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RELATIONS BETWEEN HYDRAULIC GEOMETRY AND STREAMFLOW STATISTICS IN NEW HAMPSHIRE AND VERMONT

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Descriptors: Floods, hydraulic geometry, streamflow, fluvial morphology, New Hampshire, Vermont

Research Objectives

Establish criteria for characterizing stream hydraulic geometry, including criteria for (a) selecting a representative reach; (b) determine bankful stage from topographic and vegetative characteristics of channels; and (c) develop methods for spatially averaging channel geometry measurements.

Determine the nature and consistency of relations between hydraulic geometry (e.g., stream bankful width, depth, cross sectional area, channel capacity) and various flow statistics (e.g., flood magnitudes, mean flows, flow variability) in New Hampshire and Vermont. This determination included assessment of the degree to which recent flood history affects the relationships.

Principal Findings and Significance:

Bankfull width is the channel characteristic most strongly related to floodflows at unregulated stream reaches in New Hampshire and Vermont.

Average bankful depth, cross-sectional area, and width/depth ratio are also significantly related to floodflows, but not as strongly as is width.

Bed-material size is not a significant predictor of flood magnitude, either separately or in combination with other factors.

Estimations of flood magnitude at selected return periods can be made via regression on bankful width alone, with standard errors of estimate ranging from 37% (2-year flood) to 48% (100-year flood). Estimations of flood magnitude at selected return periods can be improved via multivariate regression relations using bankful width plus the basin characteristics drainage area and main-channel slope; these relations have standard errors ranging from 36% to 37%.

Analysis of residuals and validation results indicate that regression equations developed herein have satisfactory properties for use in predicting flood magnitudes from 2-year to 100-year return periods in the region. These equations have predictive abilities superior to previously-developed equations based on basin characteristics alone.

Channels in glaciated New England appear to be as closely adjusted to current flow regimes as do more purely "alluvial" channels in other regions.