Potential of Engineered Floodplains and Wetlands as Fine Particle BMPs: Case Study of Trout Creek and the Upper Truckee River

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A two dimensional floodplain model, capable of resolving water motion, depth, temperature, and suspended sediment concentration has been developed for application on parts of the Upper Truckee watershed. Data from the Trout Creek floodplain was intended to be collected to provide information on sediment deposition, water depth and inundation time to calibrate and validate the model. Instrumentation was deployed for two winters, but the prevailing drought conditions resulted in Trout Creek not overbanking. Consequently, suitable data could not be collected. In order to allow for the model to receive some degree of calibration, particularly with respect to the efficiency of floodplain vegetation's role in fine sediment removal, a laboratory flume was constructed and artificial floodplain plants were installed. Tests are currently underway. An analysis of previous storm events has been conducted to provide boundary condition data for the floodplain model. The original intention had been to use Storm Water Management Model (SWMM) for this purpose, but the drought conditions meant this model would have been of limited value, and the use of real data was considered to be a better solution.

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SWMM model: The original intent was to develop as SWMM model to provide the boundary conditions for modeling the Trout Creek floodplain. However the last 2 winters were dry and insufficient flow was obtained for developing and calibrating such a SWMM model. In a separate effort, a basin-wide SWMM model is being developed (PLRM) so such an effort would have been duplicative. Instead, to provide model boundary conditions, a detailed statistical analysis was performed to determine fine particle loading in urban runoff as a function of storm type (e.g., thunderstorm, rain on snow, snowmelt), duration, and intensity. Relationships from this analysis were used to predict urban particle fluxes during simulations of flooding on the Trout Creek and Upper Truckee field sites.

Trout Creek water quality modeling: Water quality modules simulating several species of nitrogen and phosphorus were added to BreZo, the 2D hydrodynamic-water quality model used for this study. These, along with the temperature, suspended sediment, and residence time modules, complete the addition of water quality to the original hydrodynamic model. Because of the lack of a runoff event of sufficient magnitude to cause overbank flooding during the monitoring period, calibration and validation of the Trout Creek model was performed using data collected by the USGS during 2003 and 2006 as part of the Lake Tahoe Interagency Monitoring Program (LTIMP). Daily mean, minimum, and maximum water temperature were predicted correctly by the model, indicating realistic reproduction of flow patterns and residence time.

[1] This document is an intermediate progress report, not a final report; consequently, any results should be considered preliminary and should not be cited. Please contact the principal investigators or the Tahoe SNPLMA Science Program Coordinator if you have questions.

Floodplain manipulation studies were performed to assess the impacts of changing vegetation or small scale topography features on sediment retention. The impacts of manipulation of vegetation type, backwater pond size and location, check dam presence and location, and berm presence and location were examined.

Upper Truckee analysis: The calibrated hydrodynamic-water quality model is currently being applied to the Upper Truckee Marsh floodplain site, located at the mouth of the Upper Truckee River. This site is the location of a planned restoration, and simulations are being conducted to assess whether the floodplain vegetation and topography changes which produced maximum sediment retention at the Trout Creek field site will have a similar effect on the Upper Truckee.