

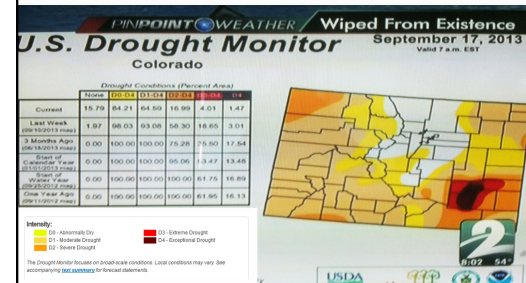
Surviving the Deluge: Colorado's Flood Recovery

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"Our state is experiencing a natural disaster the likes of which has not been seen in our lifetime." CDOT

September 11th started it all...

- 8 days ~ 1,000-year rain ~ 100-year flood
- Flooding affected 24 counties
- 9 people lost their lives
- \$2 billion in property damage



Snow equivalent –
160-200 inches of
snow in same time
period (~8 days).

Mountain snowfall
~200" annually

Flood Recovery

Historic Rainfall/Damage

- Adams County – over 15 inches (*annual Avg. 14.85 inches*)
- Boulder County – over 18 inches (*annual Avg. 19.30 inches*)
- El Paso County – over 11 inches (*annual Avg. 21.09 inches*)
- Larimer County – over 12 inches (*annual Avg. 16.98 inches*)
- Washed out roads severed multiple cities from the rest of the state



State Highway 257 near Johnston

Immediate Goals

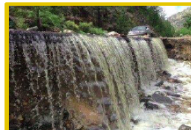
- Restore access by December 1, 2013
- Temporary repairs to restore mobility
- Reconnect communities

Long Term Recovery

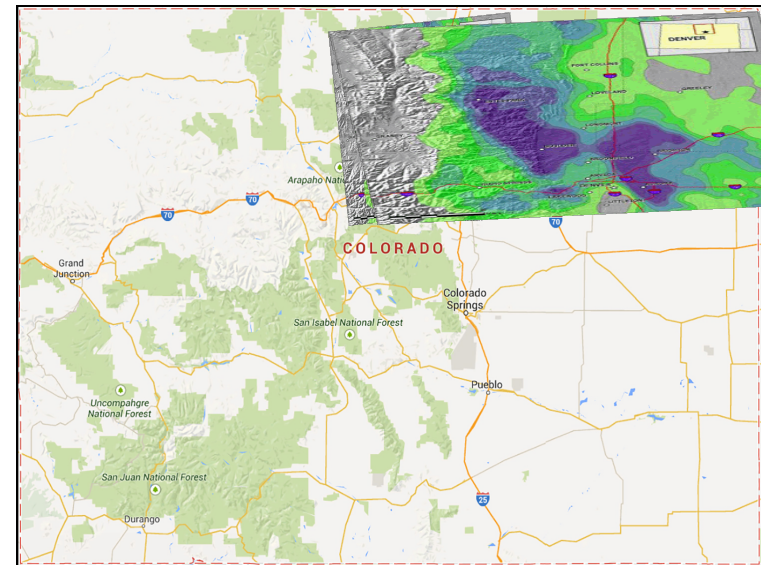
- Total costs estimated at over \$400M (includes state system only)
- Local road costs currently undetermined

