

- Upper Fourmile Creek -

WALL STREET

Fourmile Creek Watershed

2013 Colorado Flood Recovery



COLORADO
Department of Local Affairs
Community Development Block Grant –
Disaster Recovery



COLORADO
Colorado Water
Conservation Board
Department of Natural Resources



United States Department of Agriculture
Natural Resources Conservation Service



Multiple Benefits

- **Protect life, property, and infrastructure**
- **Mitigate flood risk**
- **Enhance ecosystem structure and function**
- **Improve water quality**
- **Protect water supply and firefighting capabilities**
- **Protect historical structures**

Located 10 miles west of Boulder, the Wall Street community and surrounding Upper Fourmile Creek Watershed have experienced a sequence of compounding disasters in the last decade. In 2010, the Fourmile Canyon Fire burned 23 percent of the watershed, destroyed more than 160 homes, and left the watershed vulnerable to flooding. Typical summer thunderstorms over the burned area in 2011 and 2012 produced flash floods that transported a significant amount of sediment and debris into the creek corridor, plugging culverts and reducing the channel capacity. The following year, the September 2013 flood unleashed 13-18 inches of rain over the wildfire's burn scar, inundating the canyon with floodwaters, sediment, and debris. The flood destroyed local roads and homes built within the active creek corridor, and washed out every crossing in the Wall Street neighborhood. Some residents were stranded due to impassable roads and had to hike to a nearby ridge and await helicopter evacuation.

The primary objective of the Wall Street project was to remove flood-deposited sediment and debris from the channel and floodplains in order to increase the capacity of the creek corridor to convey future floodwaters, and provide locations for sediment from future events to be deposited away from homes and roadways.



Watershed
Fourmile Creek



Locale
Boulder County



Local Sponsor
Four Mile Fire
Protection District



Property Ownership
87% private
13% public



Project Cost
\$1,460,650



Construction Dates
Aug. 21 - Nov. 20, 2017
(92 days)

The Fourmile Watershed Coalition (FWC) formed in the wake of the flood to facilitate long-term recovery of the Fourmile Creek corridor. Through the Four Mile Fire Protection District, they secured federal and state funding to complete the Wall Street project in 2016.

Flood damage in the Fourmile Creek Watershed near the Wall Street project area (also note the burn marks on the trees on the hillside).



River Corridor Rehabilitation

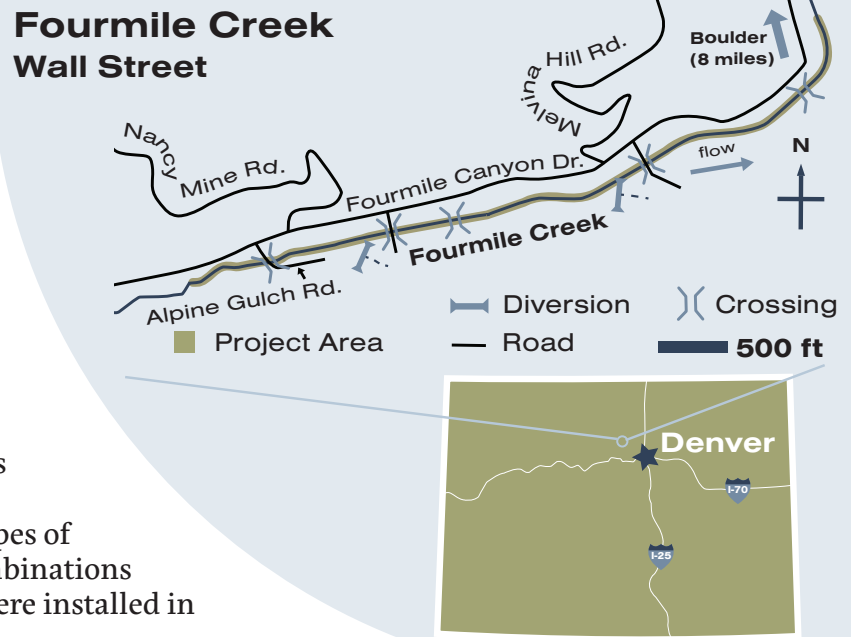
The Wall Street project was built to mitigate flood damage in the watershed by removing sediment and debris from the channel and floodplain. The project attempted to give the river room to adjust and protect assets at the margins of an active corridor to the greatest extent possible.

In select locations where bank protection was necessary, the project stabilized eroding and failing streambanks with several different types of bioengineering treatments, consisting of combinations of rock and plant materials. All treatments were installed in conjunction with live willow plants.

