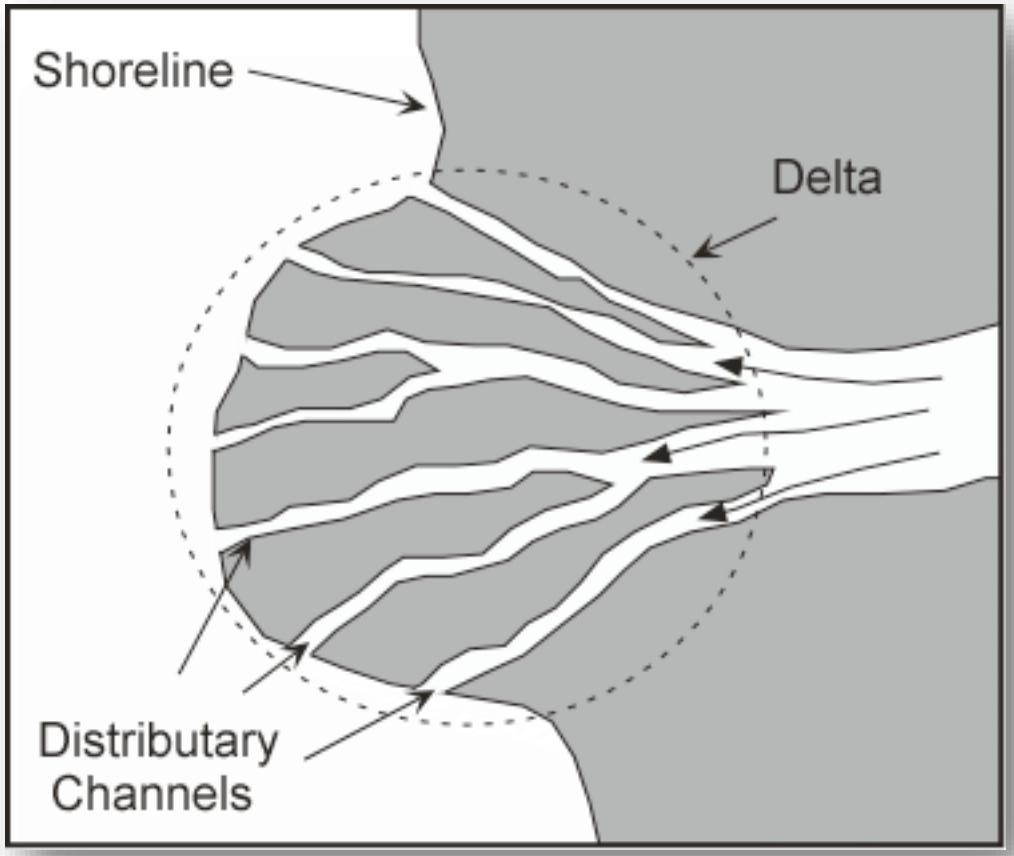
Oxbow Lake

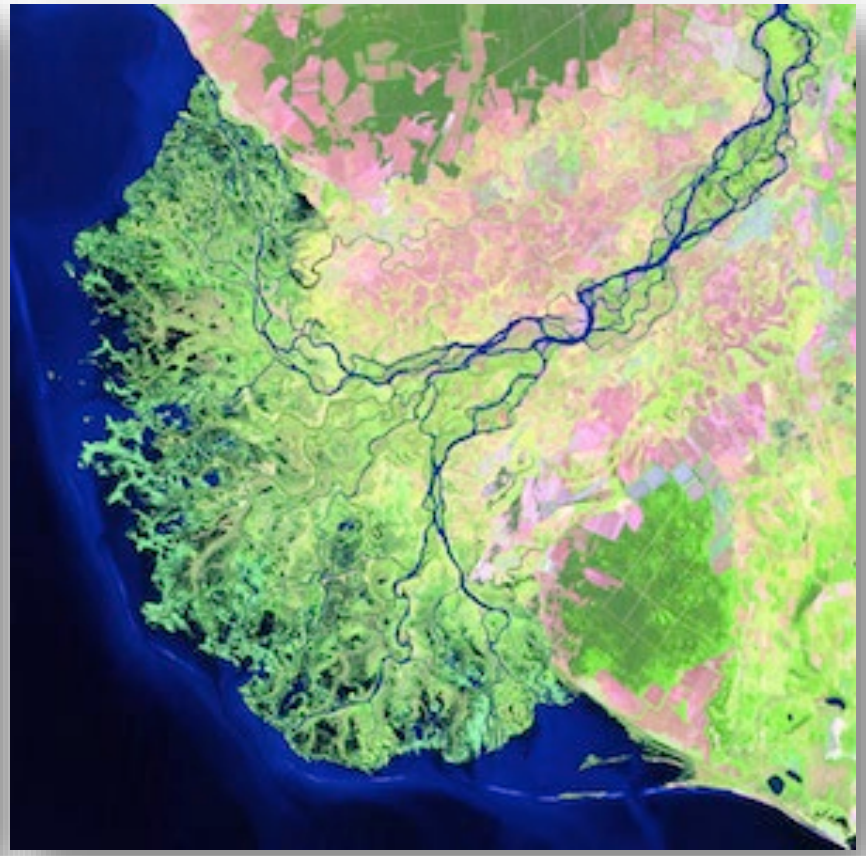
- A U-shaped body of water that forms when a wide meander from the main stem of a river is cut off, creating a freestanding body of water.
- Deposition and erosion cause the channel to migrate.



