

**Table 3.4.1. Geomorphic Processes and Calculated Applied Tractive Shear**

Process	Calculated Applied Tractive Shear in PSF
Transport	< 0.27
Deposition with meander	0.41 – 0.70
Incision	1.00 – 1.50
Widening with woody debris jams	2.42

3.4.3 Hydraulic Model and Geomorphic Process

Based on the results of the comparison of the hydraulic and geomorphic models, the hydraulic model may be used to predict geomorphic processes when integrated with field observations. The results of modeling future conditions can be used to predict the geomorphic response to the new conditions. Fluvial processes correlate well to applied shear. In turn, the sediment supply which is controlled by the applied shear stress has a defining influence on the dominant process. Meandering and widening only occur in reaches with sediment deposition. Widening occurs only in reaches with woody debris jams. Incision and transport only occur in areas of limited sediment supply. When relating each fluvial process to bed slope: Incision occurs when the bed slope is greater than the 1.2-in event water surface slope. Deposition and meander occurs when the bed slope is greater than the water surface slope. Transport occurs when the applied shear is near or less than the resistive shear and the slope of the bed and water surface are similar.

3.5 Sediment Transport

Sugar Creek is capable to transport sediment throughout the watershed. Once dislodged, the clay particles are easily transported; sand deposits only in reaches with low bed slope or debris jams. Because urban development has increased the frequency of flows, the sand has less time between flow events to consolidate into bars and for stabilizing vegetation to establish. So, although a great deal of sandy sediment is delivered to the stream, most of it is stored in transient bars and accumulates in stable formations only in the lower reaches.

3.6 Methods of Management

3.6.1 Watershed-Scale Stability - Arrest Channel Incision

Arresting channel incision is one of the most beneficial actions available to stabilize the Sugar Creek Watershed. Incision causes most of the problems throughout the basin including mass wasting, scoured or sediment crossings, and plan form adjustment. Fortunately, incision responds well to treatment. Stopping the incision “short circuits” the cycle of channel evolution and improves the likelihood that the channel will self-heal. The knick points and knick zones are sites where the hydraulic slope is locally high enough to induce upstream-migrating erosion. Grade control structures will lower the slope below the threshold for bed erosion in this stream. To