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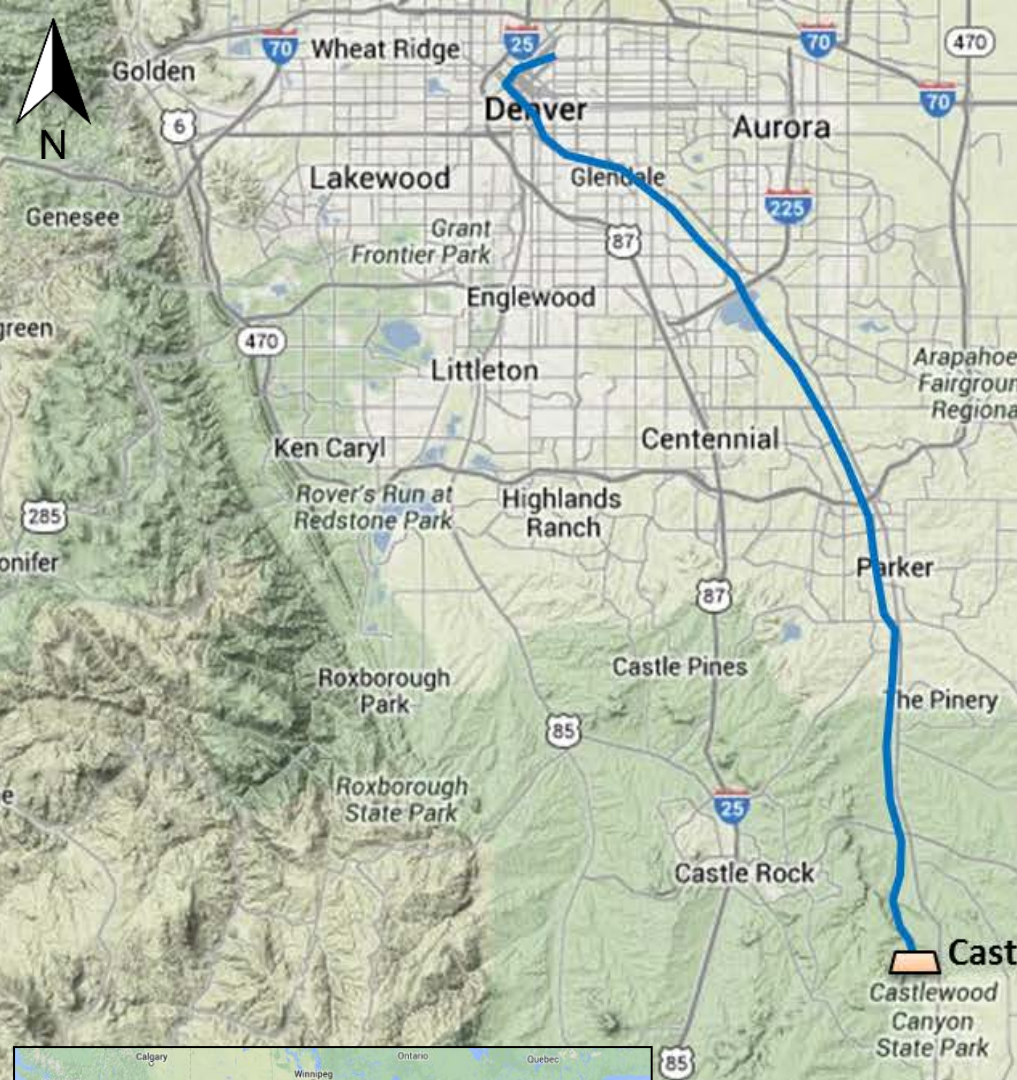


80th Anniversary of the

CASTLEWOOD DAM FAILURE

Lee Mauney, Hydrologic Engineer, Bureau of Reclamation





■ 40 miles SE of Denver, Colorado
■ Cherry Creek to South Platte River

1933



[History Colorado]



[History Colorado]

Cherry Creek

Looking South from
11th Street Bridge, Denver



2013

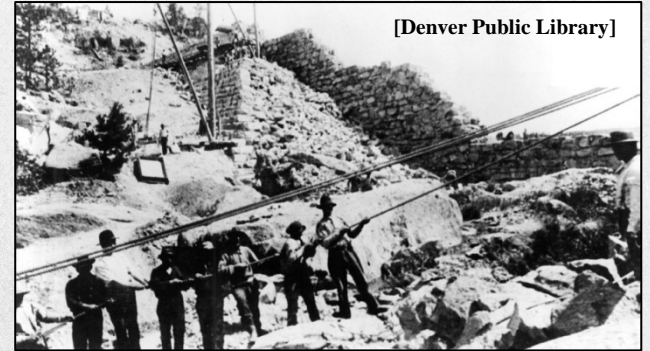
[Lee Mauney]

