

The Effects of Headcut and Knickpoint Propagation on Bridges in Iowa

Athanasios N. Papanicolaou
IIHR - Hydroscience and Engineering
University of Iowa
100 C. Maxwell Stanley Hydraulics Laboratory
Iowa City, IA 52242
apapanic@engineering.uiowa.edu

John Thomas
IIHR - Hydroscience and Engineering
University of Iowa
100 C. Maxwell Stanley Hydraulics Laboratory
Iowa City, IA 52242
john@goldenhillsrccd.org

ABSTRACT

Headcuts (known also as primary knickpoints) and knickpoints (known also as secondary knickpoints) have been found to contribute to the accelerated riverbed degradation problem in the midwestern United States. Step-changes that occur at the head of channel networks are referred to as headcuts, and those that occur within the confines of channel banks are referred to as knickpoints. The formation of headcuts and knickpoints and their upstream migration have been linked to the over-steepening of stream reaches when the flow plunges to the bed and creates a plunge pool. Secondary flow currents and seepage are believed to be some other parameters contributing to the formation and evolution of headcuts and knickpoints. Ongoing research suggests that headcuts and knickpoints, where they form and migrate, may account for 60% (or more) of the bed erosion in the streams. Based on preliminary observations, there is a strong indication that headcuts and knickpoints can also have a greater influence on flow thalweg alignment (line of deepest flow) for small rivers. A shift in thalweg toward a riverbank or embankment is usually a prime factor contributing to riverbank erosion and scour.

Key words: bridges—erosion—headcuts—knickpoints