

Colorado Division of **Water Resources**

COLORADO DAM SAFETY BRANCH

ASDSO Board Meeting Colorado Dam Safety Branch 2013 Flood Response

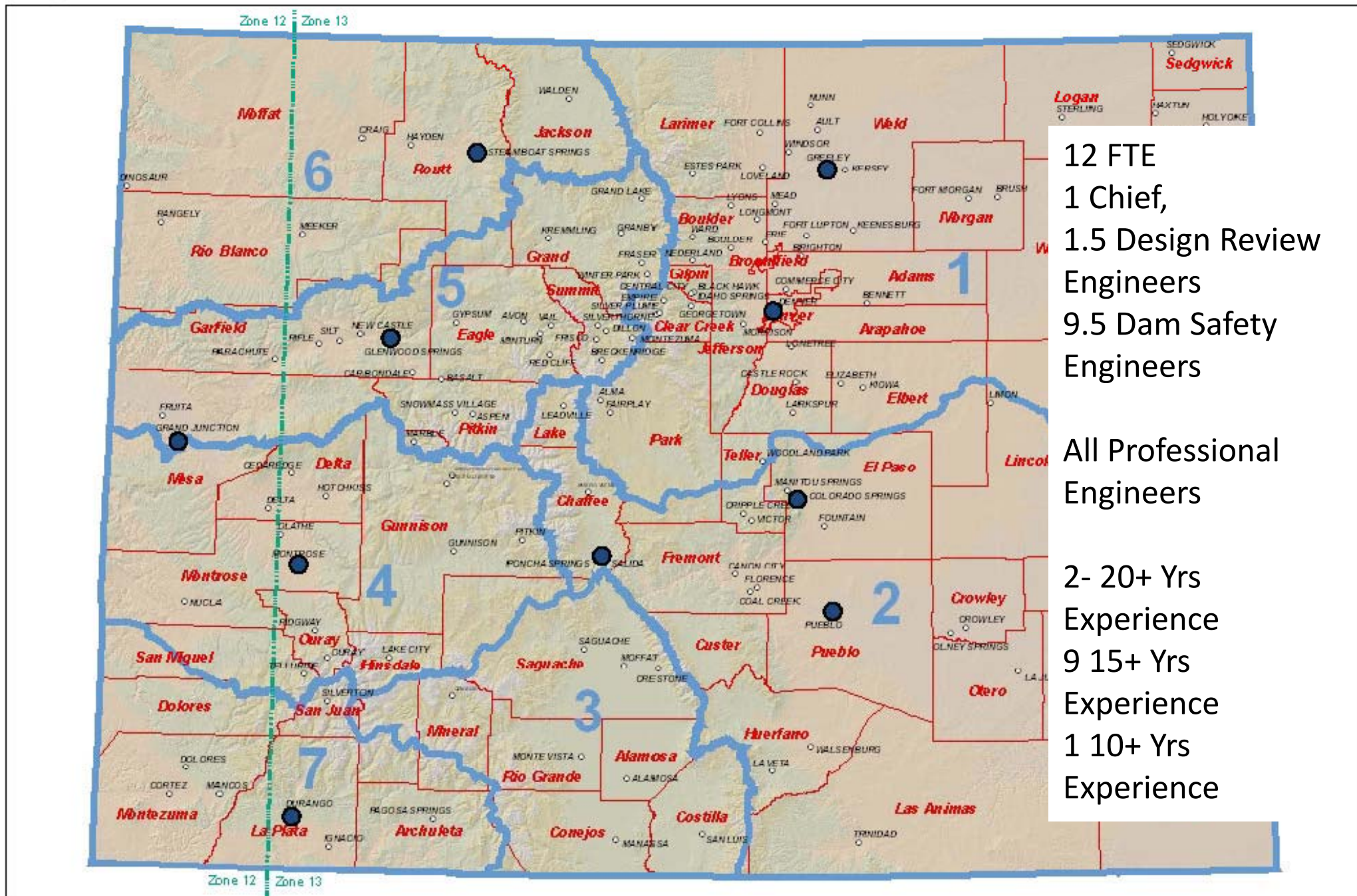
In the Cloud, November 18, 2013

Bill McCormick, PE, PG



2013 Flood Response Discussion Topics

- Who We are, where we are
- How and When We Became Aware
- Response to Ongoing Incidents
- EOC Communication and Coordination
- Emergency Dam Inspections



WEBEOC Auto Notification

On Thu, Sep 12, 2013 at 12:58

AM, <Kevin.Kurecich@state.co.us> wrote:

Larimer County, Colorado LARIMER COUNTY EOC PARTIALLY ACTIVATED in support of **Flooding for much of Larimer County — including the High Park and Hewlett burn areas — until 3:45** Larimer County has also activated a JIC to support emergency services with current operations.

Larimer County Sheriff's Department reporting **numerous reports of flooding and debris on roads and various areas of the county.**

A Flash Flood Warning has been issued for much of Larimer county until 345am.

NO STATE ASSISTANCE REQUESTED AT THIS TIME

NE Field Manager - kevin.kurecich at 00:49:47 on 9/12/2013

Posted to: NE Regional Board- State Significant Events-
I25 N Board- NE Regional Board- I25 N Board-

DSB Notification Starts, Jer, John and Ryan

On Thu, Sep 12, 2013 at 2:11 AM,
McCormick - DNR, Bill <bill.mccormick@state.co.us> wrote:

It looks like it could be one of those times for us to be on alert.
Please check weather and make contact with your local lem.
Call me to discuss your current situation, observations and availability.

----- Forwarded message -----

Date: Sep 12, 2013 4:01 AM

Subject: Larimer County Event Post- WEBEOC Search & Rescue

CO HY 36 and Big Elk Meadows, Larimer County, CO POTENTIAL SAR
MISSION REQUEST TO STATE EOC -

Larimer County OEM Erik Nilsson ([970-222-4708](tel:970-222-4708)) has received a POTENTIAL
SAR

MISSION REQUEST to the STATE EOC regarding availability of NG
BlawkHawk for mission support regarding IR/Nighttime aerial support.

Current Situation of Concern is CO HY 36 and Big Elk Meadows.

At the current time field operations is reporting critical flash flooding at
this location with possible small dam breaching. There are residences in
the area and possible life safety issues.

NE Field Manager - kevin.kurelich at 01:53:12 on 9/12/2013

WEBEOC Auto Notification

Date: 09/12/2013 4:10 AM (GMT-05:00)

To: [CDPS webeoc state sig_events@state.co.us](mailto:CDPS_webeoc_state_sig_events@state.co.us)

Subject: Larimer County Event Post- WEBEOC Search & Rescue

CO HY 36 and Big Elk Meadows, Larimer County, CO A helicopter with night vision and hoisting capability has been requested to assist with possible extrication of residents along CR 47, in from Highway 36. We have just breached a small holding pond which will dominoe into two others in the vicinity of Big Elk Meadows.

Emergency phone notification from LCSO Dispatch has been sent twice advising all residents of the danger and to seek safety on high ground should water breach all the ponds or small dams.

