Using Tree-Ring Analysis to Date Major Flood Events on the Saco and Cutler-Ellis Rivers, New Hampshire

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Introduction

The occurrance of floods is of great concern to residents, engineers, and planners living in or involved with near-stream environments. The records of floods are often very short and not completely representative of natural variations, especially of extreme events. This study examined the feasibility of using tree-ring analysis to date wounds and scars from flood events. These resulting dates and levels of the scars were compared to flow data to see if there was enough correspondence between the tree-ring information and the flow data to indicate that tree-ring studies could be used to reconstruct flood flows for use in environmental planning.

Field Investigation

The sites studied were along two rivers near Mt. Washington in New Hampshire. The Cutler-Ellis river is a fast, narrow mountain stream that descends relatively steeply from the east side of the Presidential range into the Saco River Valley. The Saco River itself is a much larger, meandering river that flows south through the lower Mt. Washington valley.

The first river is mostly confined between steep slopes with only an occasional small, local floodplains. There were many scarred trees within the bankfull channel and a few scarred trees above the bank full level. On the Saco River similar observations were made and core samples were taken from trees along both rivers. Sections were cut from some dead trees and one small living tree. In coring near scars it is difficult sometimes to obtain cores that clearly show the effects of the wounding of the tree.

Results of the Investigation

Many of the core samples did show actual wounds, discoloration from barrier zones formed to seal off the wounds, or decay related to the wounds. As expected, the rings were difficult to see in some diffuse porous species. The sections taken were cut longitudinally and transversely. This sectioning revealed scars that were not visible by inspection from the outside of the tree.

Comparisons of wound dates, heights and frequency showed some correspondence with recorded high flows. As one would expect, within and near the bankfull channel there was a higher frequency of scarring, often matching higher flow years. Above the bankfull

level the fewer scars matched major flood events as recorded by the streamflow data. Major flood events were first determined by the tree-ring analysis and confirmed by hydrologic records. Higher flood events occurred in the years of 1973 and 1977, and between the growing seasons of 1985-86 and 1987-88.

Conclusions

There is good potential for obtaining past flood information from tree-ring analyses of riparian trees in the New Hampshire area. The use of nondestructive tree coring can produce much information but for a comprehensive study it would be necessary to take some sections of strategically located trees in order not to miss some flood events that may have caused scars that have been completely overgrown in the following years. It would confirm results if tributary streams as well as main rivers are studied and several locations along each watercourse should be sampled to demonstrate floods that are more than a local event, possibly due to ice or debris jamming. One also has to be cautious about other causes of riparian tree scarring such as beaver activity. Older trees on flood plains near the bankfull channel offer the best potential for dating the extreme flood events.