RIVERBANK STABILIZATION ON THE CONNECTICUT RIVER:

LESSONS LEARNED FROM 25 YEARS OF RESTORATION

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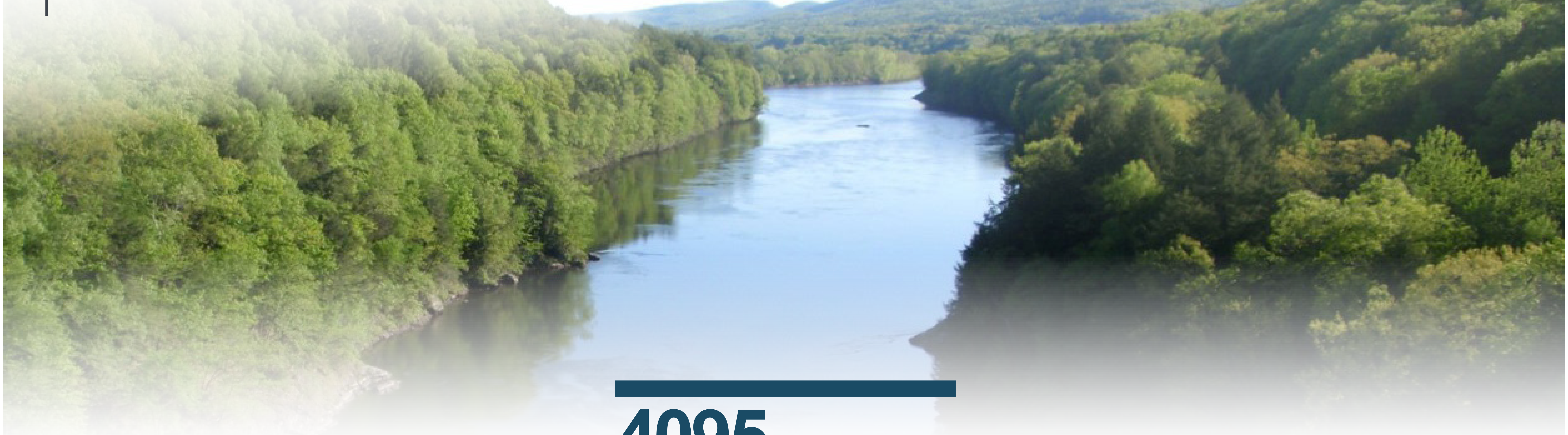
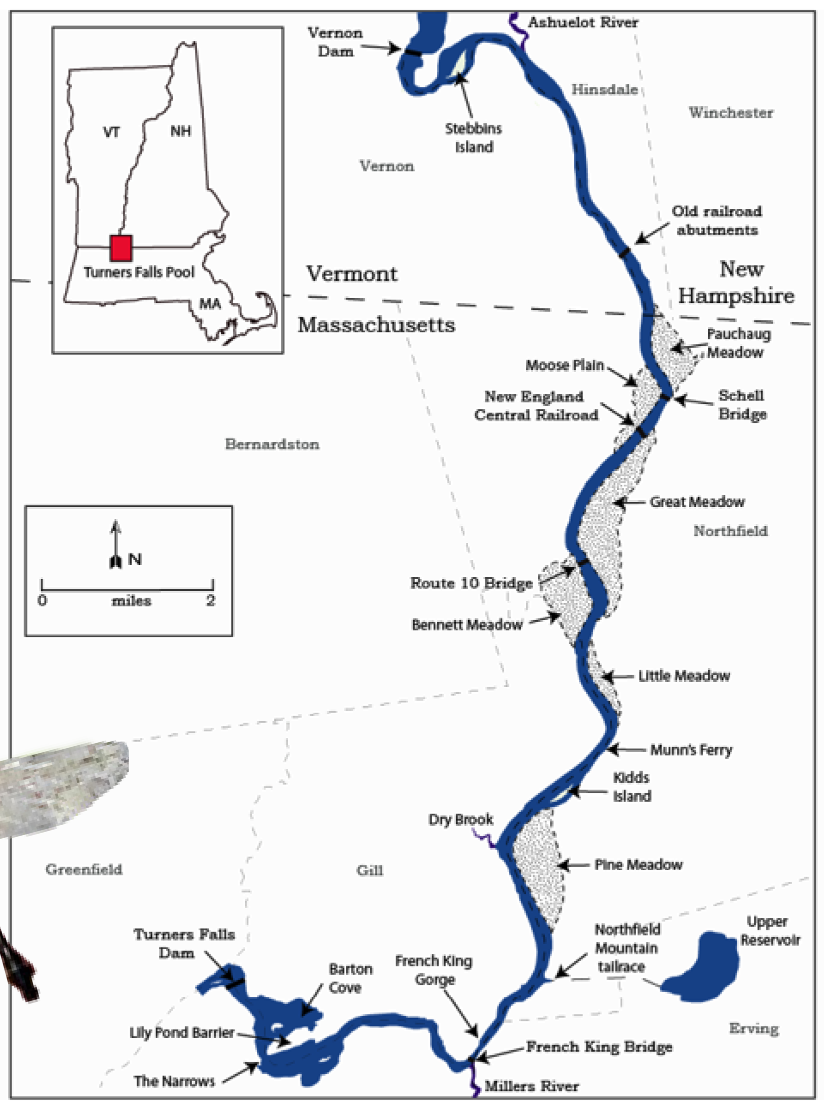


