At Stage I, the channel is stable and transports the water and sediment delivered to it without significant adjustment **(Figure 3.1.4)**. Although not a universal feature, internal floodplains are common in stable streams including those in the Southeastern US. Bankfull floodplains occur at the elevation corresponding to the dominant discharge. The dominant discharge is the flow that, over time, accomplishes the most work on the stream channel. In undisturbed streams, the dominant discharge typically occurs every 1.5 to 2 years. In urban basins with uncontrolled stormwater discharges this discharge may occur 5 to 10 times each year. The bankfull floodplain performs a valuable function by lowering the bank shear during higher flows and effectively managing the stream energy.

During Stage II, natural or manmade events disturb the channel. In disturbed systems, the dominant discharge often occurs far more frequently and may not support the development of internal floodplains. Common forms of manipulation include direct alteration of channel dimensions or alignment, or increases in the rate, volume or timing of flow.

In Stage III, the stream cuts downward, lowering its channel slope to redistribute energy. This incision process migrates upstream. The migrating face of an incision front is referred to as a knick point or knick zone. The typical shape of these channels is V- shaped or narrow U-shaped (Figure 3.1.4)**.** Incision proceeds until the channel has reached a stable slope, the incision reaches a more resistant layer or the streambanks begin failing because of mass wasting.

Channel widening through mass wasting of the streambanks, Stage IV, follows incision. Here trees toppled into the stream and banks retreat from abutments and other infrastructure. There are two common mechanisms of bank failure. Fluvial action erodes soil away from the toe of the slope resulting in a cantilevered bank, which eventually fails through toppling. Alternatively, the incision cuts deeply enough into the bed that the streambanks exceed their critical height and fail. Both mechanisms may operate in a stream and illustrates this phase (**Figure 3.1.5**).

3.1.4 Meander Formation and Migration – Evaluating Channel Change in Plan Form

Adjustments in plan form are common and have an important influence on the sustainability of a stormwater system as well as on the safety and service life of near-stream infrastructure. Some plan form adjustments can liberate significant sediment and present major erosion hazards. The management requirements of plan form adjustment differ from those of an incising or widening stream. Consequently, distinguishing between these processes was an important part of the investigation and analysis.