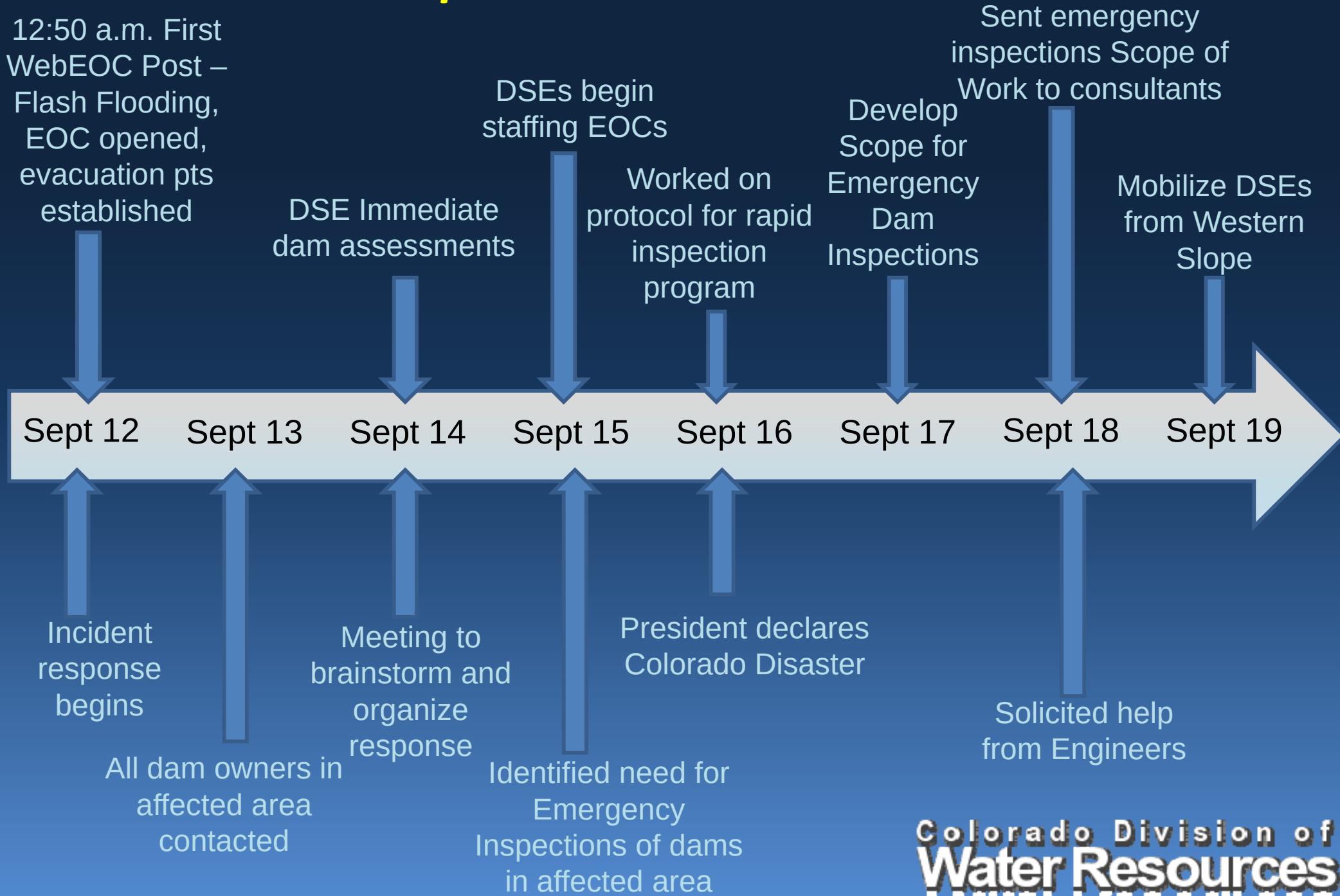
Currently, radar is showing that the rain is moderating for the time being but a couple of pulses of energy/rain are immediately upstream and so we will have to wait that out and see what additional rainfall brings us as far as more problems.

Larimer County EM Director - erik.nilsson at 02:03:54 on 9/12/2013

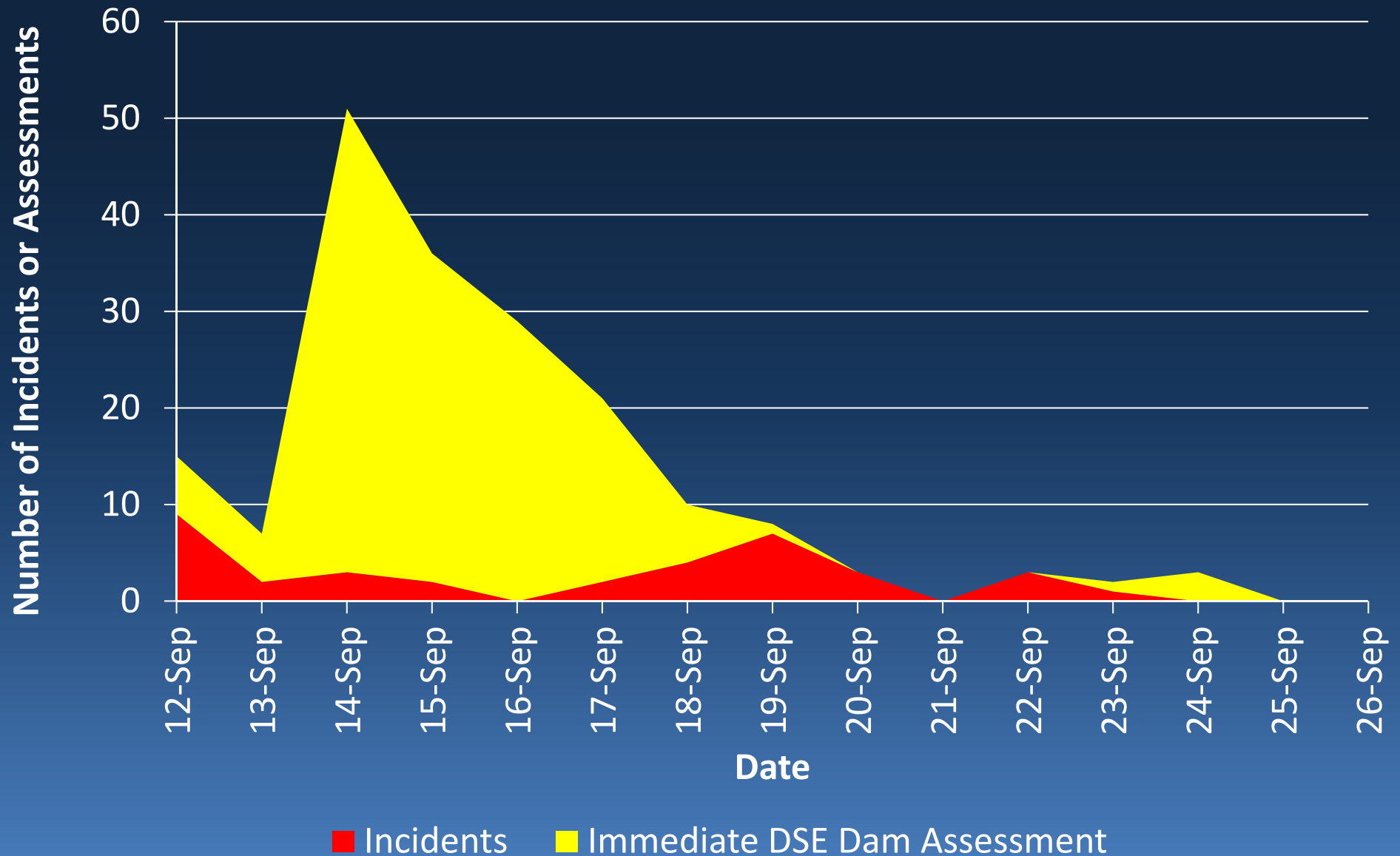
County EOC Contact DSE Awareness

- John B., Ault, CO out of bed by 2:15 am local, checks forwarded emails, appraises Larimer Cty LEM of dams by 3:00 am
- All other Front Range Dam Safety Engineers on the ground and actively checking/calling owners/monitoring by 6:00 am, Ryan, Jeremy, Kallie, John H.
- DWR Leadership (Deputy SE Scott) Notified of situation and DSB actions by 6:00 am