Castlewood Dam Failure, 1933

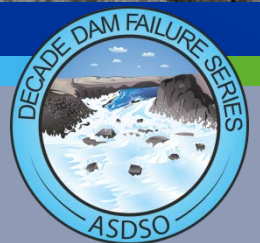


Constructed in 1890

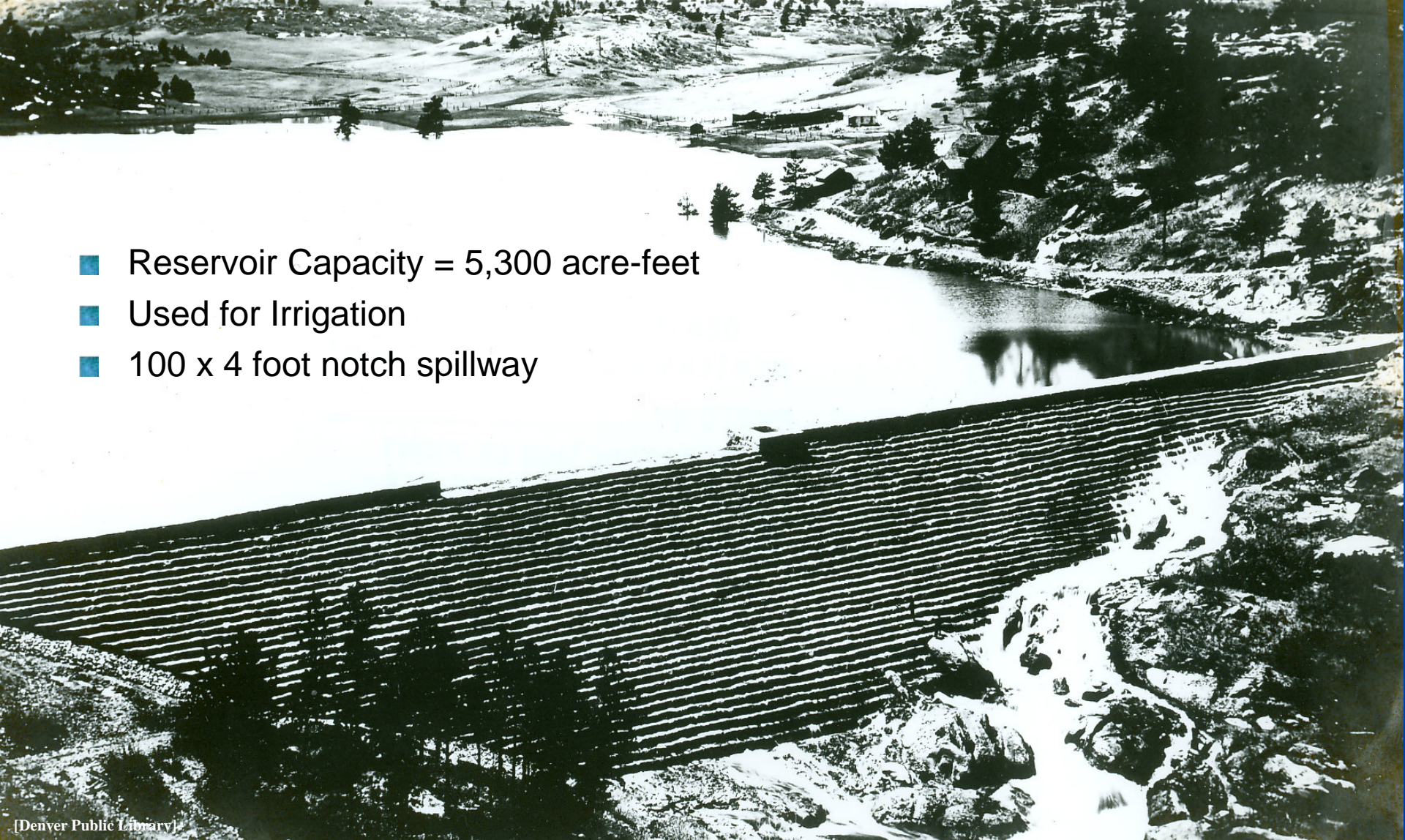
- Masonry and Rockfill Structure
- Built from local materials



Castlewood Dam Failure, 1933



- Reservoir Capacity = 5,300 acre-feet
- Used for Irrigation
- 100 x 4 foot notch spillway



[Denver Public Library]

Castlewood Dam Failure, 1933



**CASTLEWOOD DAM
CAN DO NO HARM**
if It Should Go Out, the Fact
Would Hardly Be Known
in Denver.

**THE ANNUAL SCARE OVER
THE BIG CASTLEWOOD DA**
A Committee of the Council May Be Appointed to
Up and Investigate. Times 4-11

