

Flood Recovery and Resilient Stream Restoration: Lyons, Colorado

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Background/Objectives. On September 13, 2013, a one-in-500-year flood event ravaged the St. Vrain River near Lyons, Colorado. The flood devastated the watershed, causing loss of life and millions of dollars in damage to homes, personal property, highways, infrastructure, and habitat. A study and 30% design performed by others found that aquatic habitat limitations resulting from the 2013 flood included disconnection from the floodplain, vertical instability of incising reaches, and lack of habitat variability and complexity throughout the project area. Based on the results of this study and the 30% design, this project was initiated to “promote overall watershed recovery and resiliency by restoring stream function and re-establishing connections between stream reaches and their associated floodplains, to protect values at risk, homes, businesses and infrastructure” (USDA, 2016). Through a public stakeholder process, the community agreed to collaboratively design a project that protects life and property and restores the north St. Vrain Creek to a stable equilibrium.

Approach/Activities. Focus of the design was to optimize river function and habitat by leveraging hydrology, geomorphology, aquatic and riparian science. In addition to providing flood protection, the design provided habitat resiliency by restoring the natural processes of the river and watershed. Resiliency was built by providing a higher degree of river capacity and a foundation for the natural ecosystem to regrow and restore itself within the context of existing development. Drop structures that were installed after the flood provided important interim habitat for larger fishes, but they needed to be modified to improve overall aquatic habitat quality representative of the region. The 7,200-foot reach was designed to protect life and property and improve the overall aquatic habitat and ecological function of the river by increasing the complexities of hydraulic habitats. The design included removing the drop structures installed following the flood and incorporating new pool complexes (riffle, pool, run) with the pool depths planned to sustain overwintering habitat. The river design and construction included removing flood deposited material, increasing the cross-section of the channel in places to increase conveyance and lower the water surface elevation during high flow events, the use of root wad toe structures, channel reshaping to form bankfull benches, construction of an overflow channel, habitat and roughness rock placed in the channel and along the banks, and a detailed revegetation plan for the different hydrologic zones of the watershed. Existing backwater wetlands were protected and enhanced. Limited hard armoring (boulder block wall) was included around a bridge at the upstream end of the project.

Results/Lessons Learned. The design and permitting were performed under a tight timeframe due to funding limitations. Several hydraulic models were used in the hydraulic analysis, which required numerous iterations due to the limited reliability of existing survey data. Permitting of the project was challenging due to the numerous funding and regulatory agencies required to review and approve the design. Permitting and detailed design was completed in December 2017, and the construction was completed between December 2017 and May 2018. Monitoring is ongoing. This presentation will discuss the challenges and achievements in successfully restoring this section of the St. Vrain River following such as a catastrophic climatic event and the resiliency incorporated into the restored stream system.