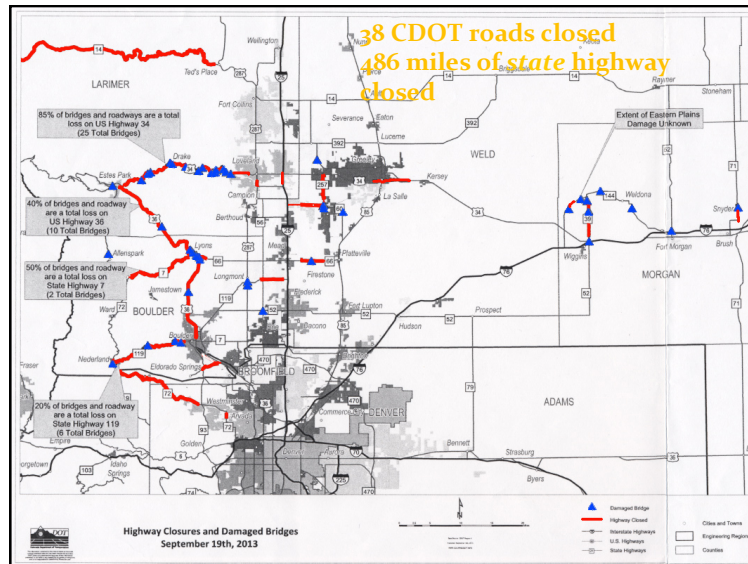


U.S. Highway 34 near Drake



National Guard at U.S. 36





- 30 mi stretch between Loveland-Estes on US 34 - 85% road & bridges total loss
- Flood went over retaining wall and washed out a hole on other side 35 ft deep
- Flood dropped bottom of river 4 feet - visibly missing under footings
- Large boulders have been deposited at opening of the canyon - now being excavated and reused as rip rap

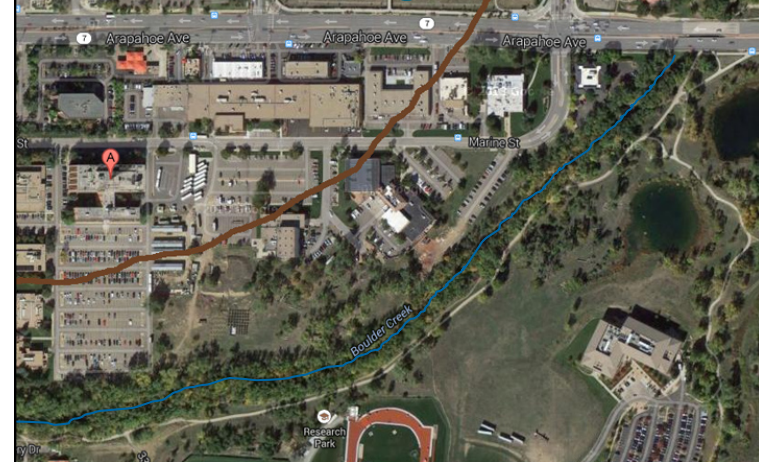


U.S. Highway 34, Big Thompson Canyon

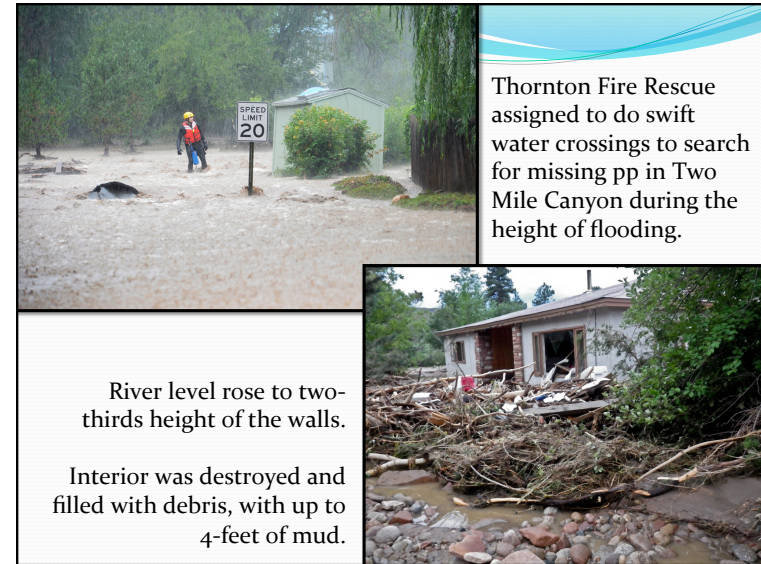
Peak Flow Estimates

- Some of the peak flows measured 5 x 100-yr flood event
- **Highest** - North Fork of the Big Thompson River **18,400 cfs**
- Little Thompson River at Pinewood Springs - **14,600 cfs**
- West Creek upstream of Glen Haven - **11,000 cfs**
- Buckhorn Creek upstream of Masonville - **11,000 cfs**