Large wood complexes include 5 or more overlapping pieces of large woody material to provide bank stability and aquatic habitat. **Rootwads** are single pieces of wood with intact rootballs, installed to slow or redirect stream currents and provide localized areas of increased bank cohesion. **Willow toes** are concentrated willow installations to provide resistance against erosion and lateral migration through root mass cohesion. **Boulder cobble toes** are features composed of large river rock and live willow plants intended to limit bank erosion during average flows. **Stacked boulder toes** consist of 1-3 layers of large angular rock stacked along channel margins with live willows planted near the foundation offering substantial protection against bank failure.

The Wall Street project revegetated nearly four acres of land in the creek corridor. Disturbed areas were stabilized with native plants that will provide multiple benefits as they establish.

The project also constructed two fish-friendly diversion structures that feed water to ponds used by the Four Mile Fire Protection District for fire fighting and wildfire mitigation activities.



Left: Willow toe, a bioengineering treatment, taking root along Upper Fourmile Creek.
 Top: One of two new diversion structures installed during construction of the Wall Street project.
 Bottom: Work to increase channel capacity.



Project Objectives

- Remove sediment to provide storage locations for future sediment pulses
- Stabilize streambanks, streambeds, and floodplains to protect against damage to homes and infrastructure
- Restore the stream discharge capacity to pre-flood levels where feasible
- Remove flood debris and trash from the riparian corridor
- Establish vegetative cover on critically eroding land
- Improve water quality by reducing sediment from bank erosion
- Enrich riparian habitat via addition of topsoil, seeding, and native vegetation
- Enhance aquatic habitat through increased complexity, vegetation, and water quality

Before



After



Infrastructure Protection

Upper Fourmile Creek undercutting a road embankment and electrical pole.

Upper Fourmile Creek was realigned to protect the roadway and utility pole.



Pond and Water Diversion

Failing pond embankment and ad-hoc water diversion.

Formalized diversion structure was moved upstream to a more stable location, and the pond embankment was stabilized.



Flood Deposits & Realignment

Flood deposits in the Upper Fourmile Creek corridor.

Flood deposits removed, channel realigned, and floodplain revegetated in the Upper Fourmile Creek corridor.

BY THE NUMBERS

**project length:
5,400 linear feet**



**3,200 linear feet of
bioengineered streambanks**



**17 participating
landowners**



**5,657 container plants
installed**



**2 diversion
structures rebuilt**



**6,569 willow & cottonwood
live stakes planted**



PROJECT TEAM

Numerous additional concurrent construction activities occurred within the Wall Street project boundaries, including: reconstruction of Fourmile Canyon Drive by Boulder County, replacement of three private bridges, County buyout of one property, and multiple private landowner projects. Successful implementation of the Wall Street project involved significant coordination with the Boulder County road and bridge projects, with all parties collaborating to maximize efficiencies and share designs and data.

The Wall Street project was funded by the Colorado Water Conservation Board (CWCB), Natural Resources Conservation Service (NRCS) Emergency Watershed Protection (EWP) Program, and Department of Local Affairs (DOLA) Community Development Block Grant - Disaster Recovery (CDBG-DR) Watershed Resilience Pilot Program. CWCB provided technical assistance throughout project design and execution.

Partners

Private landowners
 Four Mile Fire Protection District
 Boulder County Transportation
 Pine Brook Water District
 Colorado Water Conservation Board (CWCB)
 Colorado Department of Local Affairs (DOLA)
 Natural Resources Conservation Service (NRCS)

Contractors

Watershed Science and Design
 Edge Contracting
 AlpineEco
 Resilient Watershed Partners (RWP)

FOR MORE INFORMATION

Maya MacHamer, *Watershed Coordinator*
 Fourmile Watershed Coalition
 fourmilewatershed@gmail.com
www.fourmilewatershed.org www.ColoradoEWP.com

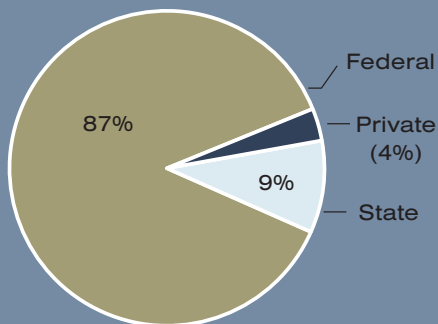
The creek was moved away from a failing roadway embankment and completely reconstructed. The rebuilt channel enhances the reach's ecological value, and its location should significantly reduce flood impacts to the roadway.



BUDGET

TOTAL: \$1,460,650

Project Funding by Source



Project Cost Breakdown

