

July 26, 2021

News and Comments

Here are few news items that I thought might be of interest along with my comments:

- [Iceberg tracks in the seafloor: Icebergs can travel south all the way to Florida!](#); from the United States Geological Survey (USGS), a study on the iceberg scours on the seafloor that appear to date back to the Pleistocene Epoch.
 - Also from the USGS, the [latest earthquakes](#) and a discussion on the Indigenous history of [Yellowstone National Park](#).
 - The volcanic eruptions near Reykjavik, Iceland are going into a quiet phase, [Joining Rest Of Nation, Volcano Goes On Vacation](#).
 - A bit of an understatement, the United States [Oil and gas industry supports more than 11 million jobs nationwide](#); in fact our high standard of living is entirely due to our lavish use of fossil fuel energy, especially oil and gas. For a start, try feeding 7 to 8 billion people without ammonium nitrate fertilizer produced from natural gas via the [Haber-Bosch process](#).
 - The [Geological Society of America Award Winners for 2021 are here](#); the top award was the Penrose Medal awarded to Ian W.D. Dalziel of the University of Texas. Austin; congratulations to all the award winners.
 - Bang on Lulu, [Con woman stole diamonds by swapping them for pebbles](#). (*Bang on Lulu* is an obscene ditty used as a marching song in the Canadian Army)
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Depositional Environments for Sedimentary Rocks - Part 3, Rivers and Flood Plains



Figure 1 - North Saskatchewan River near North Battleford

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Going on with our look into depositional environments in Table 1, let's look at [fluvial and alluvial](#) processes.

Table 1 Terrestrial Depositional Environments

Environment	Key Transport Processes	Depositional Settings	Typical Sediments
Glacial	Gravity, moving ice, moving water	Valleys, plains, streams, lakes	Glacial till, gravel, sand, silt, clay
Alluvial	Gravity, moving water	Where steep-sided valleys meet plains	Coarse angular fragments
Fluvial	Moving water	Streams	Gravel, sand, silt, organic matter
Aeolian	Wind	Deserts and coastal regions	Sand, silt
Lacustrine	Moving Water	Lakes	Sand, silt, clay, organic matter
Evaporite	Still water	Lakes in arid regions	Salts, clay

[Credit: Steven Earle, Creative Commons Attribution-NonCommercial-Share Alike 4.0 International License](#)

Alluvial and Fluvial Processes

Rivers are complex systems that deposit all grades of sediments at various stages of their flow from highlands to a lake or the ocean. Figure 2 shows the various stages of a river's flow.

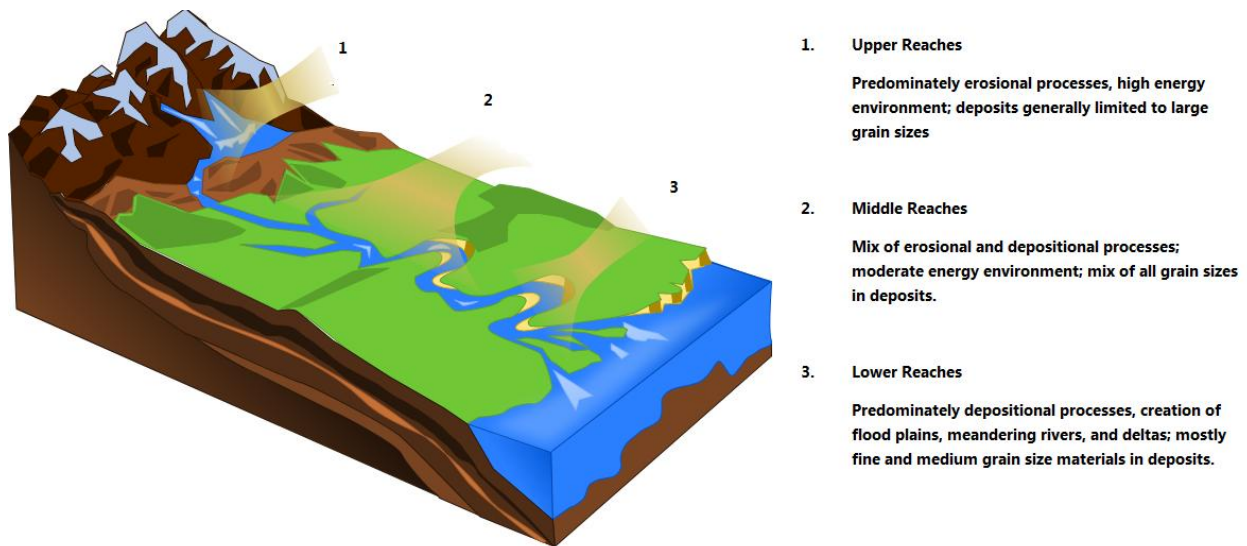


Figure 2 -General Stages of a River's Flow

[Credit: Distorted, Creative Commons Attribution-Share Alike 3.0 Unported license](#)

In the upper reaches of a river the flow is high energy and often turbulent. Thus in the higher areas of a river, the processes are predominately erosional, that is, the river is eroding the

landscape and carrying the sediment downstream. Boulder, cobbles and coarse gravel deposits are common here.

