

# Colorado



Colorado Emergency Watershed  
Protection (EWP) Program

## Emergency Watershed Protection (EWP)



**COLORADO**

Colorado Water  
Conservation Board

Department of Natural Resources

**“This was a new way of doing business. We took a different, more holistic approach and we’re excited to see the results on the ground.”**

**-Kevin Houck, CWCB**



## **Watershed Flood Recovery**

- **Protect life and property while restoring ecological processes that connect land and water**
- **Complete recovery work on a watershed scale**
- **Support early planning to identify root issues, develop holistic solutions, and allow time to secure appropriate funding**
- **Support watershed coalitions as a model for stakeholder engagement**
- **Execute projects with multiple objectives**
- **Incorporate resiliency into every project**



# Watershed Flood Recovery Timeline

2013 Flood

SEPTEMBER 2013



Emergency  
Response and  
Repairs

SEPTEMBER/OCTOBER 2013





## Master Planning Begins

January 2014



## Project Identification and Scoping

2014-2015

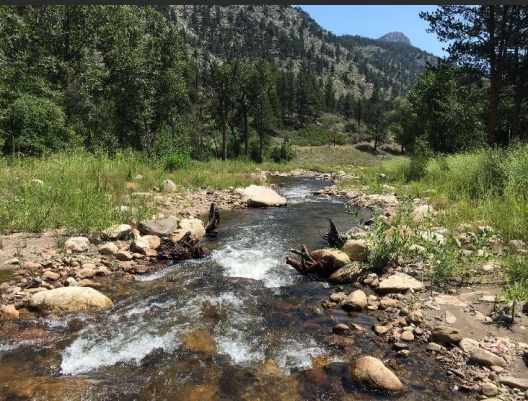


## Design and Permitting

2016







## Major Construction Completed

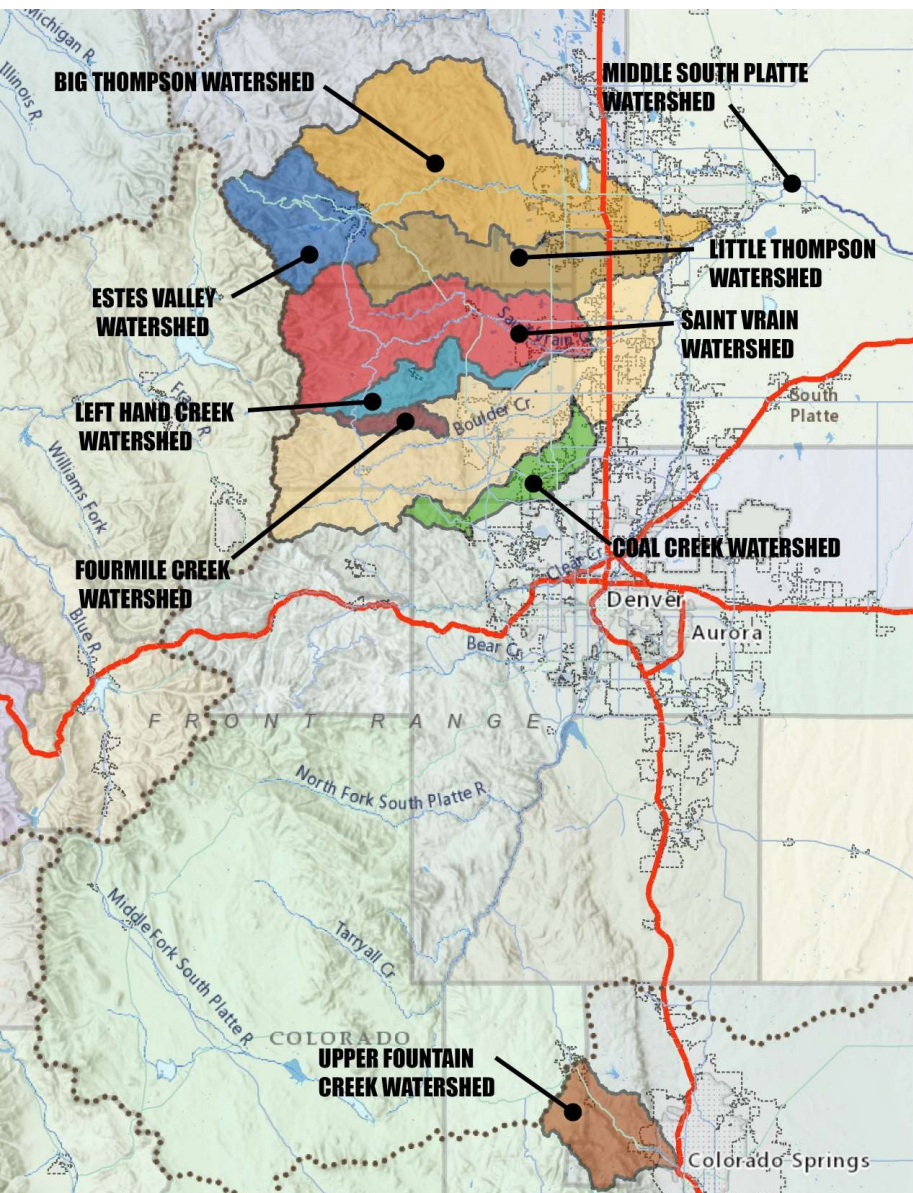
May 2018



## Major Construction Begins

January 2017





## Watershed Coalition Building

- Organized stakeholders (landowners, local gov't, water districts)
- Managed Federal, State, and local recovery funds
- Shepherded permits and environmental compliance
- Hired designers and contractors to construct projects
- Partnered with State to monitor and maintain projects



# Flood Recovery Master Planning

- **Master plans:**
  - Defined each watershed's vision for recovery
  - Enhanced the community's understanding of the river corridor and associated risks.
  - Provided conceptual designs and cost estimates
  - Prioritized projects
  - Fostered consensus-driven and technically sound solutions





# Flood Recovery Funding Programs

NRCS Emergency  
Watershed Protection  
(EWP)

