Third Annual
Maryland Dam Owner Workshop

Lessons for all Dam Managers from Oroville Dam Incident in California

November 14, 2018

Dam Safety Division

Maryland
Department of
the Environment

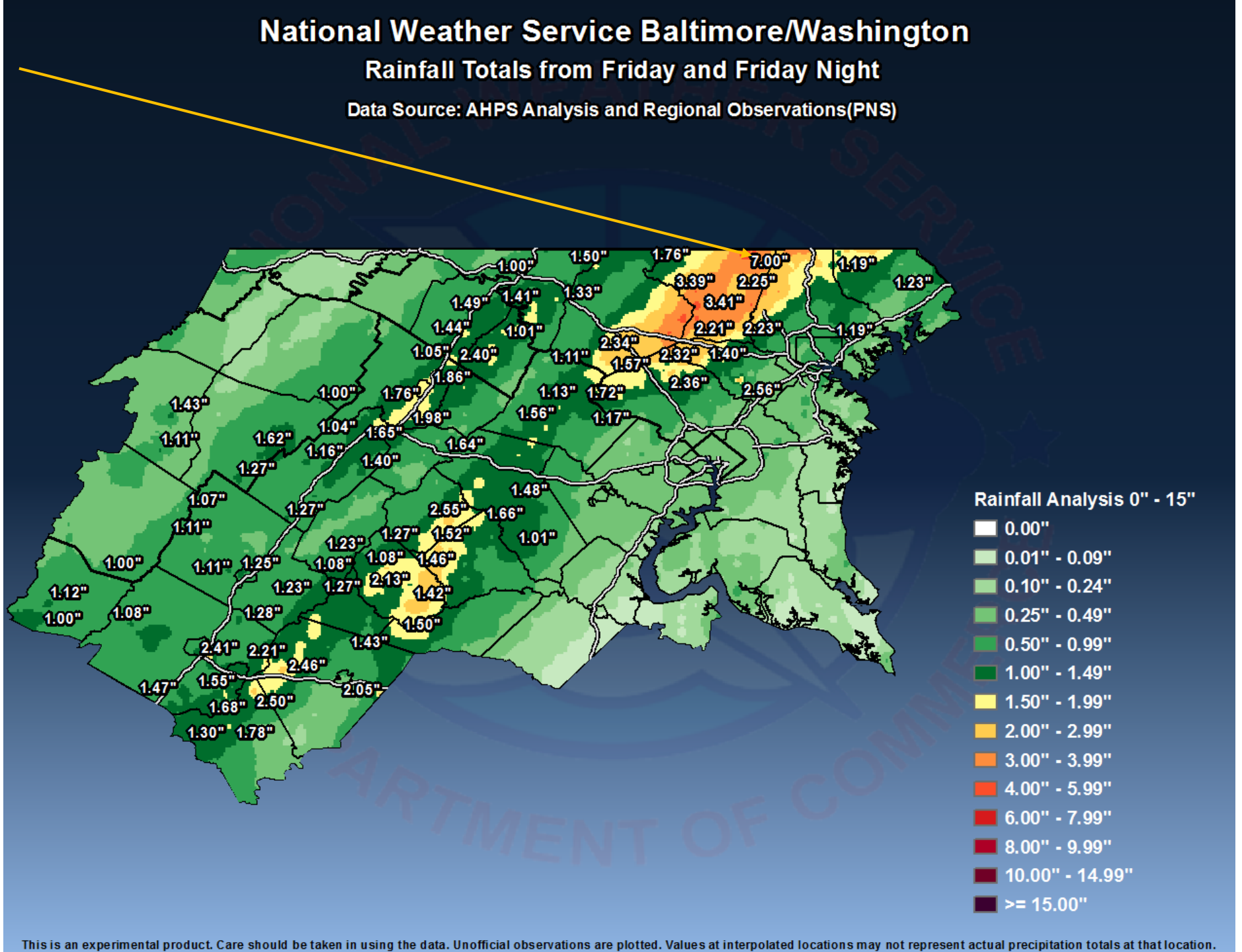
Today's Attendees