The middle reaches of a river are a mixture of erosional and depositional processes. As the energy begins to dissipate, coarser grained materials are deposited. (N.B. This is a good place to [pan for gold](#).) Flood plains and meanders may also begin in the middle reaches. Medium energy conditions are common leading to the deposit of gravel and sand.

The lower reaches of a river are where the stream slows down and the energy acquired in the upper parts is dissipated. The lower parts of a river often flow through a flood plain made up of the river's deposits and may terminate in a delta deposit. Under the lower energy conditions, sand, silt and clay deposits are common.

Rivers usually show a seasonal flow varying from low water to high water periods. Floods can be spectacular, such as the 2009 flood season of the Red River, shown in Figure 3.



Figure 3 - Red River in Flood

[Credit: Jordan Morningstar, Creative Commons Attribution 2.0 Generic license](#)

The flow of a river through a flood plain is not a stable process. The flow is turbulent and there will be differences in water flow. Thus the river will eventually begin to shift its course into a meandering stream. This occurs because when an irregularity diverts a rivers flow, there will be erosion on the outside of a curved stream channel, where the velocity is greatest, and deposition occurs along the inside of a channel, where the stream velocity is lowest. Eventually the meander grows till it is cut off and an oxbow lake is formed. Figure 4 shows this development.

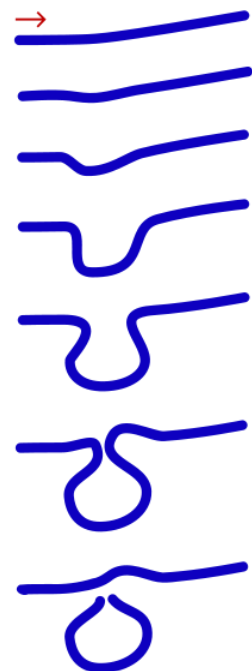


Figure 4 - Meander Development

[Credit: Maksim, Creative Commons Attribution-Share Alike 2.5 Generic, 2.0 Generic and 1.0 Generic license](#)

Figure 5 shows the hydraulic processes within the river that drive the erosion and deposition.

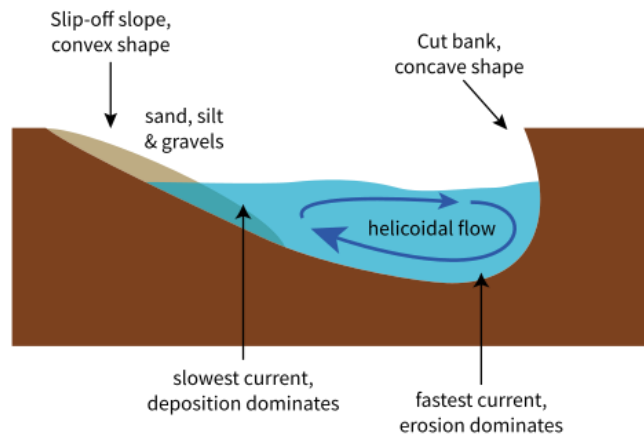


Figure 5 - Cross-section of A Meandering River

Credit: [Edw davis, Creative Commons Attribution-Share Alike 4.0 International license](#)

Summing It Up

Deposits from rivers are formed under complex conditions and a wide variety of conditions. the key to understanding the types of sediments that are deposited is the energy regime:

- Where the water flow is rapid, i.e. high energy regimes, only large grained sediment particles will deposited: boulders, cobbles and coarse gravel.
- Where there are moderate water flows, i.e. medium energy regimes, moderately grained sediment particles will be deposited: fine gravel and sand.
- Under low flow conditions, i.e. low energy regimes, fine and very fine particles will be deposited: very fine sand, silt and clay.

When sediments are buried and lithified over time, clays and silts will form shales and siltstones; sand deposits will form sandstones; and gravel deposits will form conglomerates.

Standard Caveat

The purpose of my weblog postings is to spark people's curiosity in geology. Don't entirely believe me until you've done your own research and checked the evidence. If I have sparked your curiosity in the subject of this posting, follow up with some of the links provided here. If you want to, go out into the field and examine some rocks on your own with the help of a good field guide. Follow the evidence and make up your own mind.

In science, the only authority is the evidence.