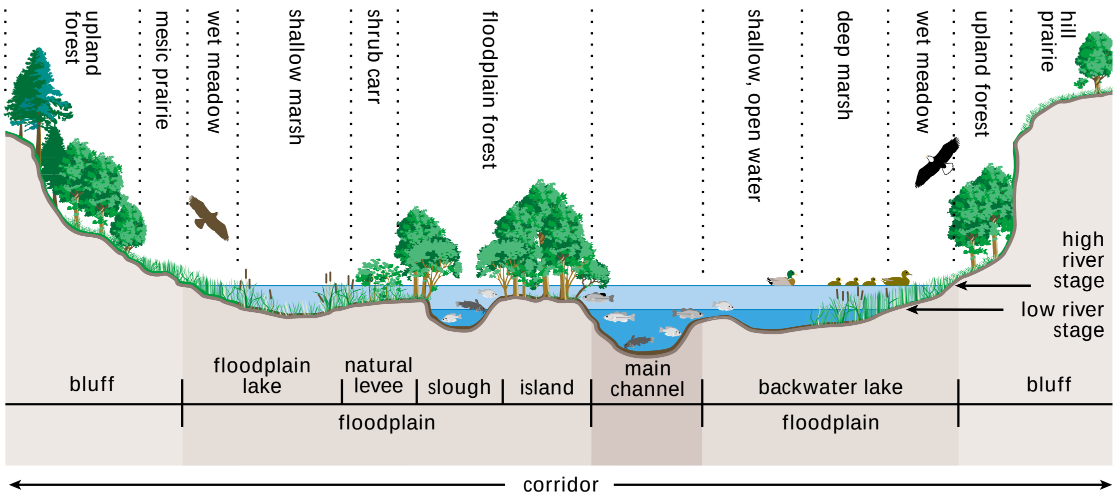

***Figure 1.11: A cross section of a river corridor.** The three main components of the river corridor can be subdivided by structural features and plant communities. (Vertical scale and channel width are greatly exaggerated.)*

Source: Sparks, Bioscience, vol. 45, p. 170, March 1995. ©1995 American Institute of Biological Science.

pass through without spilling over the banks. Two attributes of the channel are of particular interest to practitioners, channel equilibrium and streamflow.

Lane's Alluvial Channel Equilibrium

Channel equilibirum involves the interplay of four basic factors:

- Sediment discharge (Q_s)
- Sediment particle size (D_{50})
- Streamflow (Q_w)
- Stream slope (S)

Lane (1955) showed this relationship qualitatively as:

$$Q_s \bullet D_{50} \propto Q_w \bullet S$$

This equation is shown here as a balance with sediment load on one weighing pan and streamflow on the other (**Figure 1.13**). The hook holding the sediment pan can slide along the horizontal arm according to sediment size. The hook holding the streamflow side slides according to stream slope.

Channel equilibrium occurs when all four variables are in balance. If a change occurs, the balance will temporarily be tipped and equilibrium lost. If one variable changes, one or more of the other variables must increase or decrease proportionally if equilibrium is to be maintained. For example, if slope is increased and streamflow remains the same, either the sediment load or the size of the particles must also increase. Likewise, if flow is increased (e.g., by an interbasin transfer) and the slope stays the same, sediment load or sediment particle size has to increase to maintain channel equilibrium. A stream seeking a new equilibrium tends to erode more sediment and of larger particle size.

Alluvial streams that are free to adjust to changes in these four variables generally do so and reestablish new equilibrium conditions. Non-alluvial streams such as bedrock or artificial, concrete channels are unable to follow Lane's relationship because of their inability to

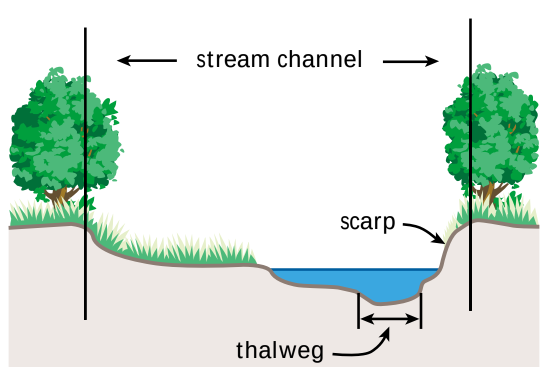

***Figure 1.12: Cross section of a stream channel.** The scarp is the sloped bank and the thalweg is the lowest part of the channel.*