LTAP Office along Boulder Creek










Colorado Springs – Fire & Flood

- **Waldo Canyon Fire – July 2012**
 - 18,247 acres burned, 346 homes destroyed
 - Most destructive fire in CO history, by # of homes destroyed, UNTIL...
- **Black Forest Fire – June 2013**
 - 14,280 acres burned, 511 homes destroyed
 - After just 2 days – Most destructive fire in Colorado history





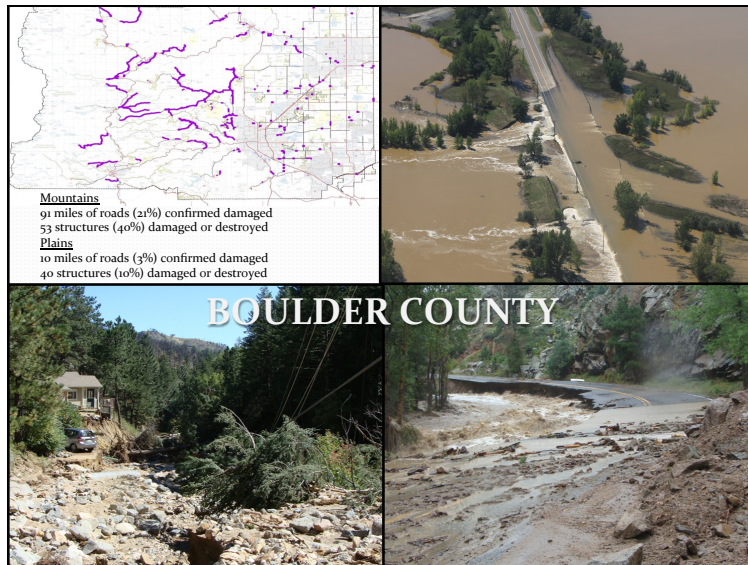

Local Agency Efforts – Larimer County

Unprecedented Damage County Wide

- **65** bridges significantly damaged or destroyed
 - **25-30** miles of roadway completely obliterated
 - **2,000+** properties without access
 - **Repair estimate \$100 million**
- 'Normal Year':
- 2-3 bridges
 - 1-2 miles of roadway
 - **Transportation budget \$20 million**

Local Agency Efforts – Larimer County

- Coordination Challenges
 - 1 Road – Town/County, Utility Co, Sanitary Sewer, Trails (Rec District), Fish Creek (Corps), Reimbursement (FHWA & FEMA)
- Can I rebuild?
- Will you buy me out?
- Will you put the river back?
- Will you put fill back?
- Can I put fill back?
- Where's the floodplain?
- Will you do a master plan?
- Who gets to decide?



Local Agency Efforts – Boulder County

• High Hazard Debris Problems

- We don't own the land over which creek runs + someone else owns water = disjointed management ownership
- **Emerald Ash Bore Quarantine** – couldn't haul out any wood; had to grind up fine before removed
- **Private Access Permitting** – 940 signed rights of entry to access property
- 157 damaged private access bridges
 - Private Access options for long term decisions – How to rebuild temporary access bridges if final road design will be wider/higher, etc
- Reimbursement based – County acting as bank



Local Agency Efforts – *Historic Jamestown*

- Unprecedented **14" of rain in 48 hours** and mudslides destroyed the major infrastructure (water, sewer, roads)
- Water treatment plant inoperable and fresh water supply compromised
- River moved 200 yds and carved a new path down Main St taking roads and bridges downstream with it

"Are we rebuilding all our town structures, or are you going to help us move the river back?"

• What happens downstream?

- Multiple stream owners
- Perspective of ROW if no more road

<http://www.rebuildjamestownco.org/>



Local Agency Efforts – *City of Longmont*

- Cut in half by 500-year flood St. Vrain Creek + 100-year flood Left Hand Creek
- Combined flow rate in city peaked at 27,800 cfs
- Several traffic bridges washed away
- Primary irrigation ditch diversion structures destroyed
- Wastewater treatment plant flooded and closed
- **Public Works Emergency Response & Post Flood Recovery**
 - Road and bridge closures; then inspecting bridges for reopening
 - Measuring high water levels
 - Evacuating subdivisions
 - Shutting down wastewater treatment plant
 - Reconstructing channels to re-route the river
 - Jetting storm sewer systems & plowing mud off roads
 - Regrading slopes to mitigate undercutting of banks
 - **Rented all the large trash dumpsters in the state for trash removal**