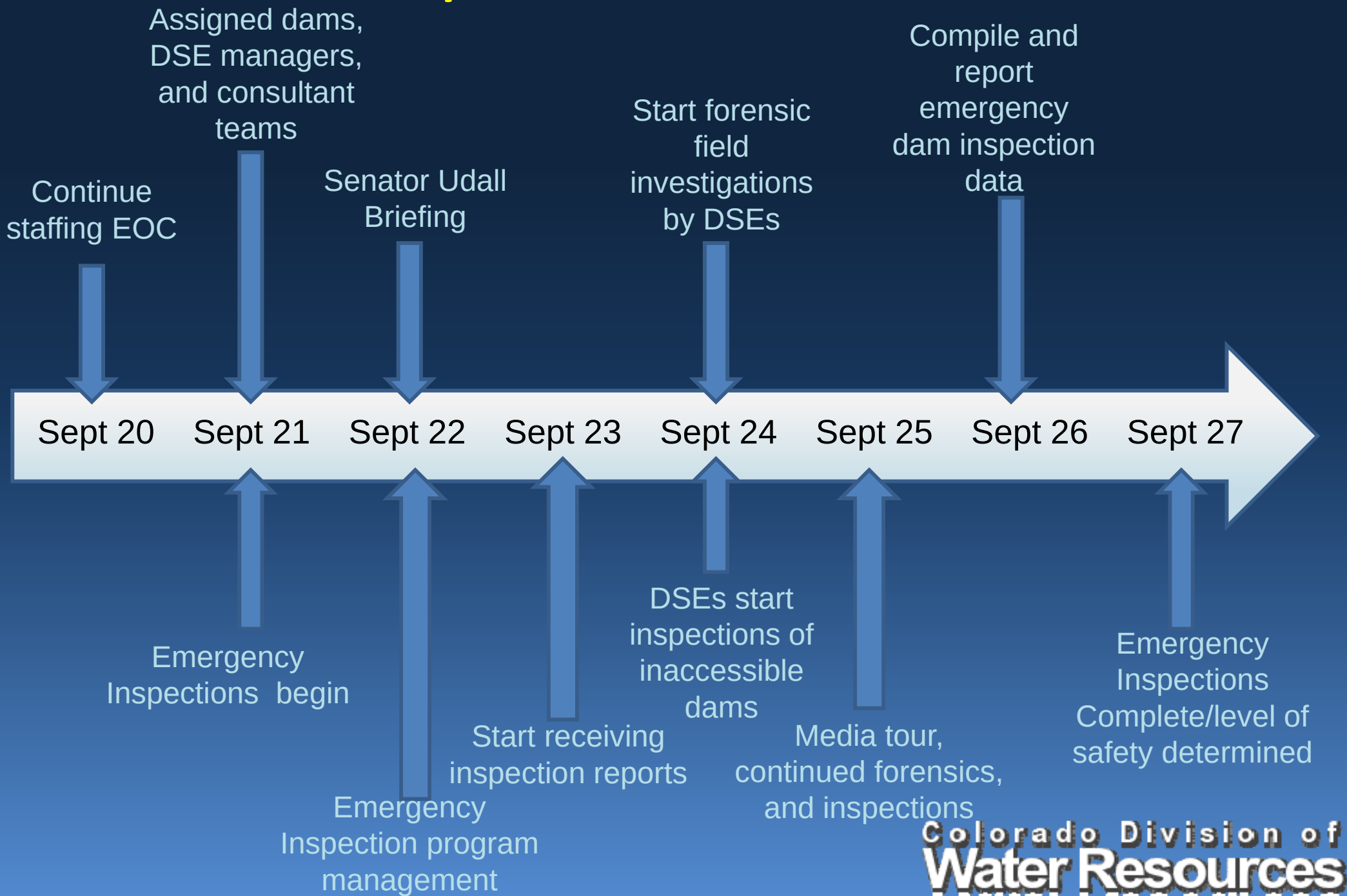
Response Timeline 1



Dam Safety Activities



Response Timeline 2

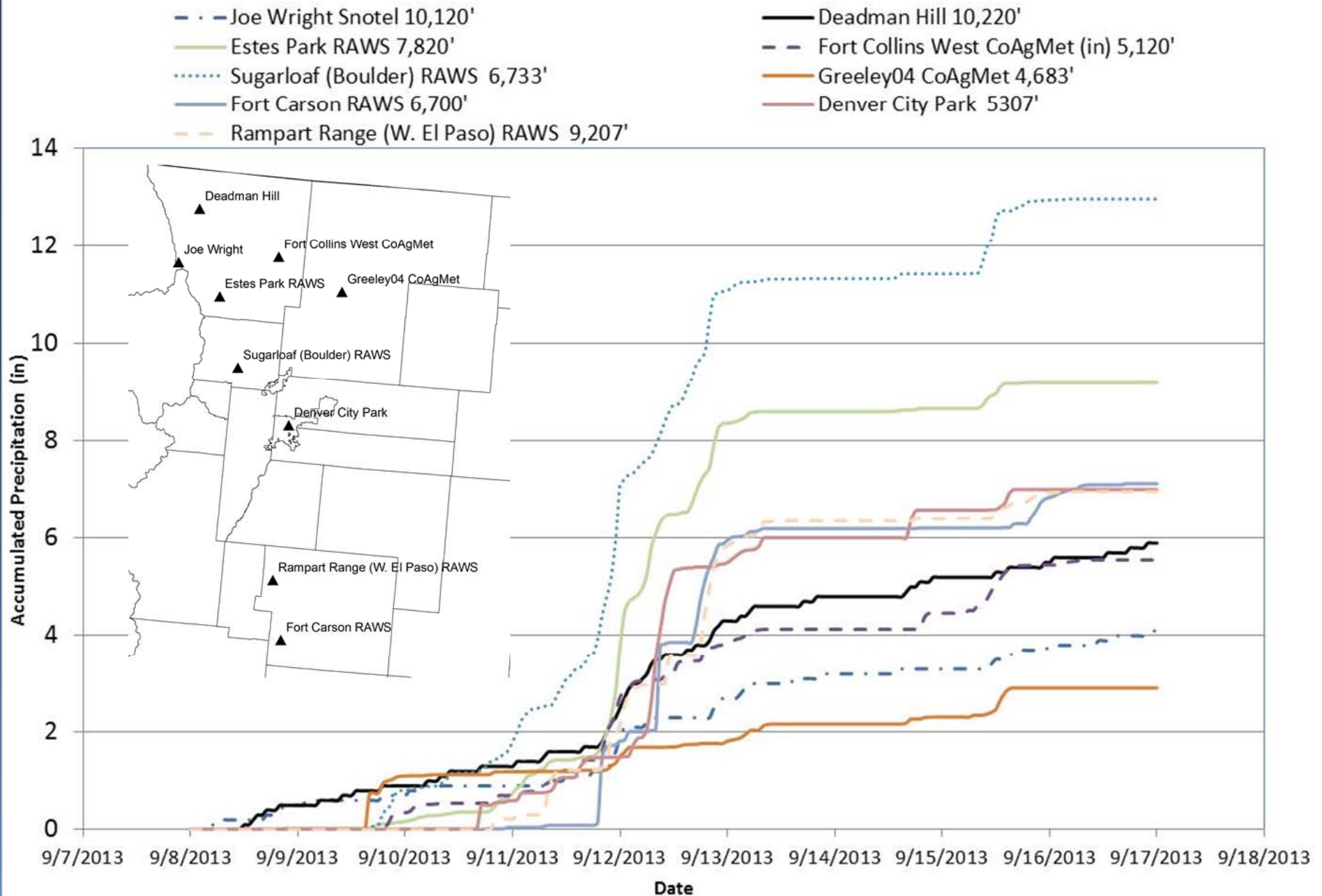


Summary Of Activities

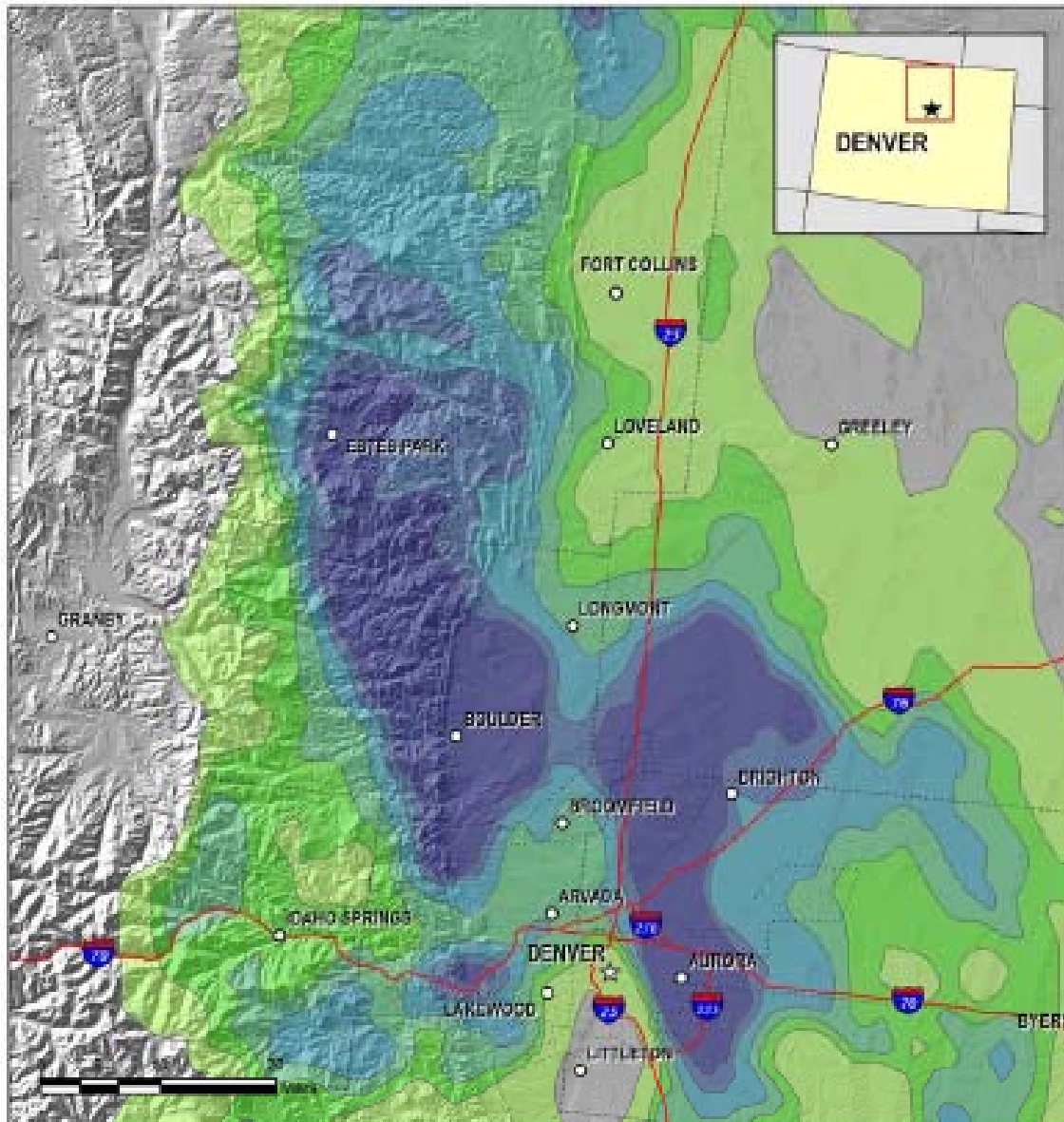
- Called 226 Dam Owners
- Responded to 34 Incidents
- Responded to more than 15 media requests
- DSEs Performed 152 Immediate Dam Assessments
- Manned 4 EOCs
- Performed 9 Forensic Investigations
- Organized 113 engineers to perform 207 emergency inspections

Why did this Happen?

Accumulated Precipitation 9/8/13-9/17/13



Rainfall Distribution (north)



Colorado Flood Event, 9-16 September 2013 Annual Exceedance Probabilities (AEPs) for Worst Case 7-day Rainfall

Hydrometeorological Design Studies Center
Office of Hydrologic Development, National Weather Service
National Oceanic and Atmospheric Administration

<http://www.nws.noaa.gov/ohd/hdsc/>

Created 24 September 2013
Precipitation frequency estimates are from NOAA Atlas 14, Volume 8, Version 2.
Rainfall values come from 6-hour multi-sensor data.

- > 1/10
- 1/50 - 1/10
- 1/100 - 1/50
- 1/200 - 1/100
- 1/500 - 1/200
- 1/1000 - 1/500
- < 1/1000



