

Most highway stream crossings are over alluvial streams which are susceptible to more hydraulic problems than non-alluvial streams. However, the security of a foundation in bedrock depends on the quality of the bedrock⁽¹⁾ and the care with which foundation is set. Serious problems and failures have developed at bridges with foundations on shale, sandstone, limestone, glacial till, and other erodible rock. The New York State Thruway Schoharie Creek bridge failure is a catastrophic example of such a failure. Bed material at the bridge site was highly cemented glacial till which scoured, undermining spread footings.⁽¹⁵⁾

Changes in channel geometry with time are particularly significant during periods when alluvial channels are subjected to high flows, and few changes occur during relatively dry periods. Erosive forces during high-flow periods may have a capacity as much as 100 times greater than those forces acting during periods of intermediate and low-flow rates. When considering the stability of alluvial streams, in most instances it can be shown that approximately 90 percent of all changes occur during that small percentage of the time when the flow equals or exceeds dominant discharge. A discussion of dominant discharge may be found in Hydraulic Design Series No. 6, but the bankfull flow condition is recommended for use where a detailed analysis of dominant discharge is not feasible.⁽¹³⁾

The most significant property of materials of which channel boundaries are comprised is particle size. It is the most readily measured property, and, in general, represents a sufficiently complete description of the sediment particle for many practical purposes. Other properties such as shape and fall velocity tend to vary with size in a roughly predictable manner.

In general, sediments have been classified into boulders, cobbles, gravel, sands, silts, and clays on the basis of their nominal or sieve diameters. The size range in each general class is given in Table 2.1. Note that even when the English system of units is used, sand size particles and smaller are typically described in millimeters. Noncohesive material generally consists of silt (0.004 - 0.062 mm), sand (0.062 - 2.0 mm), gravel (2.0 - 64 mm), or cobbles (64 - 250 mm).

The appearance of the streambank is a good indication of relative stability. A field inspection of a channel will help to identify characteristics which are associated with erosion rates:

- Unstable banks with moderate to high erosion rates usually have slopes which exceed 30 percent, and a cover of woody vegetation is rarely present. At a bend, the point bar opposite an unstable cut bank is likely to be bare at normal stage, but it may be covered with annual vegetation and low woody vegetation, especially willows. Where very rapid erosion is occurring, the bank may have irregular indentations. Fissures, which represent the boundaries of actual or potential slump blocks along the bank line indicate the potential for very rapid bank erosion.
- Unstable banks with slow to moderate erosion rates may be partly reshaped to a stable slope. The degree of instability is difficult to assess, and reliance is placed mainly on vegetation. The reshaping of a bank typically begins with the accumulation of slumped material at the base such that a slope is formed, and progresses by smoothing of the slope and the establishment of vegetation.