Local Agency Efforts

City of Westminster

- A lot of dam and embankment inspections
- Key thing for helping during the flood:
 - *"Listen to their impacted stories."*

City of Loveland

- Key – FEMA Mock Disaster Scenario Training (Maryland)
- Purchased building to establish a *Disaster Assistance Center*
- Within 36-48 hours, PW + Fire + Police visited 3 shelters
 - *"The water's not safe to drink, but what about my livestock?"*
 - *"Are they going to take my kids away because I don't have a house?"*
 - Remember – We're in the "People Business"

"Nobody cares how much you know, until they know how much you care"

Local Agency Efforts – Weld County



- **St. Vrain River** breaching banks creating 300' wide by 25' deep cavern across CR 13
- 12 days severe flooding caused closure of 160 roads, affecting more than 650 lane miles of road & 25 bridges
- Occurred at start of harvest season - Weld County is #1 producer of agricultural products in Colorado.
- Weld County received assistance with road repairs by Douglas, Mesa, Alamosa, Pitkin, Otero, Prowers and Las Animas Counties.
- Extreme damage to utilities including gas lines, fiber optics and power lines.

Local Agency Efforts – City of Fort Morgan



- Flooding of the **South Platte River**
 - Biggest impact on city's 300-acre Riverside Park - River breached protective levees - Ballfields, trails, parking, shelters, facilities destroyed by deep rushing water.
- Public Works crews heavily involved in emergency response during flood incident.
- During Night - streets and parks crews erected barricades and assisted law enforcement with traffic control to ensure public safety.
- Heavy Equipment crews cleared huge piles of debris trapped against the only bridge in Morgan County that survived intact.
- Quick debris removal response by City PW restored a vital connection between N-S halves of county isolated by flooding.

Being Prepared to Respond - CDOT

- Needed to start "Emergency Response" – but wasn't sure what that needed to be
- Incident Command Center (ICC) setup in Loveland, CO just for transportation response and recovery – **Unprecedented**
 - Everyone located under one roof
- Received a request for damages, total cost, # lost roads & bridges **on Day 3**
 - Hadn't even been in canyons yet to assess damage
- Build relationships w/Emergency management offices
 - Communicate - National Guard dispersed but didn't show up at IC center

Be Prepared for Recovery - CDOT

- 1000 structures inspected; 242 affected
- \$535 million estimated damage to CDOT facilities
 - Local Agencies sustained \$152 Mil in damages (on federally funded roads)
- 486 Miles of state highway closed
- 200+ Bridges and culverts damaged
- 120,000 cubic feet of debris removed by CDOT
- Stranded statistics worse than Hurricane Katrina; Air lift efforts largest evacuation in the country since Katrina in 2005

“Make a decision and set a goal – whether everyone in the room believes in it or not.”

- 100% roads reopened *before* Dec 1 deadline, but only 1/3 through the process

**100%
Reopen**
November 26,
2013

- Response (Sept-Dec)
- Recovery
- Reconstruction
- “About Colorado”



Risk in Reconstruction

- Moving highway inland away from river 20-ft avg; range 5 - 50 ft
- Removal of 210,000 cubic yards of mat'l
- Material will be recycled –
 - Stabilize the embankment below the highway
 - Stabilize the river channel
- Leftover Materials
 - Donated to Town & County reconstruction projects



Reconnecting Lives



BEST PRACTICES Preparing Locals for Natural Disaster Response

Lessons Learned

- VT – “You’re going to have a lot of angry people”
 - Ones chosen to work recovery and ones not chosen
 - Have good pp join the IC team, but have good pp stay home to run things there
- PTSD when workers go back to normal jobs
- ICC – Important to have a single point of contact
 - Assign roles and responsibilities for each person
- Dealing with FEMA vs. FHWA
 - FEMA wants in immediately to do assessments
 - FHWA wants the roads rebuilt
- Data Management & Document Control
 - Essential for audits and reimbursement from FEMA and FHWA
 - Built a unique GIS platform website

Lessons Learned

- Did everything by *Force Account* – Don’t do that, do *Bids*
- Consider Road and River together as a SYSTEM
 - Some places river moved 200-300 yards
- If river needs to be moved back - Property owner has decision making rights to say “I don’t want the water near me”.
 - A lot of back & forth of who wants their house by river and others that don’t.
- CWCB working with local communities to establish coalitions to develop WATERSHED MASTER PLANS
- County – getting remaining “Good” contractors to bid, difficult
- Rely on PARTNERS and those that can help you move forward.
 - “Inter-organizational relationships are critical.”