Watershed  
Resilience Pilot  
Program

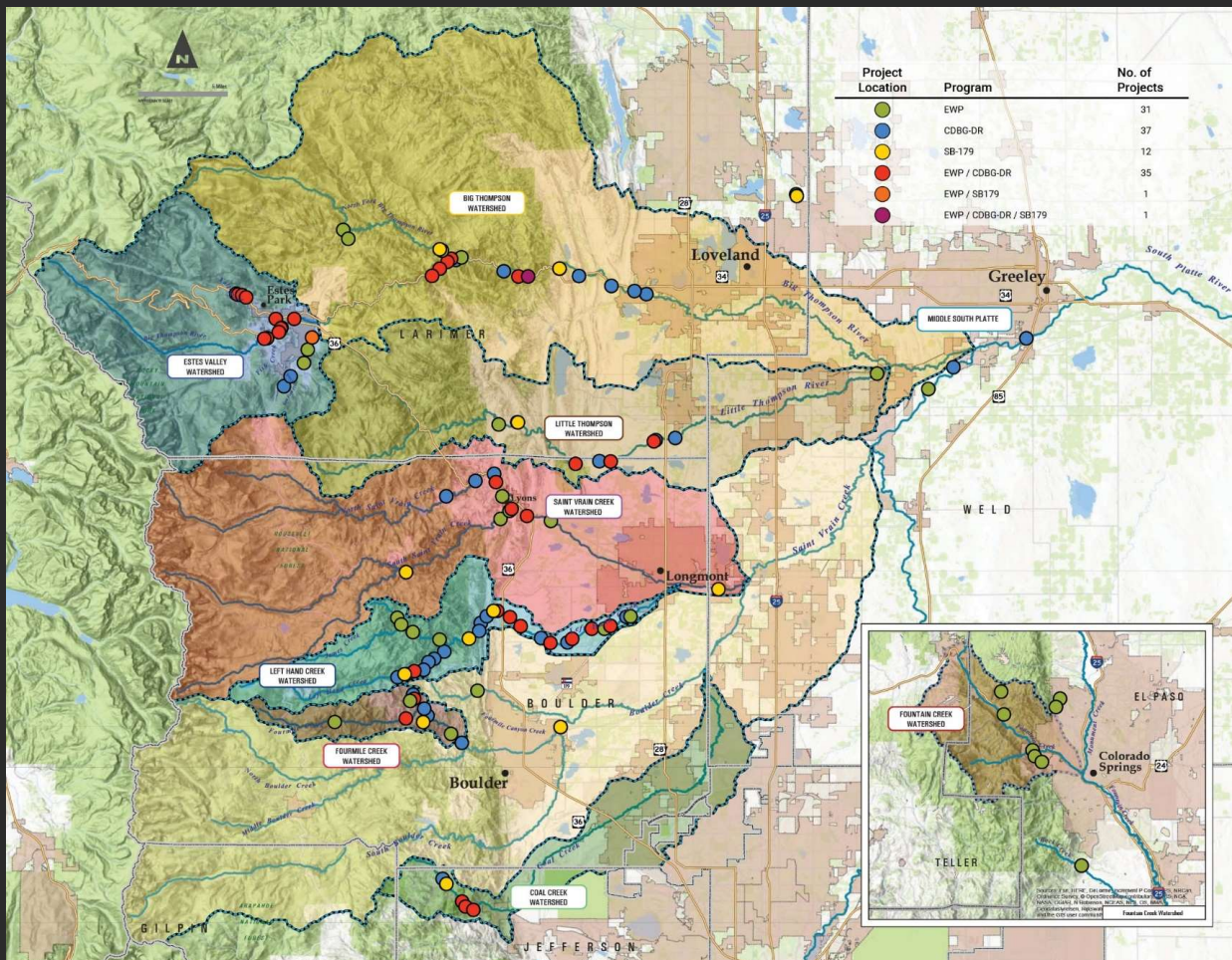
Senate Bill 14-179

Other Programs





## By the Numbers



- **117** total flood recovery projects completed (68 EWP)
- Total construction costs of over **\$70 million** (~\$50 million EWP)
- Over **\$270 million** – value of infrastructure and private structures protected
- **65 miles** of river and floodplain improvements implemented (40 miles EWP)
- **12** watershed master plans finalized
- **34** resiliency planning studies completed
- **23** comprehensive recovery planning studies completed
- Over **700** private property owners engaged
- **\$4.2 million** across 10 coalitions for capacity building staffing grants. CWCB supplemented this with an additional \$400,000.





## Watershed Approach

- Physical and ecologic concerns addressed
- Proposed solutions contemplated the need to not transfer problems
- Natural geomorphic processes and river function provided the basis for flood mitigation
- This design approach incorporated:
  - Planned depositional zones,
  - Natural woody materials,
  - Extensive vegetation and biostabilization
  - Provided space for the river to move (when feasible)





## Enhancing the Environment

- Incorporation of bioengineering techniques
- Channel sections that considered the hydrology and hydraulics for low flows, annual flows, and flood events
