Flow reconstruction and fluvial geomorphic potential for cottonwood dendrochronology

Derek M. Schook[1,2], Sara L. Rathburn[1], Jonathan M. Friedman[3]
[1] Department of Geosciences, Colorado State University
[2] I-WATER PhD Fellow
[3] USGS, Fort Collins

Abstract. Climate-induced changes in river runoff regime threaten both water supplies and floodplain ecosystems, and predicting these changes and their ecological and geomorphic effects is essential for effective river management. Nearly all large Western rivers have undergone damming or substantial flow manipulation, but dendrochronological flow reconstruction on free-flowing rivers provides a unique opportunity to isolate the effects of climate on river discharge and forest regeneration. We sampled plains cottonwoods (*Populus deltoides*) in eastern Montana, collecting 500 cores from on the lower Yellowstone River and 400 cores from the Powder River. In this semi-arid environment, growth is moisture limited, and we have identified unique roles of both river discharge and local precipitation to tree growth. Using the Lower Yellowstone cottonwood chronology, we have extended the discharge record back to 1774, and by incorporating multiple tree series we hope to further refine the reconstruction. The Lower Yellowstone is a wandering gravel bed river, while the Powder River is meandering. Thus, two different dendrochronological sampling techniques have been employed to identify rates of river migration at these complementary sites in an effort to understand river changes over the past 250 years. Identifying patterns in river migration and controls on cottonwood growth will facilitate better management of water supplies and floodplain forests in an era of climate change.