Preparing Local Agencies: *Training*

- **Classes Designed for Public Works 1st Responders**
 - Emergency response - multiple hazards that “1st responders” face
 - Preparedness - *personal*, *family* and *stress management*
- **Chainsaw/Chipper Safety** for safe clearing roads after the storm
 - Heavy Equipment and power lines
- **Agency of Natural Resources (ANR)** training on Flooding, Rivers and Emergency Management Incident Command
- Partner with State Police and State Homeland Security to provide **Incident Command Systems (ICS)** training; NIMS online
- **Unique Hazards of Working In and Around Floodwaters**
 - Pre-job hazard assessment, mitigation, first-aid, proper respirator use
- Attend courses with a **flood resiliency tie-in**:
 - Selecting good gravel road materials; effective erosion control; culvert assessment, sizing and installation; what are repair options??

Preparing for a Natural Disaster

- What will your agency do if you suddenly have to **cancel ALL services** in affected areas?
 - How will YOUR life be affected?
- Design a **Website** to convey important information/links to assist victims, municipalities, and private citizens
- **Establish a direct connection** to city, town and county agencies through a list serve, website, social media
- Develop in-state DOT and FHWA **relationships**
- Contacts w Contractors Assoc. – Local access to needed supplies
 - Ex: rip rap shortage
- Key factor - PARTNERS, PARTNERS, PARTNERS

Natural Disaster Best Practices

- Quickly rent equipment, culverts, dumpsters, etc.
 - 47 buses needed immediately to get people out
- Prepare for non-affected agencies wanting to **volunteer time and equipment**
- **Develop Clearinghouse of Procedures** – how to manage volunteers not familiar with your area/terrain
- **Radio public service announcement** to inform citizens of the nature and extent of the problem
- Stress value of **Mutual Aid agreements** between agencies
 - Agency log-in database to update available equipment

Natural Disaster Best Practices

- **Help train FEMA site inspectors** on gravel roads standards and acceptable maintenance practices
 - Inspectors able to assess damage and suggest reasonable repair strategies
- Asset and Maintenance Management **Software donations**
- Loan **digital cameras** to aid collecting photos for FEMA
- Geo-tag damage photos and map in Google Earth
- Excel customizable **Daily Work Task tracking sheet** for roadway departments
- Catalogue damaged areas using **mobile technologies (LiDAR)**
 - Change-Detection: analyzes before-and-after scenario to identify changes in the built environment (displace homes, underground pipelines, aerial energy, etc.)

Emergency Management Plans

- **Continuity of Operations Plan (COOP)** –
 - Documents overarching strategy, policies, and procedures required to support the agency during an emergency situation.
 - Coordination of State, local and tribal governments *and private sector*
 - Continuity of Government Operations – Where? Who? Essential functions
- Encourage agencies to review/revise emergency plans after dust settles
- Update them to reflect the big issues experienced - lack of electricity; lack of fuel; shelter for workers; security, etc.

*“If emergency plans just sit on shelves
it’s hard to know if they will really work.”*

Understanding FEMA Requirements

- **PLAN** for FEMA reimbursement
- Mock disaster scenario training in Emmitsburg, Maryland
- Understand liability, insurance coverage and FEMA reimburse
- Train on proper reporting methods
- Agency contracts in place ahead of storms w/ processes to *track debris removal and placement**
- Promote State Emergency Management Office /FEMA info sessions scheduled around the state
- Proper record keeping systems extremely valuable during a storm
 - If there is a disaster declaration, agencies need to capture resources used

