Mapping and the 2013 Colorado Floods

Mapping before, during, and after
Presented by

COLORADO WATER CONSERVATION BOARD

ICON ENGINEERING, INC.
Planning  Design  Management

CASFM

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
Outline

• 2013 Floods

Floodplain Mapping
• Before
• During
• After
20 counties
21,000 households
6000 sq. mi.
2,132 NFIP claims total $64M
10 Fatalities
17” rain in 6 days, 12” average annual
1,882 structures destroyed
16,000 structures damaged
Reservoirs filled, spillways activated
2013 Colorado Floods

Peak 24-hour Rain Totals
September 9-15, 2013

10.7 inches
How do Colorado floodplain managers compose our own Flood Notebooks?

The materials in this notebook were assembled in 1993 – 1994 by Sharon Gabel under the direction of Gilbert F. White. They were written in the knowledge that another great flood on Boulder Creek might rival or exceed that of May, 1894, at some time in future but that the year was entirely unpredictable. In those circumstances the suggestions as to problems and suitable field methods may turn out to be on the mark or greatly deficient. Depending upon the conditions then prevailing, the suggestions herein may require much or little revision. It is expected that whomever serves as coordinator will exercise her/his best judgement as to what then seems suitable. The goal is simple: to promptly inform the citizens of Boulder appropriately.
Floodplain Mapping

Before
During
After
Floodplain Mapping

Before

Federal
- FHBMs
- FIRMs
- MapMod – DFIRMs
- RiskMAP

State
- Criteria Manual
- Stream Restoration
- Floodplain Mapping

Local
- CRS
- UDFCD - Flash Flood Prediction Program
- F2P2
- Alert Network
Colorado State Flood Rules

Started in 2009 to carry out statutory mission to reduce flood damages

Benefit Cost Analysis required
Assumed elevations, assessor building information

Detailed DFIRM floodplain analysis
Community Storm Water Masterplans

Using existing terrain and DFIRM data, review existing and proposed land uses for flood-safe elevations.
Flood Smart Elevations

Output
- Flood Depth
- Flood Smart Finished Floor Elevation
- Included in outreach materials
Floodplain Mapping

Before

Federal
Better Maps

State
Better Rules

Local
Better Data
Floodplain Mapping

During

Federal
Emergency Response
MOTF

State
EOC
CASFM Conference

Local
Alert Gages
Forecasts
UDFCD ALERT SYSTEM

Started following the 1976 Big Thompson Flood

219 gaging stations
195 rain gages
103 stream gages
26 full weather stations
Marston Lake
Full Weather Station
Rainfall rate alarms, informed forecasters, who updated precipitation models, for Emergency Ops and Public Information.
Emergency Operation Center
National Incident Management Standards
GIS links across state
Civil Air Patrol
Aerial Photos
High Water Marks
Inundation Mapping

Town of Milliken: Observed Flood Inundation
Attempts to capture multitude of photo documentation in one place, georeferenced
During the Flood

During

Federal
Resources
Situational Awareness

State
Operations

Local
Emergency Information
Floodplain Mapping

**After**

**Federal**
- NFIP
- Outreach
- Assistance
- MOTF

**State**
- Outreach Assistance Mapping

**Local**
- BCA Planning
LiDAR

• Led thru USGS
  – FEMA
  – State of Colorado
  – Denver Regional Council of Governments

• Disaster Relief Fund
  – Federal Operational Support
Scope of Work: Project Area

- **Total Project Area:** 5,636 sq. Miles plus minimum 100 meter buffer.
- **FEMA AOI’s:**
  - Mountain Reaches (205 sqm)
  - Eastern Plains (3,150 sqm)
  - High Relief Mountain (1,261 sqm)
  - Priority 1 & 2 Areas
- **DRCOG AOI:**
  - Total 3,600 sq miles
  - 2,580 sq mile overlap with FEMA AOI
  - 1,020 sq miles of “new” area
Post-Flood Timeline

Sept
- Flood

Oct
- LiDAR flights
- Priority Delivery
  - Emergency Repairs

Nov
- Master Planning

Dec
- Priority Delivery
  - Emergency Repairs

Jan
- Recovery Mapping

Feb
- Advisory FPs & Ordinances

Mar
- Spring runoff designs

Apr
- Spring runoff repairs

May
- Terrain delivery

June
- BCAs

Gov’t Shutdown
• New lidar … amazing to come through as quick and during disaster with recovery money

• Other basins within Colorado were scoped ahead of USGS flood collection and still are not delivered
Flood Recovery Mapping
Advisory BFEs
Local Floodplain Ordinance Updates
Floodplain Mapping

After

Federal
LiDAR – terrain data to support recovery

State
Recovery flood mapping Assistance Support

Local
Advisory Mapping Ordinances Master Planning
Conclusion

• What does your flood notebook look like?

• Does it have a map?

• Does it have elevations?
Premise

Location …

Spatial relationship of the data we use as floodplain managers …

And once we have x,y added to our data, what happens when you add elevation …

x,y,z is a powerful basis for floodplain management before, during, and after a flood event.