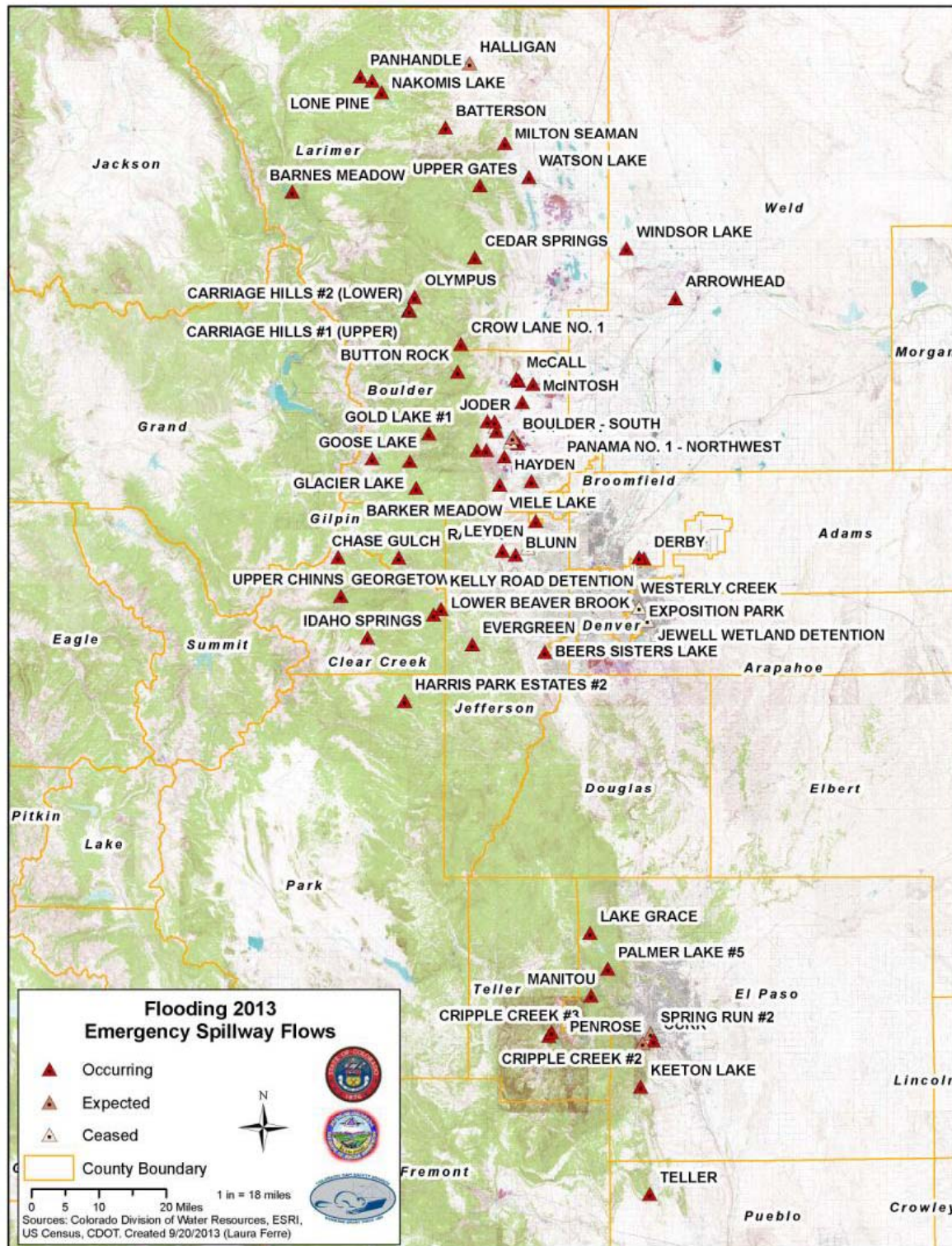
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What did it do?

