Watersheds, Streams, & Highways: Resiliency in Disaster Recovery Through Partnerships and Innovation

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Examples of Colorado Flood Events

- 10’s – Cherry Creek in Denver ($161 million, 2 deaths)
- 20’s – Arkansas River at Pueblo ($1.02 billion, 78 deaths)
- 30’s – Monument Creek ($69 million, 18 deaths)
- 50’s – Purgatoire River at Trinidad ($48 million, 2 deaths)
- 60’s – South Platte River in Denver ($2.95 billion, 8 deaths)
- 70’s – Big Thompson Canyon ($114 million, 144 deaths)
- 80’s – Heavy Snowmelt Runoff 1984 ($63 million, 2 deaths)
- 90’s – Fort Collins, Sterling, Lower Arkansas River ($518 million, 6 deaths)

• **00’s – No major disasters, but damages occurred**

All values are in 2010 dollars

Since 1900, the AVERAGE annual flood losses in Colorado is over $57 million. Nearly 400 lives have been lost.
Who is responsible for R’ing the stream?
Hey man, like why worry? Let mother nature do her thing.
CWCB Flood Recovery Team

- Local Stream Coalition Development and Coordination
- Watershed and Stream Master Planning
- Technical Support for exigent stabilization projects
- Develop Strategy for Multi-Objective Diversion Design/Construction
- Technical Support - Stream Restoration Design/Implementation

There's no heavier burden than a great potential! - Linus
Watershed Coalitions

- Estes Valley Watershed Coalition
- Big Thompson River Restoration Coalition
  - Little Thompson Watershed Restoration Coalition
  - St. Vrain Creek Coalition
- Fourmile Watershed Coalition
- Left Hand Watershed Oversight Group
  - Coal Creek Canyon Watershed Partnership
- Middle South Platte River Alliance
- El Paso County Regional Watershed Collaborative
Watershed Coalitions

- Funders
- Farmers/Ranchers
- Recreation
- Coordinator
- Consultants/Contractors
- Academics
- Volunteers
- Government
- Citizens
- Conservation Community
Post-Flood Watershed Master Planning

Delineation of 100 year, bankfull, and low flow channel/floodplain

Conceptual channel design

Project prioritization and cost estimates

Elements to include:

Channel Stabilization
Channel Location
Flood Control
Floodplain Preservation/Restoration
Aquatic and Terrestrial Habitat Restoration
Water Supply Diversion Reconstruction with Multi-Objective Function
Highway 7 Washout
Photo by Estes Park News
Highway Washouts in Estes Park
Photo from Twitter by @KDVR
Moving road on to bedrock
CASE STUDY: CDOT River Restoration
CDOT River Restoration

PROPOSED REPAIR TYPICAL SECTION

EXISTING GRADE

NON-GROUTED RIPRAP TOE PROTECTION

GROUTED CLASS 8 RIPRAP

36'

10' MIN.

1:4

BEDROCK

CLASS 2 RIPRAP FILTER

GEOTEXTILE TYPE IV-B

ROOT WAD BANK STABILIZATION

100-YEAR FLOODPLAIN

2-YEAR FLOODPLAIN

LOW FLOW

5' MIN.

1.5' MIN.

NATIVE REVEGETATION

12" SOIL DEPTH

GROUTED RIPRAP
Working the River and Road Together
HWY 36

- Moved road over
- Moved river back
- Room for river to spread out
- Reinforced banks
- Root wads
Probable Cost of Stand Alone River Project - $1,300,000

Actual Cost - $192,000

10,755 Linear Feet of Restoration on two rivers: North St. Vrain and Little Thompson
Compound Channel
Protecting the stream and the road

BEFORE

AFTER
Reshaping the Channel

BEFORE
Connecting the Channel with the Floodplain

AFTER

Coming Soon – HWY 34!
Floodplain at work
Technical Support for exigent stabilization projects
CDOT & CWCB Partnership

• Started meeting in November 2013.
• Recognized an unmet need for design hydrology for the permanent repair projects.
• Identified seven Flood Affected Watersheds that are critical to CDOT’s re-construction efforts.

• Watersheds
  • Big Thompson River
  • Little Thompson River
  • St. Vrain Creek
  • Lefthand Creek
  • Boulder Creek
  • Coal Creek
  • South Platte River
Key Messages

- CWCB/CDOT Partnership
- What kind of event did we experience in September 2013?
  - Collected numerous Peak Flow Estimates from the event
  - Comparing these flow estimates to the revised Hydrology
- The flood served as a catalyst for large scale updates
- Updated and consistent Hydrology is already helping local communities
- Higher level of risk than the existing Flood Insurance Studies indicate
- Resiliency through improved floodplain maps and better information for the Local Communities to use
Scope of the Hydrologic Evaluations

1. Estimate peak discharges from September 2013 flood and compare to current regulatory discharges.

2. Prepare rainfall-runoff model and calibrate to 2013 event.

3. Update flood frequency analyses.

4. Use rainfall-runoff model to estimate predictive peak discharges based on NOAA/NRCS design storms.
CWCB Flood Recovery Team
Technical Support – Stream Restoration
Design/Implementation
100 Year Floodplain

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