- Aquatic, riparian, and terrestrial habitat enhancement using plants and other native materials
- Revegetation with native plant species in abundance and diversity
- Removal of invasive species, such as crack willow (*salix fragilis*), that created debris blockages during the flood



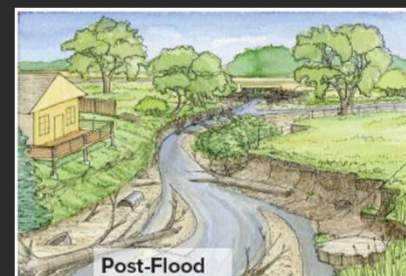
## A Model for Other Communities

- Improvements were evaluated beyond political boundaries
- Capacity was established for future disaster recovery
- Resources will become reference and guidance documents for future efforts
- Projects are being monitored for effectiveness



# Flood Recovery Resources

- Colorado Emergency Watershed Protection (EWP) Program Success Stories
- Stream Stewardship and Recovery Handbook
- Resilient Crossings Handbook
- Adaptive Management Guide
- Plant Restoration Matrix
- Living Streambanks: A Manual of Bioengineering Treatments for Colorado Streams
- Flood Recovery Project Monitoring Methods
- Technical Guidance: Revegetation Plans for Stream Restoration Projects
- EWP Program 2013 Colorado Flood Recovery Phase 2 Project Engineering Guidance



Post-Flood



Large flood event caused widespread inundation of the floodplain. The stream exceeded its banks and extended to the surrounding floodplain causing damage to private property as well as roads, bridges and multi-use paths.