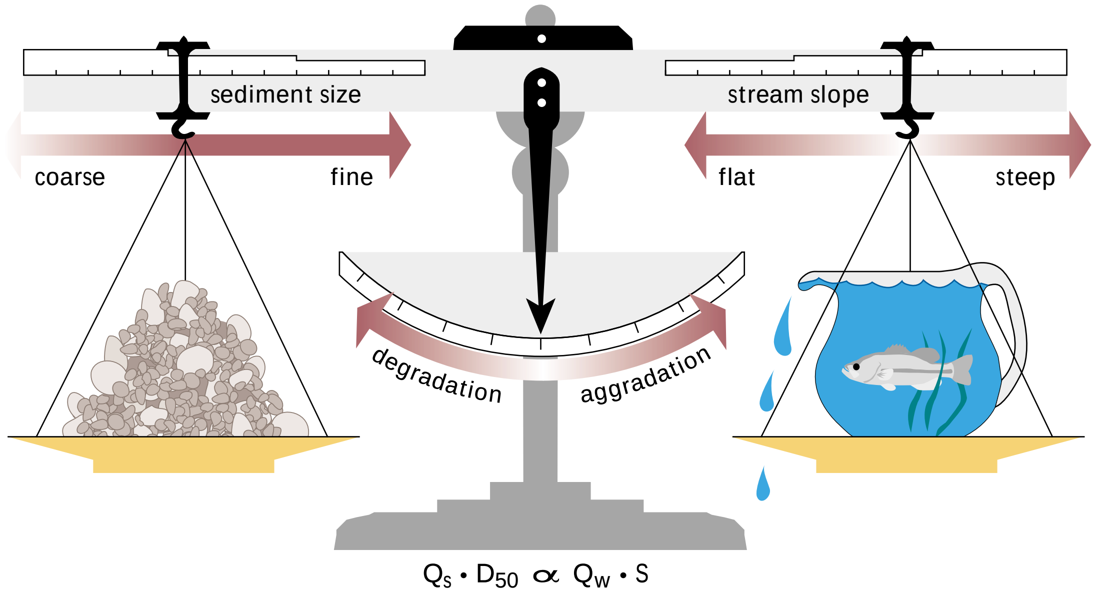

Figure 1.13: Factors affecting channel equilibrium. *At equilibrium, slope and flow balance the size and quantity of sediment particles the stream moves.*

Source: Rosgen (1996), from Lane, ***Proceedings***, 1955. Published with the permission of American Society of Civil Engineers.

FAST FORWARD

Preview Chapter 2, Section B for more discussion on the stream balance equation. Preview Chapter 7, Section B for information on measuring and analyzing these variables and the use of sediment transport equations.

adjust the sediment size and quantity variables.

The stream balance equation is useful for making qualitative predictions concerning channel impacts due to changes in runoff or sediment loads from the watershed. Quantitative predictions, however, require the use of more complex equations.

Sediment transport equations, for example, are used to compare sediment load and energy in the stream. If excess energy is left over after the load is moved, channel adjustment occurs as the stream picks up more load by eroding its banks or scouring its bed. No matter how much complexity is built into these and other equations of this type, however, they all relate back to the basic balance relationships described by Lane.

Streamflow

A distinguishing feature of the channel is streamflow. As part of the water cycle, the ultimate source of all flow is precipitation. The pathways precipitation takes after it falls to earth, however, affect many aspects of streamflow including its quantity, quality, and timing. Practitioners usually find it useful to divide flow into components based on these pathways.

The two basic components are:

- *Stormflow*, precipitation that reaches the channel over a short time frame through overland or underground routes.
- *Baseflow*, precipitation that percolates to the ground water and moves slowly through substrate before reaching the channel. It sustains streamflow during periods of little or no precipitation.