Delta

- Forms at the mouth of a stream where it terminates in a lake or ocean; when the gradient and velocity drop, sediment is deposited in the ocean or in a lake.

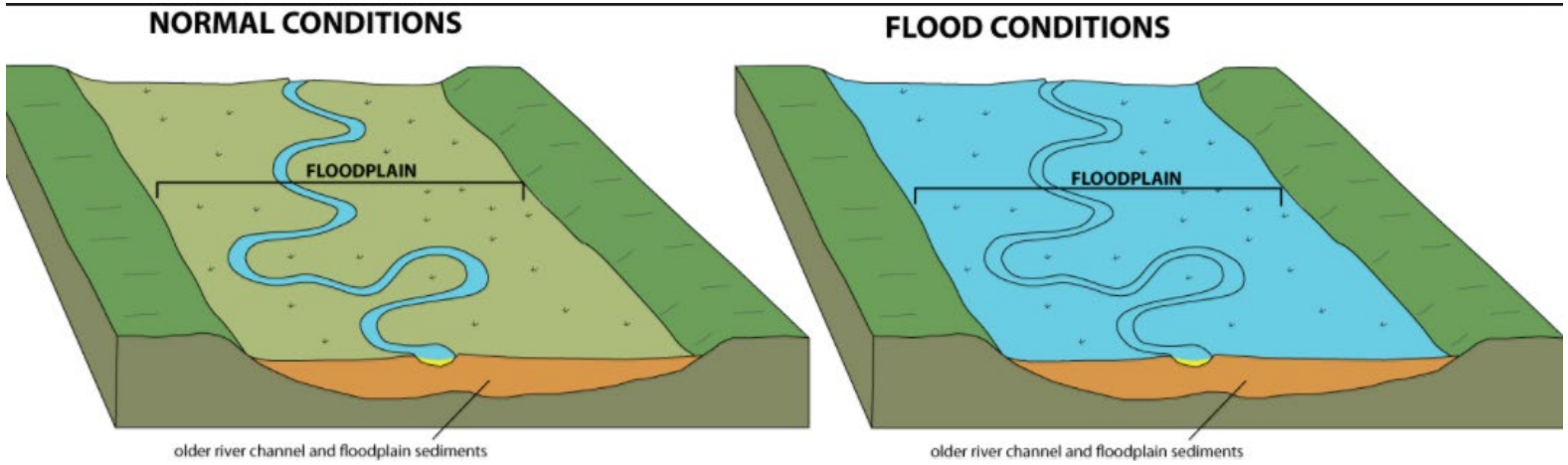




Highlight the delta in this image

Floodplain

- An area of low-lying ground adjacent to a river.
- Formed mainly of river sediment.
- Stores water during a flood and is an integral part of the drainage system.



Google Earth

- Choose a river. This could be a local river, a small stream they are familiar with, or a major river such as the Mississippi, the Nile, or the Amazon, and locate it on Google Earth.
- Save the image and paste it into Word or One Note.
- Note: It can be difficult to find the headwaters of many rivers, as they are usually in wooded areas, so you might need more than one picture to label all terms.
- Label using the following vocabulary words on the chosen river: ***headwaters, mouth, meander, cutbank, point bar, oxbow lake, erosion, and deposition*.**