The stream avulsed to create new flow paths. Sediment and debris disrupted or destroyed instream form (riffle features). Sediment deposits altered channel hydraulics (cross-section and gradient). Lateral instability during the flood caused excessive bank erosion.



Large amounts of sediment delivered from the upper watershed caused a sediment imbalance. Sediment transport is not in equilibrium due to large disruptive event. Trash and debris mobilized within the stream channel.



The stream has felled trees adjacent to its banks. More woody debris exists in the channel after the flood. Vegetation within the riparian zone is disrupted, initiating large event-based changes in riparian habitat. Water quality condition is worse than pre-flood due to elevated turbidity, suspended sediment, and poor vegetation conditions. Macroinvertebrate community is likely damaged from high flows and sedimentation.



Restoration



The flood highlighted the loss of connection between the stream and the floodplain. Roads restored or replaced. Dredging completed around bridges to restore flow capacity. Bridges replaced as needed.



Restoration projects focused on bank restoration (lateral stability) and adjusting the stream grade (vertical stability) via drop structures (riffle sequences). Channel cross-section restored / improved to restore the stream's hydraulic capacity. Secondary channels allow for the transport of high flow.



Upper watershed no longer delivering large sediment loads. Sediment from bank erosion is returning to normal due to restoration project. Stream is working to return to equilibrium conditions for sediment transport.



New vegetation planted as part of bank stabilization, which has helped to improve water quality. Instream stream features restored. Trees and large wood removed from the stream which in some cases degraded instream conditions. Restored habitat includes planting native plant species and removing invasive or non-native habitat.

[coloradoewp.com](http://coloradoewp.com)



# Watershed and Project Summaries



## BIG THOMPSON RIVER WATERSHED FLOOD RECOVERY 2013-2018



## LEFT HAND CREEK WATERSHED FLOOD RECOVERY 2013-2018



## SAINT VRAIN CREEK WATERSHED FLOOD RECOVERY 2013-2018



## LITTLE THOMPSON RIVER WATERSHED FLOOD RECOVERY 2013-2018



## FOURMILE CREEK WATERSHED FLOOD RECOVERY 2013-2018



## ESTES VALLEY WATERSHED FLOOD RECOVERY 2013-2018



## COAL CREEK WATERSHED FLOOD RECOVERY 2013-2018



[coloradoewp.com](http://coloradoewp.com)

# Preparing for the Next Flood

Colorado Hazard Mapping Program (CHAMP) - Senate Bill 15-245

Flood Hazard Mapping  
Program

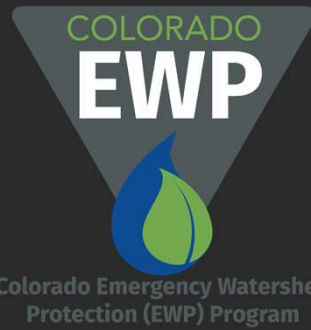


Fluvial Hazard Zone  
(FHZ) Mapping Pilot  
Program



Debris Flow Mapping  
Program





# Project Before and After Photos



# North Fork of the Big Thompson

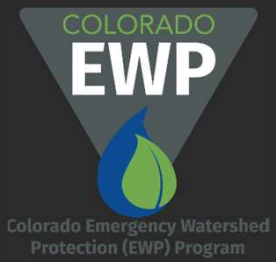


**Post Flood**



**Post Project**

1. Sediment removal to provide conveyance and create riparian corridor.
2. Large wood structures provide bank protection, improve complexity and create habitat.
3. Constructed riffles, pools, and boulder cascades provide a complex channel that can better absorb velocity at high flows and provide habitat for fish and wildlife.







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# Bielins-Hock Open Space



**Post Flood**



**Post Project**

1. Sediment removal and floodplain connectivity
2. Backwater pool improves habitat
3. Preserve existing vegetation
4. Grading and soil lift installation to stabilize banks
5. Buried rip-rap setback to protect infrastructure





COLORADO EMERGENCY WATERSHED PROTECTION PROGRAM PHASE II  
CDBC - DISASTER RECOVERY WATERSHED RESILIENCE PILOT PROGRAM  
SENATE BILL 14-179

## COLORADO WATERSHED FLOOD RECOVERY 2013-2018



# Thank You for Your Dedication and Support!