BIA Summer Water Resources Training
Dam Safety Inspections
Part 2 – Dam Failures

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Principle Causes of Dam Failures

Overtopping

Structural failure

Stability failure

Cracking
Inadequate maintenance

Piping

Overtopping Video Clip

Seepage Video Clip

Foundation Defects & Slope Instability

Seepage Video Clip

Overtopping Video Clip

Piping Failure.wmv

Overtopping Failure.wmv

Slide Failure.wmv

US Dam and Levee Failures (not comprehensive)
Mill River Dam
Williamsburg, MA
May 16, 1874
Failure worst in U.S. history, up to this time
• Fatalities: 139

Johnstown
Pennsylvania
May 31, 1889
Failure of the South Fork Dam caused an estimated $17 million in damages.
• Fatalities: 2,209

St. Francis
California - March 12, 1928
Damages: 10 bridges and more than 1,200 homes.
• Fatalities: 450+

Baldwin Hills
California - December 14, 1963
• Damages: > $21 million
• Fatalities: 5

Buffalo Creek
West Virginia - February 26, 1972
• Damages: $50 million
• Fatalities: 125
Canyon Lake
South Dakota - June 9, 1972
Damages: > $60 million
Fatalities: 237

- National Weather Service

Teton
Idaho - June 5, 1976
Damages: Unprecedented ($400M-$2B)
Fatalities: 11

- U.S. Bureau of Reclamation

Laurel Run
Pennsylvania - July 20, 1977
Damages: $10 million
Fatalities: 47

- PA Dept. of Environmental Protection

Toccoa Falls
Georgia - November 5, 1977
Damages: $2.5 million
Fatalities: 39

- National Weather Service

Recent Dam Failures

Levees
New Orleans – September 2005
Damages: $ Billions
Fatalities: >1,500

- The Times Picayune
An evacuation order remained in effect, and schools and highways were closed amid fears a collapse would send a 6-foot wall of water crashing through downtown Taunton.

- Bill Greene, Boston Globe

Whittenton Pond Dam
Massachusetts – October 18, 2005
Damages: Near Failure, ~ 2,000 evacuated

The 173-year-old wooden dam holding water.

- Associated Press

Officials studied the dam and eased some of the pressure on dam by opening the flood gates while adjusting the flow on another dam upstream.

- Joe Raedle, Getty Images

Google Earth view of New Orleans showing location of levee breaches
- Tulane University

View looking east at the 17th St. Canal breach.
- J. Augustino, FEMA

Oblique view of Industrial Canal breach and Lower 9th Ward
- Vincent Laforet, AFP/Getty Images
Support lines for a water volume measuring device crossed the Mill River in front of the dam. The Acoustic Doppler Current Profiler measures the volume and speed of water in the river’s current.

– Associated Press

**Taum Sauk Levee**
Missouri – December 14, 2005
Damages: 1 home demolished, state highway washed out
Fatalities: 0 (3 children critically injured)

– FERC

Overall view of the breached dike.

– AmerenUE
Ka Loko Dam
Hawaii - March 14, 2006
Damages: environmental, several homes, crops
Fatalities: 7

- Star Bulletin

Arizona Dam Failures

Lyman Dam Failure 1915
– Unknown

Walnut Grove Dam
February 22, 1890
Before failure, height was 110 ft and stored 50,000 ac-ft
Fatalities: Between 70 -100

- Sharlott Hall Museum
**Lyman Dam**

1915

Damage: Ranch homes and flooding in St. Johns

Fatalities: ~ 6

![Left Abutment looking downstream](Unknown)

- Unknown

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**Picacho Dam**

**Historic Failures**

- 1925
  - Overtopping failures damaged roads and canals downstream

- 1931
  - Attributed to piping along earth fissures in foundation and cracks in the dam in east half of south dike

- 1955
  - Failure on south dike attributed to earth fissure. Failure occurred after heavy rains filled reservoir. Spillway operated for first time.

- 1961
  -...

- 1983

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Topographic Map of Picacho Reservoir
Land Subsidence & Earth Fissures

Aerial View of Picacho Fissure Looking North

Hole in upstream slope of Picacho Dam - Jan. 1955

Piping failures in downstream slope of Picacho Dam - Jan. 1955

Earth fissure in bottom of Picacho Reservoir - Jan. 1955

Gillespie Dam
January 1993
Damage: > $10 Million

- William Graf, University of South Carolina
Centennial Dam
September 1997
Damages: Washed out highway
Fatalities: 0

- Steve Waters, FCDMC

Double Breach Failure of Centennial Narrows Dam
-Steve Waters, FCDMC

Primary Breach - Morning of Failure
- Steve Waters, FCDMC

Primary Breach - looking upstream
- ADWR

Secondary Breach - looking upstream
- ADWR

Williscraft Dam
Arizona – September 2004
Low Hazard Dam

- ADWR
Questions?