Characterizing geomorphic controls of riparian width for mountain streams in the Colorado Front Range

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Abstract. High variability of mountain streams causes riparian width to vary greatly from changes in drainage, valley, and channel characteristics. GIS- based models for predicting flood-prone width, valley bottoms, or riparian zones may not accurately reflect processes at the reach scale, therefore field verification and reach specific studies are needed. Management of riparian areas often designate a generalized width, which may under- or over-estimate the true riparian width. This study examines correlations between potential control variables and riparian zone width in the Colorado Front Range. Results from this study will be used to predict the riparian zone as a proxy for flood-prone width in the semi-arid Colorado Front Range. We hypothesize that local controls and large scale controls interact to determine floodplain processes. Large scale controls identified are elevation, which reflects hydroclimatology and glacial history, and drainage area. Local controls are gradient, entrenchment, the ratio of the valley width to channel width, connectedness, defined as the distance from the channel to valley edge, presence of colluvium, and vegetation type, affecting roughness during flooding and bank stability.

We chose nineteen reaches based on elevation, connectedness, gradient and drainage area using a GIS base map in anthropogenically undisturbed areas of the Colorado Front Range, which included the Cache la Poudre and North St. Vrain drainages. Riparian width was defined using a three-tiered approach: using field evidence of fluvial processes and riparian vegetation, hydraulically by comparing field delineation with various recurrence interval stages (eg. $Q_{10,}Q_{50,}$ and Q_{100}), and based on species changes along plant transects perpendicular to the stream channel. One longitudinal and two valley and channel cross-section surveys were completed at each stream reach to determine valley and channel geometry and bed gradient. Preliminary results show that gradient and valley geometry account for over 60% of the variability in riparian width for partially confined or confined reaches. Unconfined reaches were outliers in each statistical model, suggesting that non-measured factors, such as groundwater and vegetation community type, account for differences in riparian zone width. Results from these data will allow for more accurate delineations of the riparian zone for mountain streams, in addition to an understanding of the reach-scale significance of interactions between floodplain and local hillslope versus drainage basin processes.