

NORTH FORK

Big Thompson Watershed

2013 Colorado Flood Recovery



COLORADO
Colorado Water
Conservation Board
Department of Natural Resources



United States Department of Agriculture
Natural Resources Conservation Service



BIG THOMPSON
WATERSHED COALITION



Multiple Benefits

- **Protect life, property, and infrastructure**
- **Mitigate flood risk**
- **Expand recreational opportunities**
- **Improve water quality**
- **Enhance ecosystem structure and function**
- **Bolster economic development and enrich tourism opportunities**

The North Fork project is located at the confluence of the North Fork and main stem of the Big Thompson River near the Town of Drake. Set in a natural opening in the canyon, the North Fork reclaimed historic channel pathways and deposited large quantities of sediment during the 2013 Colorado flood. Storm Mountain Bridge at the upper project boundary was flanked by flood flows, while the Highway 34 bridge at the downstream end was completely blocked by sediment and debris. Additionally, public and private infrastructure built within the river corridor, including campground buildings, private residences, a hotel, and a roadway embankment, were damaged by these natural river processes. Restoring immediate access was a top priority after the flood, but emergency measures executed without a holistic vision left the reach severely degraded and in need of significant additional investment to repair.

The North Fork project sought to reduce the impacts of moderate flood events on public infrastructure, private property, and businesses at this dynamic river confluence. Sediment and debris were removed to improve flood conveyance, streambanks were stabilized using innovative bioengineering techniques, and river corridor restoration was attempted through native riparian revegetation and reintroduction of large wood.

Through funds procured from federal, state, and local sources, Larimer County and the Big Thompson Watershed Coalition (BTWC) were able to improve resiliency within the project reach. The project design was based on new technical analysis and refined with input from local stakeholders.



Watershed
Big Thompson



Locale
Larimer County



Local Sponsor
Larimer County



Property Ownership
100% private

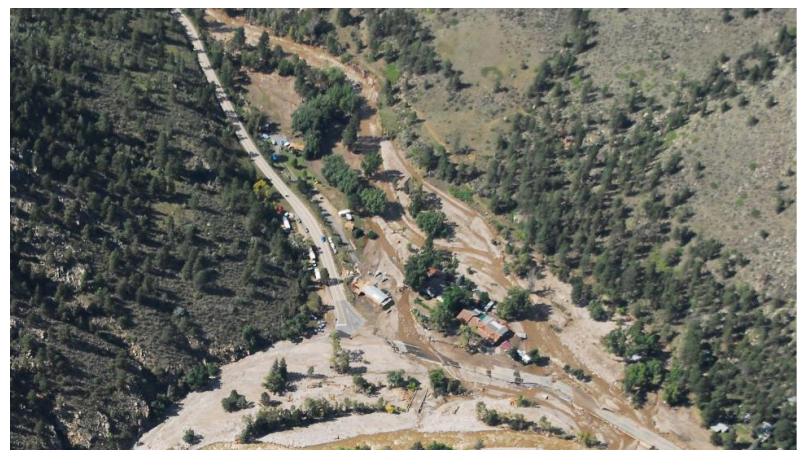


Project Cost
\$1,607,213



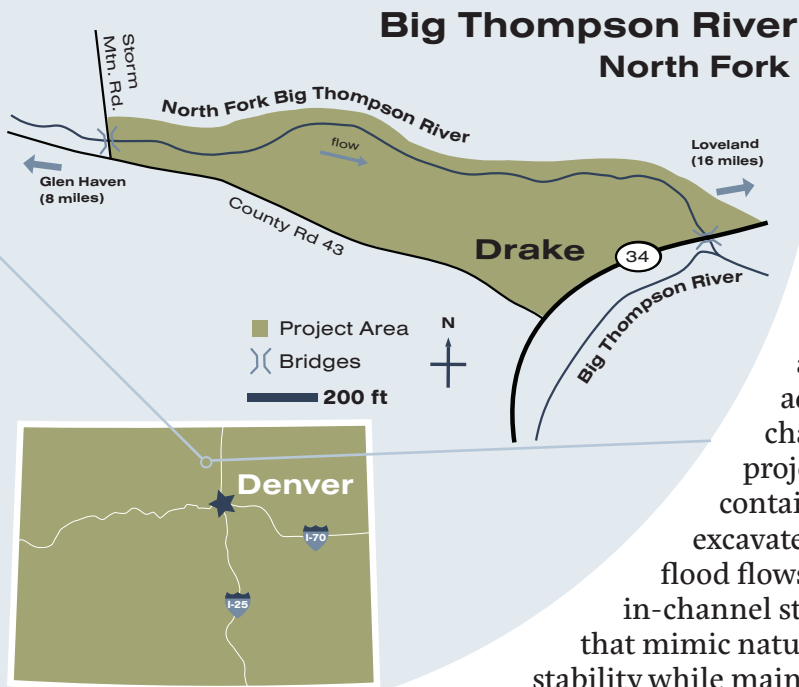
Construction Dates
Feb. 1, - Apr. 28, 2017
(87 days)

Confluence of the North Fork and Big Thompson River at Drake immediately following the flood.