*First time
Spillway Flows
9/13*

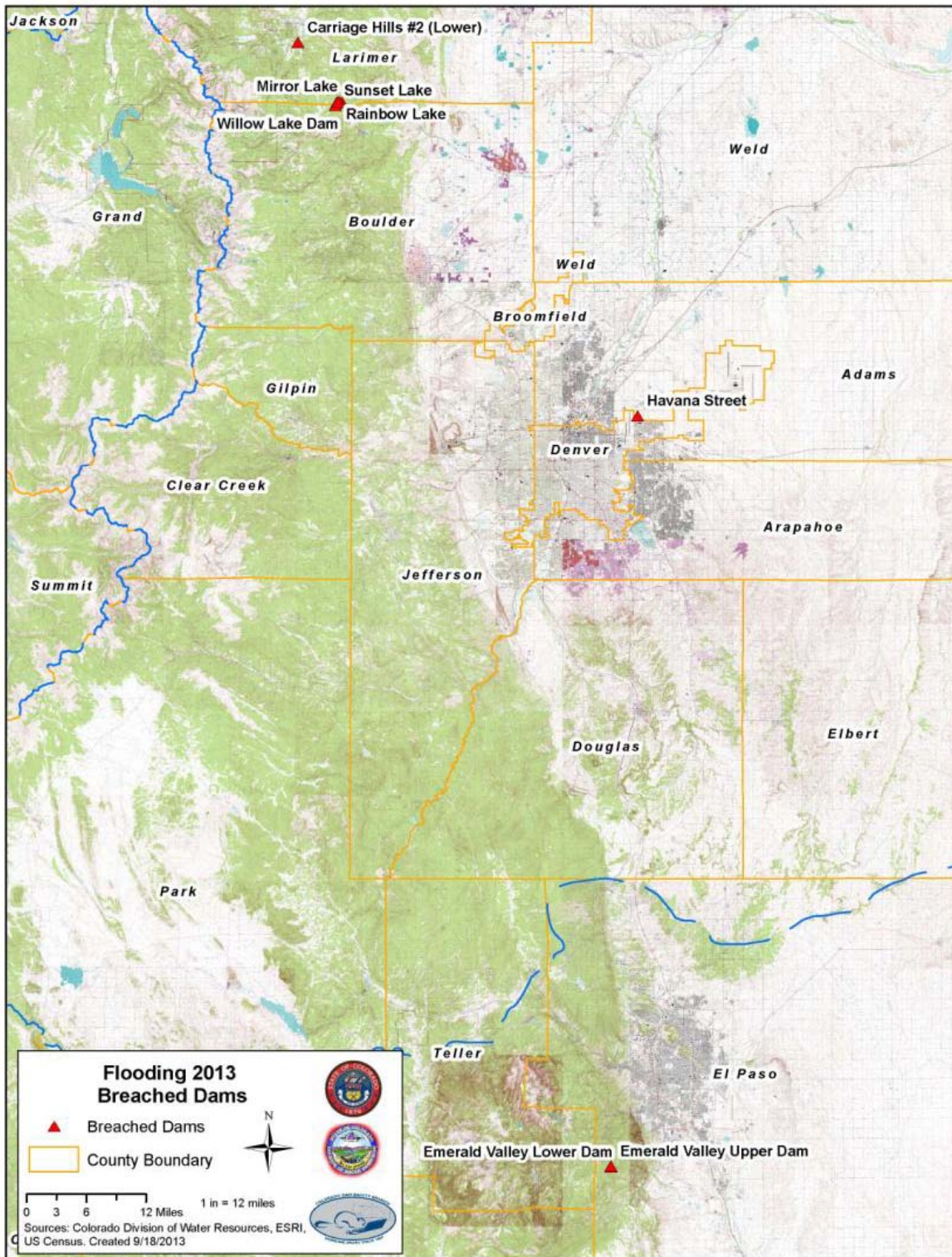


First time Spillway Flows 9/20

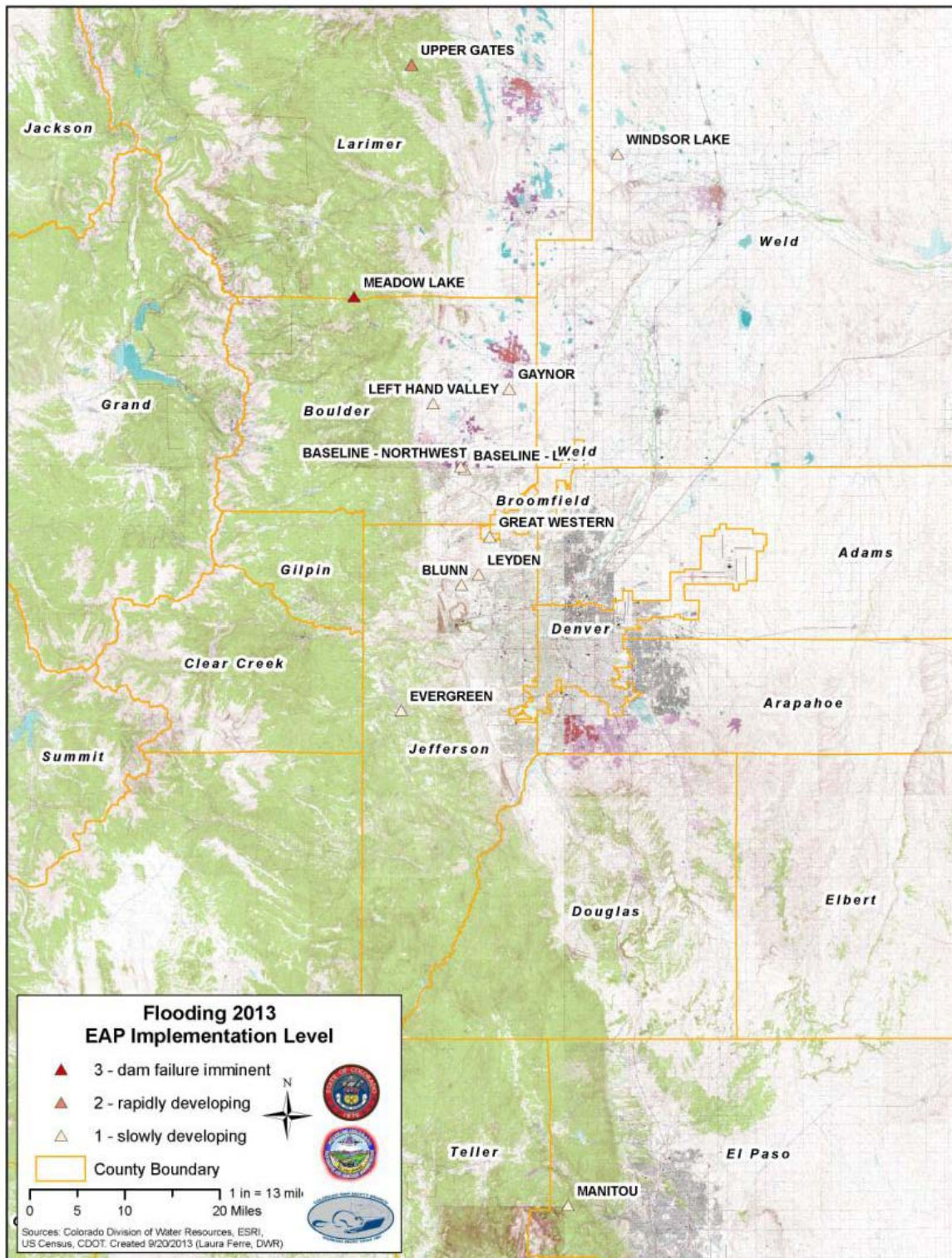


Dam Failures

9 Low Hazard



EAPs Activated (11)



Representative Photo's – 1st Time Spillway Flows



Blunn Dam, Arvada

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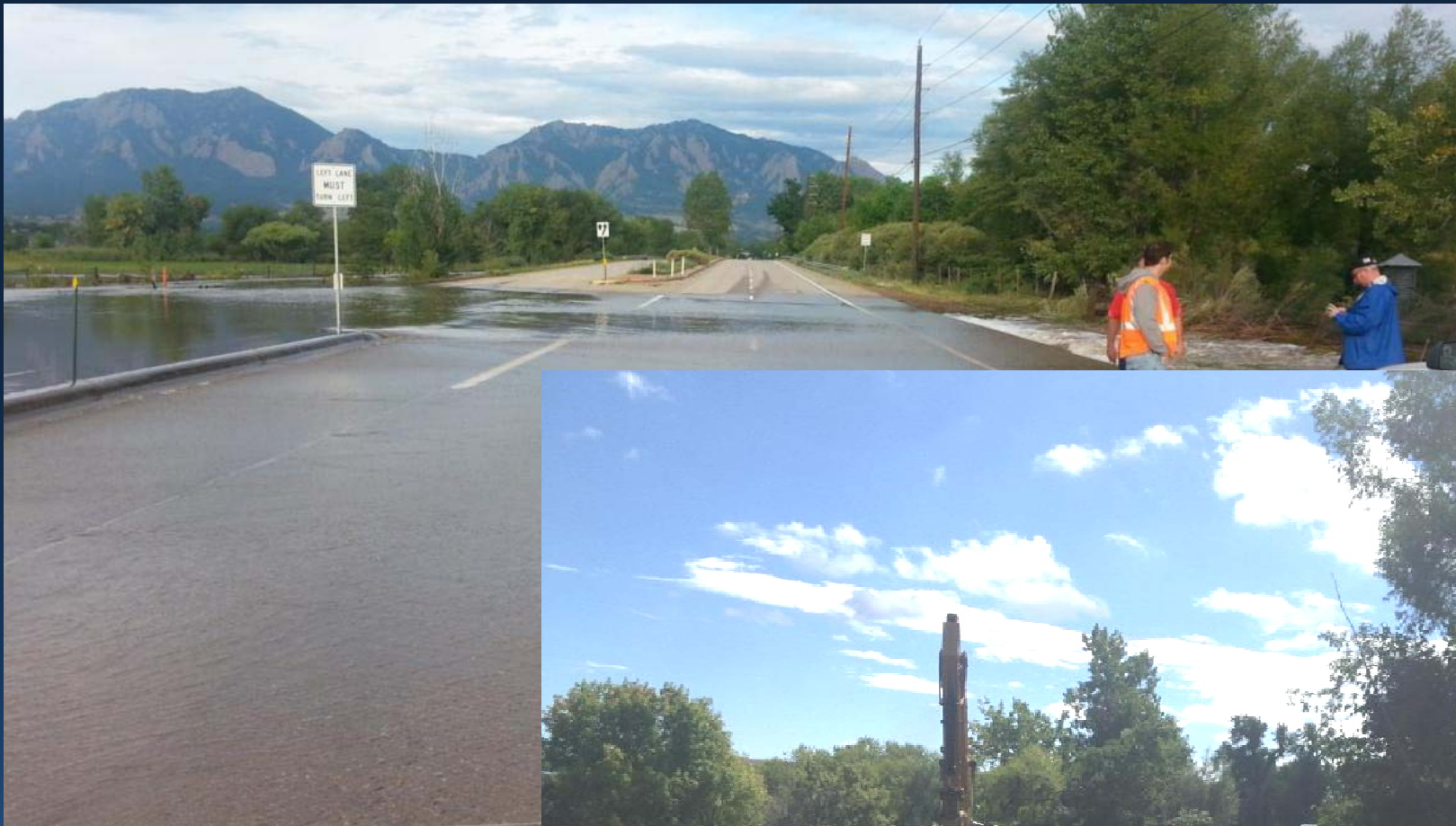
Baseline Dam, Boulder, Slope Stability



*Baseline Dam
uncontrolled
Inflow*



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*Baseline Dam
Inflow
Controlled*





*Baseline Dam
Slope
Buttressed*



*Small Dam in Distress and Dangerous Example -
Aspen Lodge and Salvation Army Dams*