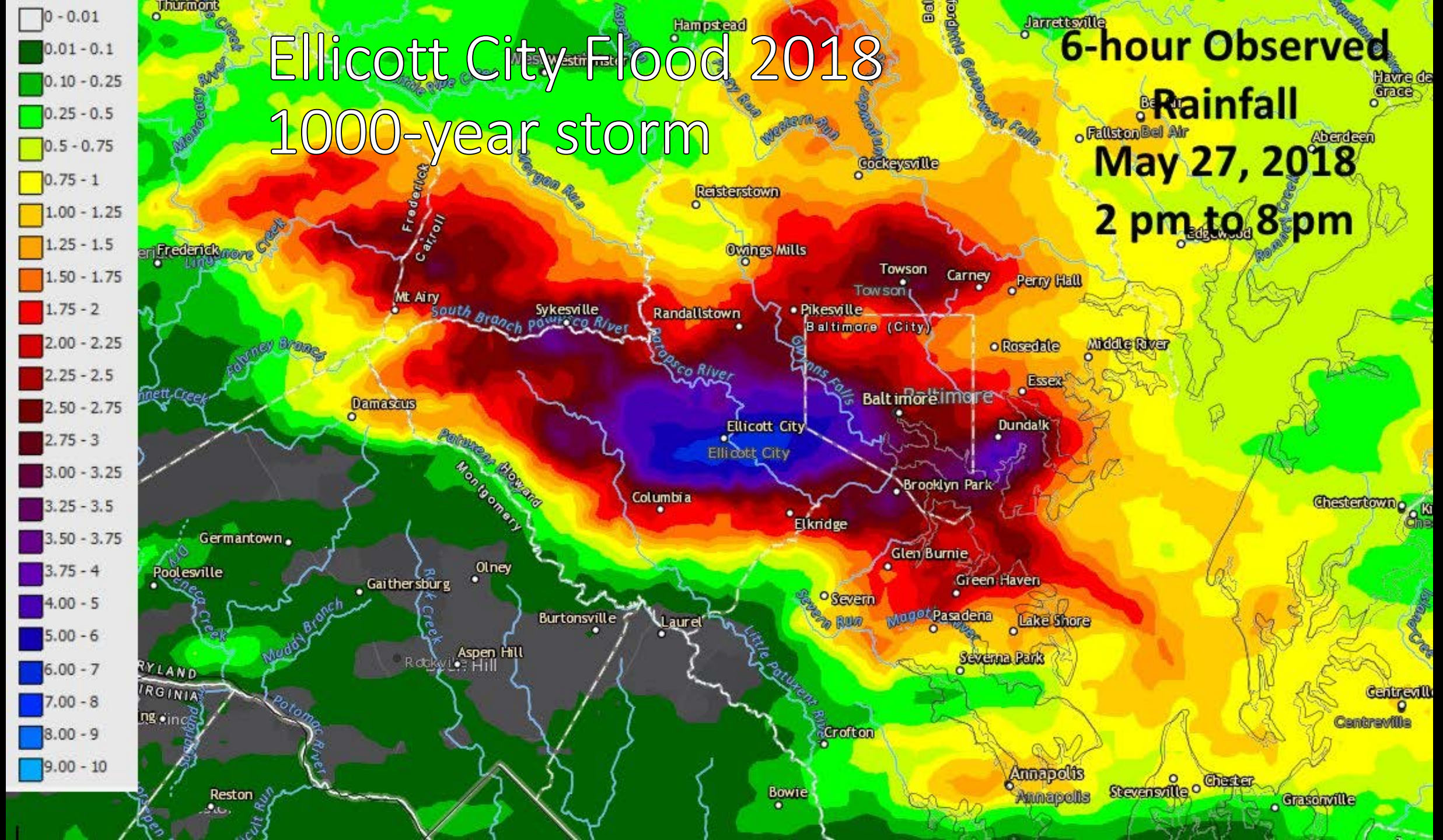
- Nearly 250 people including:
  - Dam Owners
  - Engineering Companies
  - County Stormwater Management
  - County Public Works Departments
  - NRCS
  - Soil Conservation Districts
  - FEMA
  - USF&WS