This paper discusses the successful implementation of using engineered log structures, coarse woody debris, soil bioengineering, and tree stumps to stabilize 4095 linear feet (1248 meters) of eroding river bank on the Connecticut River in Massachusetts, USA. The goal of this work was to provide near natural riverbank restoration using coarse woody debris and bioengineering techniques, without the use of stone or other hard armor. The Connecticut River has a watershed area of 11,000 square miles (2,848,987 ha) and has a bankfull width of over 800 feet (244 meters). Annual flows exceed 100,000 cubic feet/second (2,831,685 liter/second) causing significant bank failures and soil erosion.

To eliminate the use of stone, and to provide natural shoreline habitat, demonstration projects were initiated in 2009 to stabilize the eroding river shoreline using engineered woody debris. One of the goals of using the woody debris was to capture sediment during high flow storm events. An emergent wetland bankfull bench was incorporated into the design plan to provide fisheries and wildlife habitat. There are several rare dragonfly species which are found along this reach of the river and use the riverbank during emergence. The sediment deposition was monitored using bank pins, scour chains and staff gauges, and have been monitored for nine years to measure the rate of bank erosion and the sediment deposition which was captured by the woody debris.

Engineered woody debris log jams were built at a spacing of approximately 120 feet (36.5 m) on center and secured into the banks to anchor the planned sediment accretion formations. Native willow shrubs and emergent and aquatic vegetation were planted between the log jams to help in the retention of sediment, and to provide wildlife and fisheries habitat. Staff gages, and scour chains were installed vertically along the project's aquatic bench to measure accretion or deposition. To measure bank erosion, bank pins consisting of metal welding rods were installed horizontally into the banks. During the first year of monitoring, the woody debris structures accumulated as much as 30 inches (76 cm) of new sediment by reducing water velocity along the shoreline during flood events. Tropical Storm Irene on August 28, 2011 was a bankfull event which exceeded 110,000 cfs (3,114,853 lps) and submerged the bank and woody structures for over two weeks. Following the storm significant sediment was deposited and retained by the wood structures; there was no measured horizontal bank erosion. The accumulated sediment has permitted emergent vegetation to become established, which further protects the adjacent river banks.

4095 linear feet (1248 meters) of eroding river bank stabilized

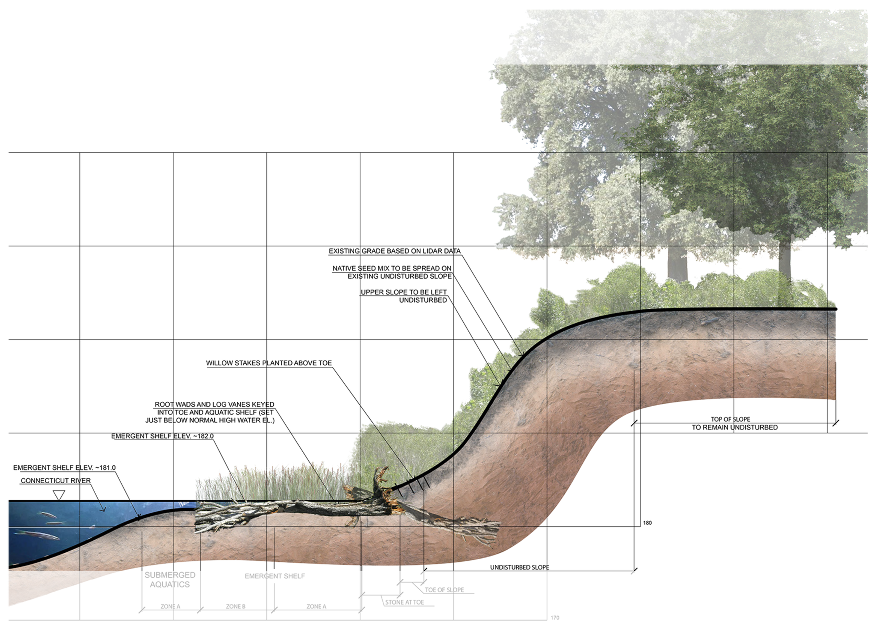


Map of the Turners Falls Pool showing town boundaries and major natural and human landmarks. The gray shaded areas are low meadows along the river that largely represent the extent of the active floodplain.

Building a new shoreline using stone, logs and plants - 1999

New shoreline - 2005 Post Construction

Site after four years



Riverbank section

Building engineered logs

Log construction

Log construction

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