9/19 Identified

9/21 Resolved



Debris Flow into Spillway, Dam overtopped,

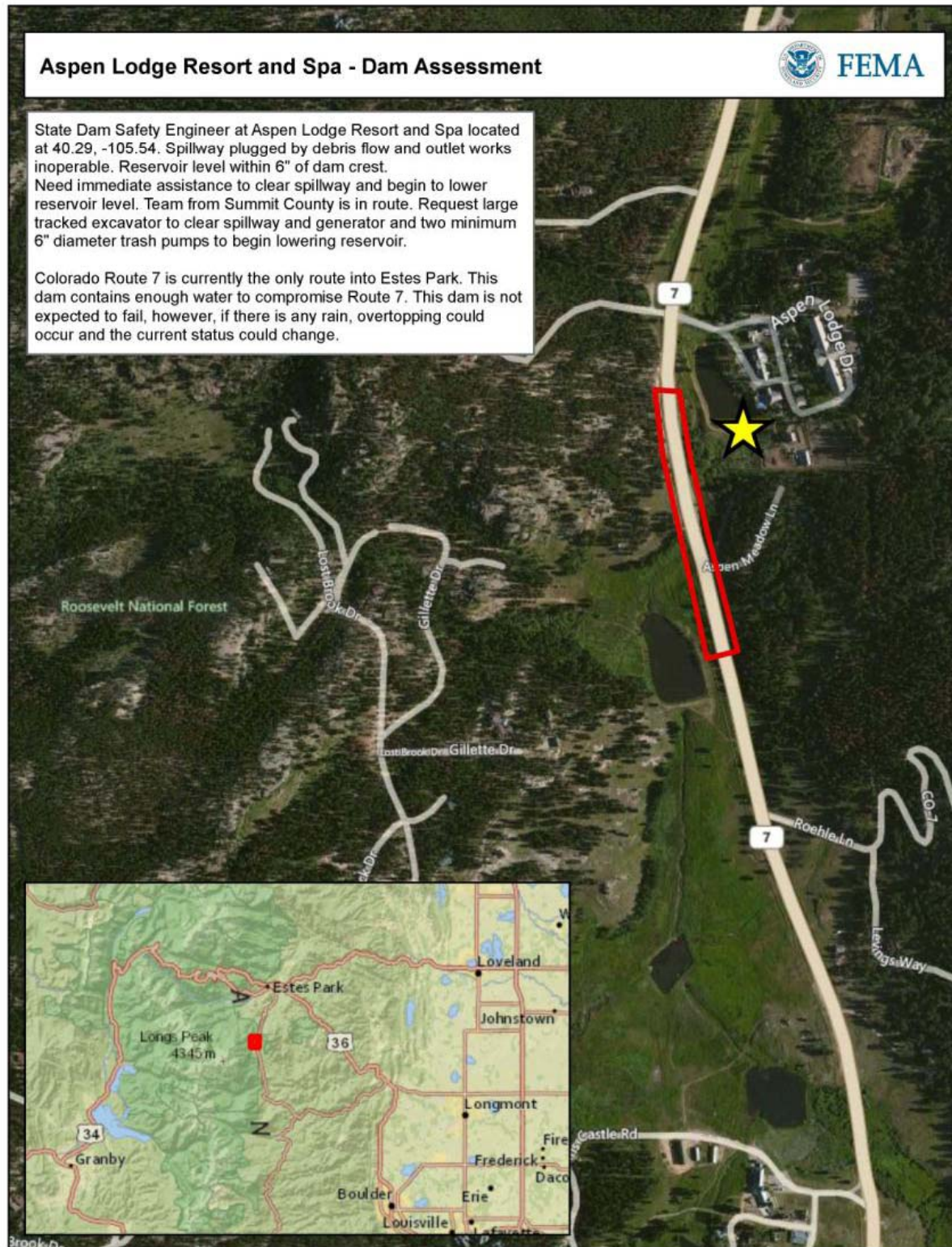
*Threat to Hwy 7
and dam
downstream
recognized 9/19*

Aspen Lodge Resort and Spa - Dam Assessment



State Dam Safety Engineer at Aspen Lodge Resort and Spa located at 40.29, -105.54. Spillway plugged by debris flow and outlet works inoperable. Reservoir level within 6" of dam crest. Need immediate assistance to clear spillway and begin to lower reservoir level. Team from Summit County is in route. Request large tracked excavator to clear spillway and generator and two minimum 6" diameter trash pumps to begin lowering reservoir.

Colorado Route 7 is currently the only route into Estes Park. This dam contains enough water to compromise Route 7. This dam is not expected to fail, however, if there is any rain, overtopping could occur and the current status could change.





*Owner Unable, EOC Resources distant,
Prioritize, Improvise, begin to lower Reservoir (9/20)*

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Mobilize local Excavator, after working out payment (9/21)

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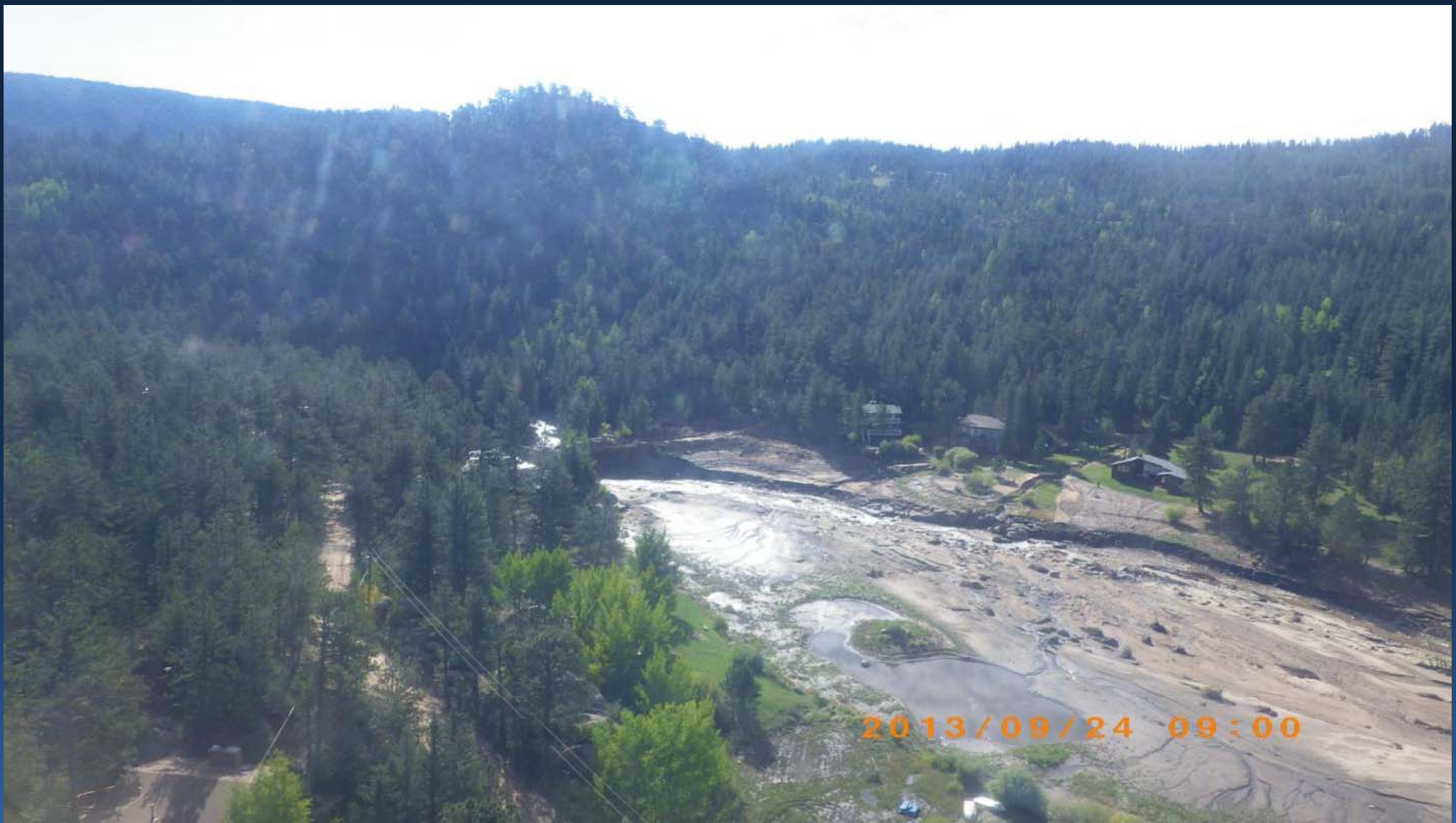
Danger Mitigated (9/21), Rain falls again 9/22