Common FEMA Missteps

- No **debris** standing in wetlands; final location must be landfill
- Imperative applicants follow their **procurement** policy
- Do not make repairs contingent upon federal funding; If work needs to get done - **do it.** (and communicate)
- **Document** EVERYTHING! Never give FEMA original, and don't hold anything back
- Expect **transparency**, it's your funding – if you don't hear, just ask
- Convey **YOUR priorities** - roads project before waste water treatment plant??
- Applicants can write small projects – **Effective February 26, 2014** large project threshold raised to \$120,000

FHWA's Emergency Relief (ER) Program

- **Emergency fund** for **repair** or **reconstruction** of highways, roads, and trails, that suffered serious damage as a result of:
 - Natural disaster over a wide area; or
 - Catastrophic failure from any external cause.
- ER is **not** intended to:
 - replace Federal, State, or local funds;
 - correct non-disaster related deficiencies;
 - relieve *heavy maintenance* responsibilities of Federal-aid recipients; or
 - improve the highway.

FHWA ER ROLES & RESPONSIBILITIES

- **FHWA Roles & Responsibilities**
 - Administer ER Program
 - Implement Policies and Procedures
 - Assist in Locals Developing ER Applications
 - Participate on Damage Inspection Teams
 - Provide Technical Assistance & Training
- **State DOT Roles & Responsibilities**
 - Identify Federal-Aid Highways
 - Identify Damaged Sites
 - Organize Damage Inspections
 - Complete Emergency Repairs
 - Maintain Adequate Records of Repair Work
 - Request ER Funding/Submit Application
 - Coordinate Locally Administered Projects
 - Complete Permanent Repairs
- **Local Agency Roles & Responsibilities**
 - Identify Damaged Sites & **Participate on Damage Inspections**
 - Coordinate with State DOT
 - Complete Emergency Repairs
 - Maintain Adequate Records of Repair Work
 - Complete Permanent Repairs (**when authorized**)

Eligibility for ER Funds

Eligible Event/Site

- Governor or Presidential declaration
- Directly related damage to Federal-Aid highway system occurs
- EVENT causing at least \$700,000 in eligible damage
- Eligible SITES must meet minimum \$5,000
- ELIGIBLE REPAIR WORK: 1) *exceeds* heavy maintenance, 2) is extraordinary, and 3) restores pre-disaster service
- HEAVY MAINTENANCE: Work **usually done** to repair damage **normally expected** from seasonal/occasionally unusual natural occurrences

Timber and Debris Removal

- Debris removal that **is eligible for FEMA** funding is **NOT eligible for FHWA ER funds***
- Debris Removal from Federal-aid highways is eligible for FEMA if:
 - President must declare an emergency or a major disaster, and
 - FEMA determines debris removal is eligible under Stafford Act

Emergency vs. Permanent Repairs

- **Emergency Repairs –**
 - Occur *during* or immediately following a disaster; Prior authorization **not** required
 - Restores essential traffic
 - Minimizes the extent of damage
 - Protects remaining facilities
 - Reimbursed at 100% Federal share (unless Site ineligible)
 - IF work completed within first 180 days following event start date
 - After 180 days - Eligible at Permanent Repairs reimburse rate (i.e. 80/20)
- **Permanent Repairs –**
 - Occur *after* emergency repairs completed and is intended to restore the roadway to pre-disaster conditions
 - Prior authorization *required* before work can begin

Resources

- **VT Mitigating Flood Damage to Local Roads – Publication**
 - Properly constructing and maintaining a road drainage system is the most effective ways to reduce flood damage.
- **Protecting Yourself While Helping Others – Publication**
Safety Awareness for Responders to Hurricanes
 - Worker education and training www.iuoeiettc.org
- **NH Public Works Mutual Aid Program** <http://t2.unh.edu/ma>
Statewide mutual aid program endorsed by FEMA
 - Aiding each other in a legal way; reimbursed by FEMA funds in a declared emergency; reimbursed by Municipal funds if not a declared emergency.
- **RI Equipment/Material Sharing Program for Municipalities**
 - [Podcast on klap.org](http://www.klap.org) - Sharing program between municipalities and DOT

Best Advice

“Listen to the needs of your stakeholders now to help understand what gaps are out there.”



*Disaster does not dictate culture,
Culture dictates how you will deal with the disaster.*



What else would you do for a community bath during a no flush rule??

CDOT Flood Video

North Central Flood Recovery Efforts

