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Factors Affecting Water and Sediment Quality: Soils, Landscape, and Erosion

The characteristics of water and sediment in an aquatic ecosystem are influenced by the [minerals](#) and soils within the basin. Soils and mineral parent materials vary in their chemical composition and reactivity, and in physical properties such as texture and stability. As water moves through the landscape it can react with, dissolve, and transport minerals and soil or chemical components of this material. Basin topography affects the amount of time that water is exposed to minerals and soils; water flowing quickly down a steep hill, for example, will be in contact with soils for less time than water percolating through a gently sloping landscape.

Erosion

Surface erosion occurs when sediment particles are detached from the land and carried into a waterbody by surface runoff. Rain falling on bare soil can dislodge soil particles, a significant first step in the weathering process. This type of erosion is most common on agricultural land, land with little vegetation or ground cover, or disturbed land with exposed soils. Mass wasting refers to the movement of large quantities of sediment, rock, and organic matter downslope by gravity, and includes landslides, rockfalls, and debris flows and avalanches. This type of erosion is most common in steep areas. In-stream erosion occurs when sediments and rocks are eroded from the streambanks or streambed.



Landscape erosion is a source of sediment entering the river.

Source: Jane Elser
(click to enlarge)

Sedimentation

The deposition of sediment into waterbodies is called sedimentation or siltation. Increases in concentrations of suspended sediment can be detrimental to aquatic life. Fine sediment can reduce water transparency, clog fish gills, and can fill substrate pores, suffocating fish eggs and insect larvae. Chemicals such as nutrients, metals, hydrocarbons, and organic compounds can adsorb (attach) to sediment particles and enter the river through landscape erosion. Once in the river, these chemicals can be transported downstream, settle to the bottom with the sediments, or dissolve in the water.

In the lower Athabasca region, bitumen is exposed at the earth's surface in many waterbodies. Bitumen particles are eroded from streambanks and substrate, and are carried downstream by the river. The deposition of these particles in the lower reaches of tributaries and in the [Peace-Athabasca Delta](#) has led to concentrations of sediment hydrocarbons that are naturally elevated above levels in other river systems.



Bitumen-containing solids at the side of the Steepbank River.

Source: Hatfield Consultants 2008
(click to enlarge)

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