Year in Review

- 2018 Extreme Rainfall Events
  - Carroll County-Cascade Lake Dam Incident
  - Howard County-Ellicott City Flooding (again)
  - Wicomico County-Anderson Mill Pond Overtopping
  - Wicomico County-Riawalkin MillPond
- Bloede Dam Removal

Cascade Lake Dam - Carroll County July 25, 2018




Ellicott City Flood 2018
1000-year storm
6-hour Observed
Rainfall
May 27, 2018
2 pm to 8 pm
0 - 0.01
0.01 - 0.1
0.10 - 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1
1.00 - 1.25
1.25 - 1.5
1.50 - 1.75
1.75 - 2
2.00 - 2.25
2.25 - 2.5
2.50 - 2.75
2.75 - 3
3.00 - 3.25
3.25 - 3.5
3.50 - 3.75
3.75 - 4
4.00 - 5
5.00 - 6
6.00 - 7
7.00 - 8
8.00 - 9
9.00 - 10
Thurmont
Hampstead
Jarrettsville
Havre de Grace
Aberdeen
Bel Air
Fallston
Cockeysville
Reisterstown
Owings Mills
Towson
Carney
Perry Hall
Pikesville
Randallstown
Sykesville
Mt Airy
Frederick
Carroll
Baltimore (City)
Rosedale
Middle River
Essex
Baltimore
Dundalk
Ellicott City
Damascus
Columbia
Elkridge
Brooklyn Park
Glen Burnie
Green Haven
Severn
Pasadena
Lake Shore
Severna Park
Chestertown
Centreville
Crofton
Annapolis
Stevensville
Chester
Grasonville
Bowie
Reston
Burtonsville
Laurel
Aspen Hill
Olney
Gaithersburg
Germantown
Poolesville
Patapsco River
South Branch Patapsco River
Gwynns Falls
Little Patuxent River
Severn Run
Magothy River
Western Run
Gunpowder Falls
Monocacy River
Potomac River
Howard
Montgomery

