FLOOD PLAIN

Floodplain is generally a flat area of land next to a river or stream. It stretches from the banks of the river to the outer edges of the valley.

A floodplain consists of two parts. The first is the main channel of the river itself, called the floodway. Flood ways can sometimes be seasonal, meaning the channel is dry for part of the year.

Beyond the floodway is the flood fringe. The flood fringe extends from the outer banks of the floodway to the bluff lines of a river valley.

Some rivers have very narrow floodplains. In fact, some rivers, or parts of rivers, seem to have no floodplain at all. These rivers usually have a steep stream gradient—a very deep, fast-moving channel. Ngonye Falls, Zambia, marks a remote stretch of the Zambezi River where the floodplain is extremely narrow. As the Zambezi leaves the wide floodplain of the sandy Kalahari, it enters a narrow basalt channel as fast-moving white water rapids.

GEOLOGY OF A FLOODPLAIN

There are two major processes involved in the natural development of floodplains: erosion and aggradation. The erosion of a floodplain describes the process in which earth is worn away by the movement of a floodway. Aggradation (or alluviation) of a floodplain describes the process in which earthen material increases as the floodway deposits sediment.

A river erodes a floodplain as it meanders, or curves from side to side. The massive lowland floodplain of the Amazon River, for instance, is carved with hundreds of oxbow lakes that document the meandering river and its tributaries over time. Oxbow lakes are formed when a meander, or bend, in the river is cut off from the river's mainstem. Features such as oxbow lakes and seasonal wetlands are often a part of floodplains created through erosion and deposition.

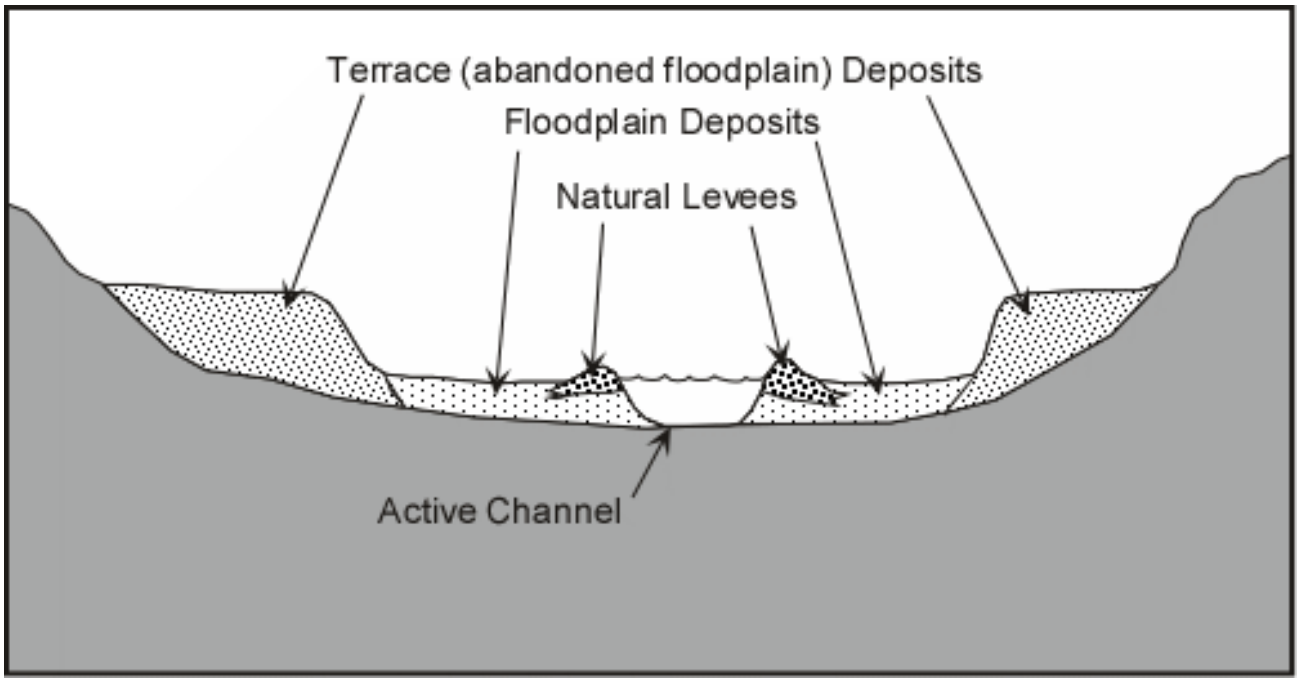
A meandering stream can contribute to a floodplain's aggradation, or build-up in land elevation, as well as its erosion. A typical aggradation environment is a wide, shallow, braided river. Braided rivers often include river deltas, where the main floodway is

separated into discrete channels and tiny islands. The process of subsidence, in which the elevation of a delta may sink due to sea level rise or human activity, often offsets aggradation in the floodplains in these areas. The huge aggradation of sediment around the Nile delta, for instance, is subsiding due to the rising level of the Mediterranean Sea.

The alluvium, or sediment, of a floodplain varies. Its coarseness and composition depend on the surrounding landscape and the velocity of the currents that created the floodplain. Some floodplains are mostly fine-grained silt, while others are sandy.

The deposit of alluvium created as a river or stream breaks, or breaches, its bank is called a crevasse splay. The formation of a crevasse splay is very similar to the formation of an alluvial fan. The thickest layer of sediment is nearest the breach, while the thinnest and youngest sediments are fanned out.

The layered sediments of many floodplains can create important aquifers. Clay, sand, and gravel filter water as it seeps downward. Water purification systems often take advantage of this natural phenomenon in a process called bank filtration. In bank filtration, water is deliberately filtered through the banks or floodplain of a river or lake. Nearby wells then collect the filtered water, which is then ready for more intense purification processes.



NATURAL LEVEE

Natural levees are deposits containing mud, sand and stones and are formed to slope away from either side of the river or flood plain. Natural levees commonly form around lowland rivers and creeks without human intervention. They are elongate ridges of mud or silt that form on the river floodplains immediately adjacent to the cut banks. Like artificial levees, they act to reduce the likelihood of floodplain inundation.

Deposition of levees is a natural consequence of the flooding of meandering rivers which carry high proportions of suspended sediment in the form of fine sands, silts, and muds. Because the carrying capacity of a river depends in part on its depth, the sediment in the water which is over the flooded banks of the channel is no longer capable of keeping the same amount of fine sediments in suspension as the main thalweg . The extra fine sediments thus settle out quickly on the parts of the floodplain nearest to the channel. Over a significant number of floods, this will eventually result in the building up of ridges in these positions, and reducing the likelihood of further floods and episodes of levee building.

If aggradation continues to occur in the main channel, this will make levee overtopping more likely again, and the levees can continue to build up. In some cases this can result in the channel bed eventually rising above the surrounding floodplains, penned in only by the levees around it; an example is the Yellow River in China near the sea, where oceangoing ships appear to sail high above the plain on the elevated river.

Levees are common in any river with a high suspended sediment fraction, and thus are intimately associated with meandering channels, which also are more likely to occur where a river carries large fractions of suspended sediment. For similar reasons, they are also common in tidal creeks, where tides bring in large amounts of coastal silts and muds. High spring tides will cause flooding, and result in the building up of levees.