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*Small Dam Forensic Analysis Example - Meadow Lake
Helicopter Access Only*

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*Meadow Lake, Big Elk Meadows Subdivision
from the air*



Meadow Lake, Breach Dimensions



Meadow Lake, Vertical Surveys

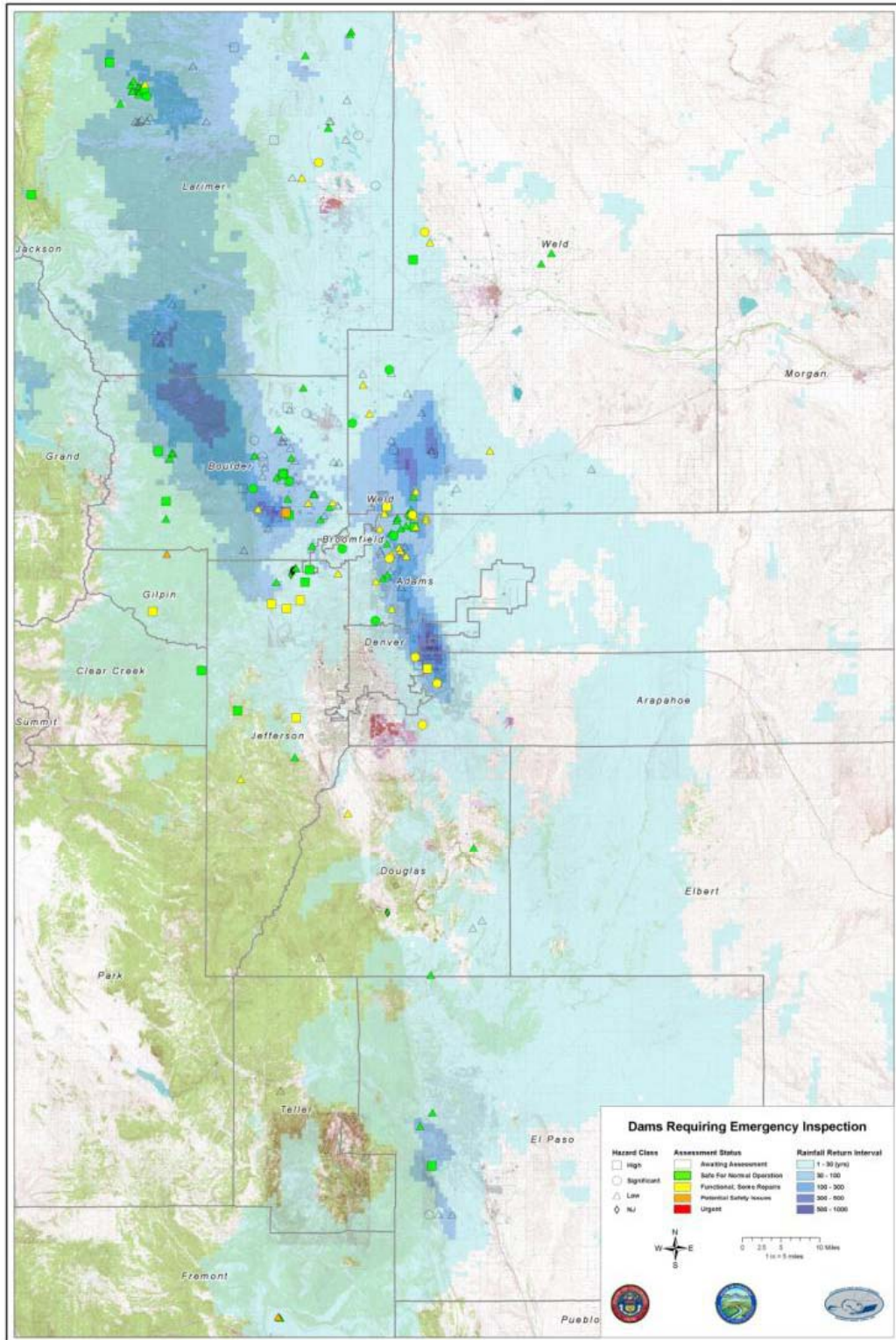


Local aide mission as well, DSE's delivered water, basic supplies (cookies, cat food)

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Emergency Inspections

- Clipped dams in Database that fell inside 1/50 yr or greater rainfall
- Some DSE Filtering (and push-back)
- 207 total dams



Volunteer Inspection Scope & Process

- Numerous engineers reaching out to help
- EMAC Agreement (CO-WY)
- Scope Document
- Waiver (AG's office)
- Purchasing Approval
- Dam Inspection Selection Process
- Dam Lists
- Inspection Forms
- Group Managers

Emergency Dam Inspections Program

<i>Emergency Dam Inspections Program Statistics</i>		
Participants	Number	Comments
Volunteer Engineers	113	Teams of two, all lead by a Colo. Professional Engineer
Federal Agencies	4	NRCS, USACE, USBR, FERC
State Agencies	1	Wyoming
Engineering Consultant Firms	27	From up and down Front Range

Emergency Dam Inspections Status

<i>Emergency Dam Inspections Program Status 10/1/13</i>		
Inspection Activity	Number	Percent Complete
Inspections Required	207	100%
Inspections Assigned	207	100%
Assignments Confirmed	207	100%
Inspections Scheduled	207	100%
Condition Assessments Submitted	192	93%

Conditions of Dams

<i>Emergency Dam Inspections Status</i>			
Condition Assessment Categories	Definition	Number	Percent of Total
Response Level 0 –	Safe for normal operation	128	62%
Response Level 1 –	Functional; some repairs needed; no dam safety concerns	65	31%
Response Level 2 –	Potential dam safety issue exists; needs immediate evaluation	14	7%
Response Level 3 –	Urgent; failure is imminent or in progress; notify 911 immediately	0	0%
	Totals	207	100%

- Owners of all 207 dams notified of conditions, with EIR sent by 11/7/2013

Flood Related Dam Damage

- 27 Dams with identified damage related to rainfall and flooding
- Rough Estimate, \$5.4 million
- All owner notified of available funding sources (FEMA PA, CWCB no-interest loans)

Program and Cost



Questions?