Riawalkin MillPond Dam Overtopping Oct 14, 2018

Anderson MillPond Dam Overtopping 2018

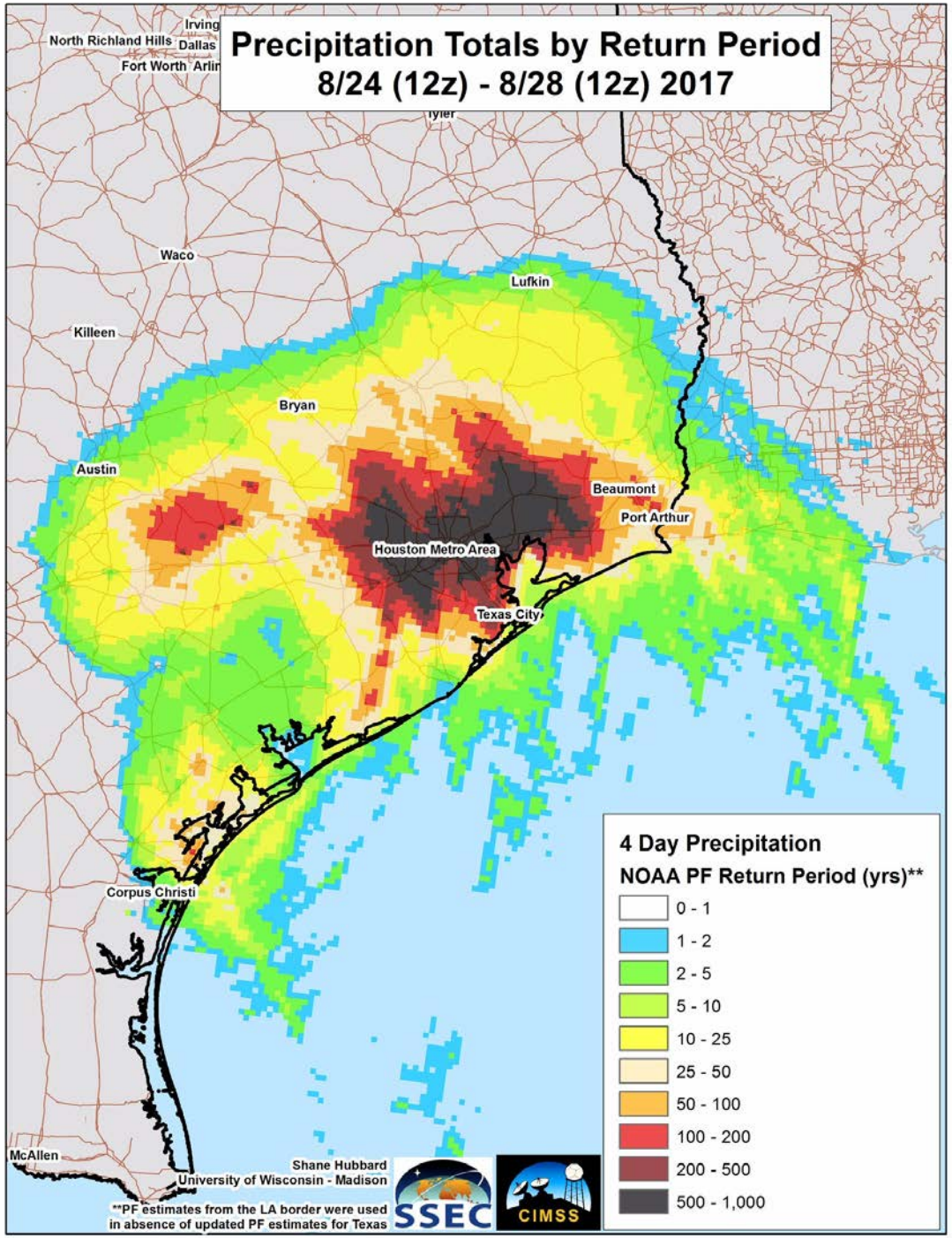
Climate Change

- Extreme Events are becoming more severe and more frequent
- Even high and significant hazard dams designed to safely pass large storms (PMF or half-PMF) may be adversely impacted
  - Earthen emergency spillways (auxiliary spillways) may flow more frequently than designed
  - Oroville Dam spillways failed at lower flows than designed
  - Nationwide concern regarding safety of earthen spillway under high flows

