SEMINAR
WEDNESDAY, APRIL 16 at 3.30 pm.
St. Anthony Falls Laboratory Auditorium

RIPARIAN VEGETATION AS A PRIMARY CONTROL ON CHANNEL CHARACTERISTICS IN NONCOHESIVE SEDIMENTS

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ABSTRACT

Three main channel patterns predominate in natural rivers: 1) straight, 2) meandering, and 3) braided. The classical stability analyses suggest that the width to depth ratio of the channel is the dominant control on the pattern. Numerical and experimental models, however, suggest that braiding is the dominant mode for a river when the flow is through noncohesive sediment and that meandering is only an intermediate state. These studies suggest that bank stabilization by vegetation or cohesive sediment is the dominant control on channel planform.

In natural systems the cohesion necessary to stabilize banks is largely derived from vegetation. Vegetation increases bank stability through root reinforcement of the sediment and increases the threshold shear stress needed to erode the sediment. In addition, vegetation offers resistance to the flow by increasing the drag and reducing the velocity, thus decreasing the stream power available for erosion and transport. Vegetation is ubiquitous and it will opportunistically colonize those areas of the channel that are abandoned or exposed at low flows. Vegetation that is not removed in its immature stage will become stronger and increasingly resistant to erosion and removal by the flow. This has strong implications for river management and climate change. Vegetation gone awry has profound impacts on stream habitat and is increasingly being recognized as a concern for future development projects.

Experimental modeling, numerical modeling, and field studies thus far have identified the robust effects of increased vegetation as leading to a decrease in braiding intensity, lateral mobility, and width to depth ratios. In addition to the environmental implications of such changes, there are strong implications from a theoretical standpoint. The results of modeling and field studies suggest that the presence of vegetation alone could alter a multiple channel stream to a single-thread channel and promote further investigation. The theoretical framework, evidence from various studies, and the methods for an experimental model will be presented.