River Corridor Rehabilitation

The North Fork project attempted to provide an innovative solution in a dynamic environment. The design seeks to provide maximum boundaries at which the river channel can move, erode, deposit sediments, and change where possible. Natural channel adjustment of the low-flow and bankfull channels is welcome and even encouraged by the project design. Because large flood flows cannot be contained with the channel, an overflow channel was excavated and guidebanks were added to direct future flood flows around critical infrastructure. Engineered in-channel structures are designed using native materials that mimic natural bed forms in order to sustain long-term bed stability while maintaining the natural elements in the system.



Whenever possible, plant materials were incorporated into engineered structures (bioengineering), as the combination of rock and roots will not only add strength to the structures, but will also provide long-term ecological and physical benefits to the stream. Large wood was reintroduced into the channel and floodplain to provide habitat complexity and direct erosive energy towards desirable locations. Bioengineering treatments will also direct small scale erosion and deposition away from sensitive locations.

Since completion of the project, BTWC and Larimer County have been working together on long-term stewardship of the project area through volunteer revegetation projects, collaboration on adaptive management efforts, and work with the State on long-term project effectiveness monitoring to assess changes in river health and watershed resilience.

Project Objectives

- Stabilize streambanks to protect against additional damage to existing infrastructure
- Establish cover on critically eroding land
- Increase the capacity of the stream channel and floodplain
- Improve water quality through the reduction of sediment loading caused by bank erosion
- Enhance riparian habitat through revegetation
- Improve fish habitat through revegetation, improved water quality, and better in-stream habitat complexity

Above: Low-flow pool and riffle features, combined with a roughened floodplain and buried rock structures, work in concert to improve aquatic habitat while providing relative stability to the river channel. Engineered structures were built by incorporating available native material and plants into the features to promote natural ecosystem function.

Right: Spring 2018 at the North Fork site as revegetation efforts begin to take root.





Post-Flood

Looking upstream at the North Fork of the Big Thompson River from the US 34 bridge 2 months after the flood (November 2013). The flood altered the channel alignment from its pre-flood location and deposited massive amounts of sediment and debris. Development in the channel's native corridor led to widespread damages. Photo: Bill Spitz



Post-Emergency Work

Looking upstream at the North Fork from the US 34 bridge after emergency work was completed (December 2016). Efforts undertaken in the months following the flood to quickly protect damaged structures from future floods resulted in a channelized ditch with riprap on both sides. The emergency repairs may have provided some emotional comfort but offered very little long-term relief and even less ecological benefit.



Post-Project

Looking upstream at the North Fork from the US 34 bridge after project construction (July 2018). The project removed sediment and debris to increase the river corridor's size. It also created riffle/pool habitat, planted the site with native vegetation, and realigned the channel for improved floodplain access and a better approach to the bridge. The structures installed are intended to provide bank protection and grade control while allowing for natural shifting of the low-flow channel.

BY THE NUMBERS

project length: 2,100 linear feet



5 in-stream structures



1,150 linear feet of overflow channels & berms



2,500 linear feet of bioengineered streambanks



3,000 cubic yards of sediment removed



899 container plants



3,636 willow & cottonwood live stakes



- PROJECT - TEAM

The North Fork project was sponsored by Larimer County, who also completed reconstruction of County Road 43 and associated river restoration work in this watershed. The rock cuts for the road reconstruction generated excess rock that Larimer County contributed to the North Fork project for use as riprap and boulders. The North Fork project used nearly 6,000 cubic yards of this rock (valued at more than half a million dollars), far exceeding the local sponsor's obligation to provide 12.5% of the project's construction cost as match. Larimer County's contribution enabled this project to be executed quickly and without the need to search for additional funding.

Stakeholder engagement, design work, and construction oversight were completed in cooperation with the Big Thompson Watershed Coalition, Colorado Water Conservation Board (CWCB), and Natural Resources Conservation Service (NRCS).

Partners

Big Thompson Watershed Coalition
Colorado Water Conservation Board (CWCB)
Natural Resources Conservation Service (NRCS)

Contractors

Muller Engineering Company
Connell Resources
Resilient Watershed Partners (RWP)

Willow cuttings soaking in preparation for installation during construction of the North Fork project.

FOR MORE INFORMATION

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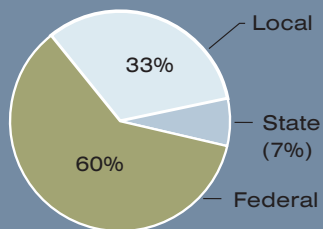
www.ColoradoEWP.com



BUDGET

TOTAL: \$1,607,213

Project Funding by Source



Project Cost Breakdown