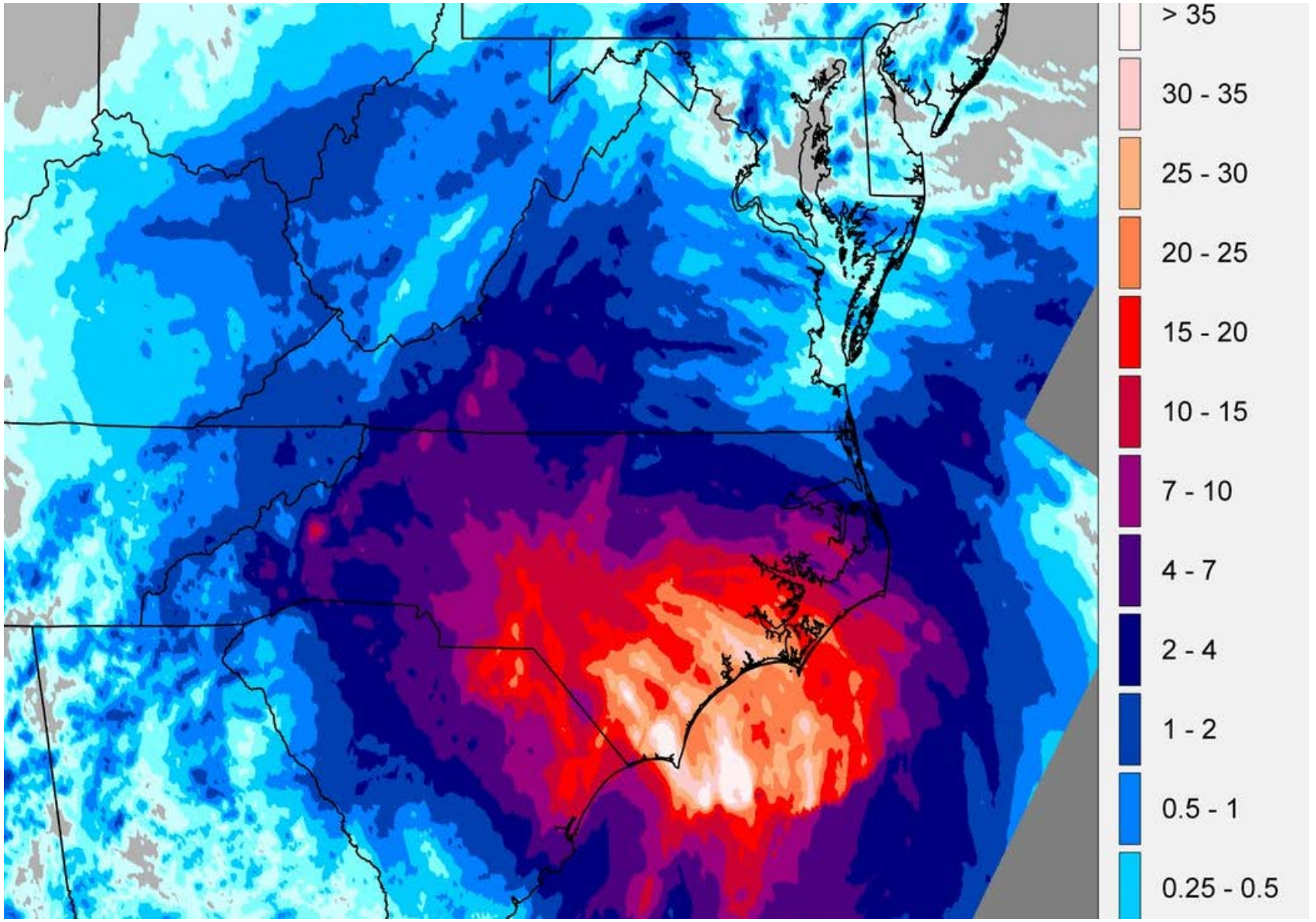
Clear Spring 2014

- June 2014
- 5.2 inches rain in 2 hours
- 1,000 year event (Atlas 14)

Houston Flood 2017
Hurricane Harvey
up to 60 inches of rain
in 4-day period
1000-year storm



Hurricane Florence Sept 13-17, 2018



Rainfall
Inches

Dam Removal

- Dam no longer needed
- Expensive Repairs Required for Safety
- Inadequate Spillway due to Hazard Creep
- If owners no longer wish to retain their dam some resources may be available for dam removal
  - Counties: may get some credits for meeting MS4 permit requirements
  - MDOT/State Highway Administration: MS4 permit
  - Private companies wishing to create stream restoration and/or wetlands credits for agencies

Bloede Dam Removal Ongoing

Welcome
John W. France, PE, D.GE, D.WRE

- Leader of forensic team which evaluated the 2017 failure of the Oroville Dam spillways
- 25 years with AECOM (formerly URS Consultants)
- 16 years with other engineering companies before that
- Now a private consultant, JWF Consulting, LLC
- He will present lessons learned from the Oroville Dam incident