AN IMPENDING DANGER
The Castlewood Dam Is Declared
to Be Unsafe. Times
5-13-91
REPORT OF INVESTIGATORS.
**THE TRUTH ABOUT
CASTLEWOOD DAM**
Times 5-3-00

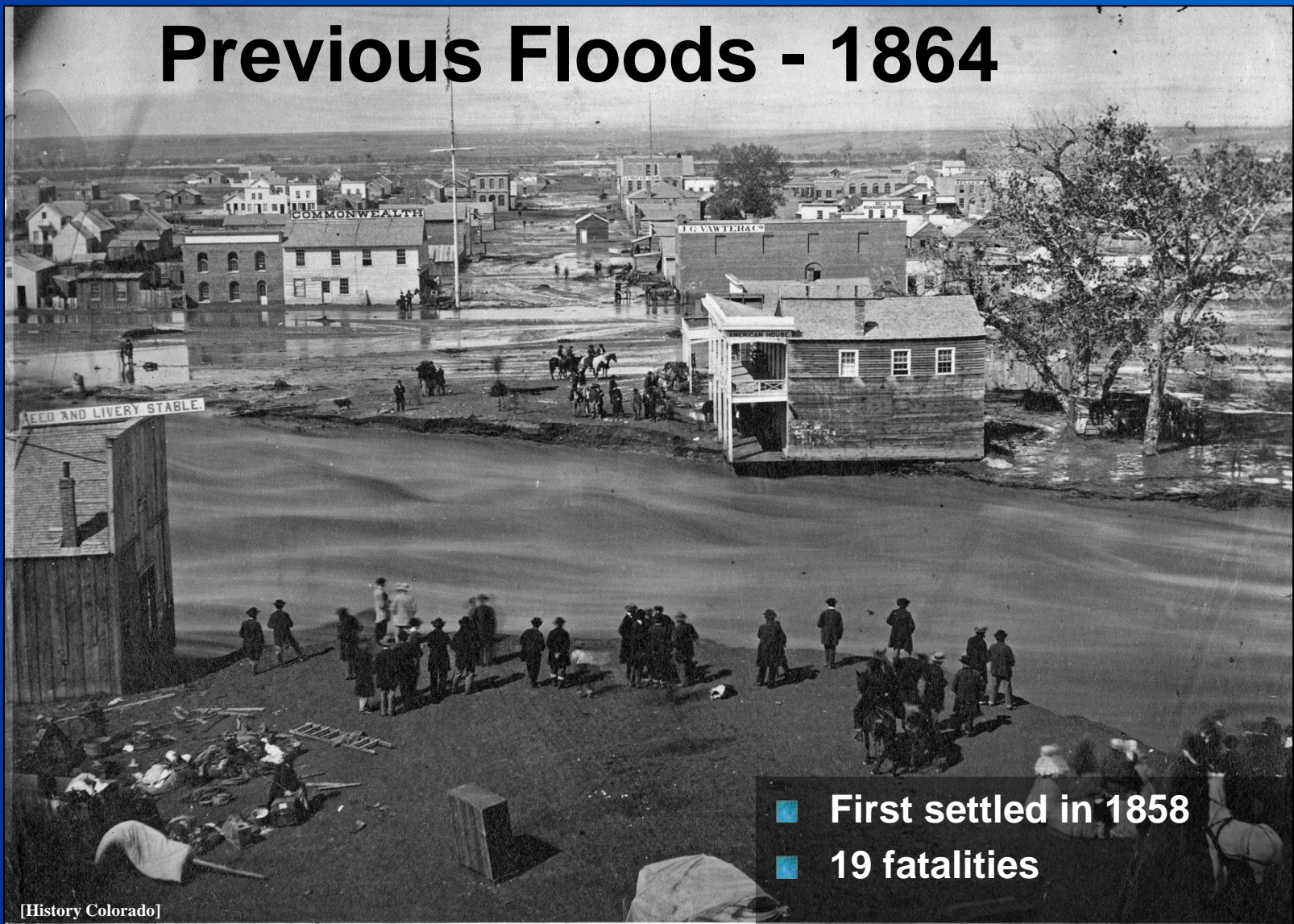
- Controversy from the beginning
 - Safety was questioned by downstream citizens and committee of engineers.
 - Owners (Denver Water Storage Company) and designers support dam.
 - In 1897 a section washed out and repairs were made...
- Chief Engineer was A.M. Welles (33 years before failure)
 - “The Castlewood Dam will never, in the life of any person now living, or in generations to come, break to an extent that will do any great damage either to itself or others from the volume of water impounded, and never in all time to the city of Denver.”



Castlewood Dam Failure, 1933



Previous Floods - 1864



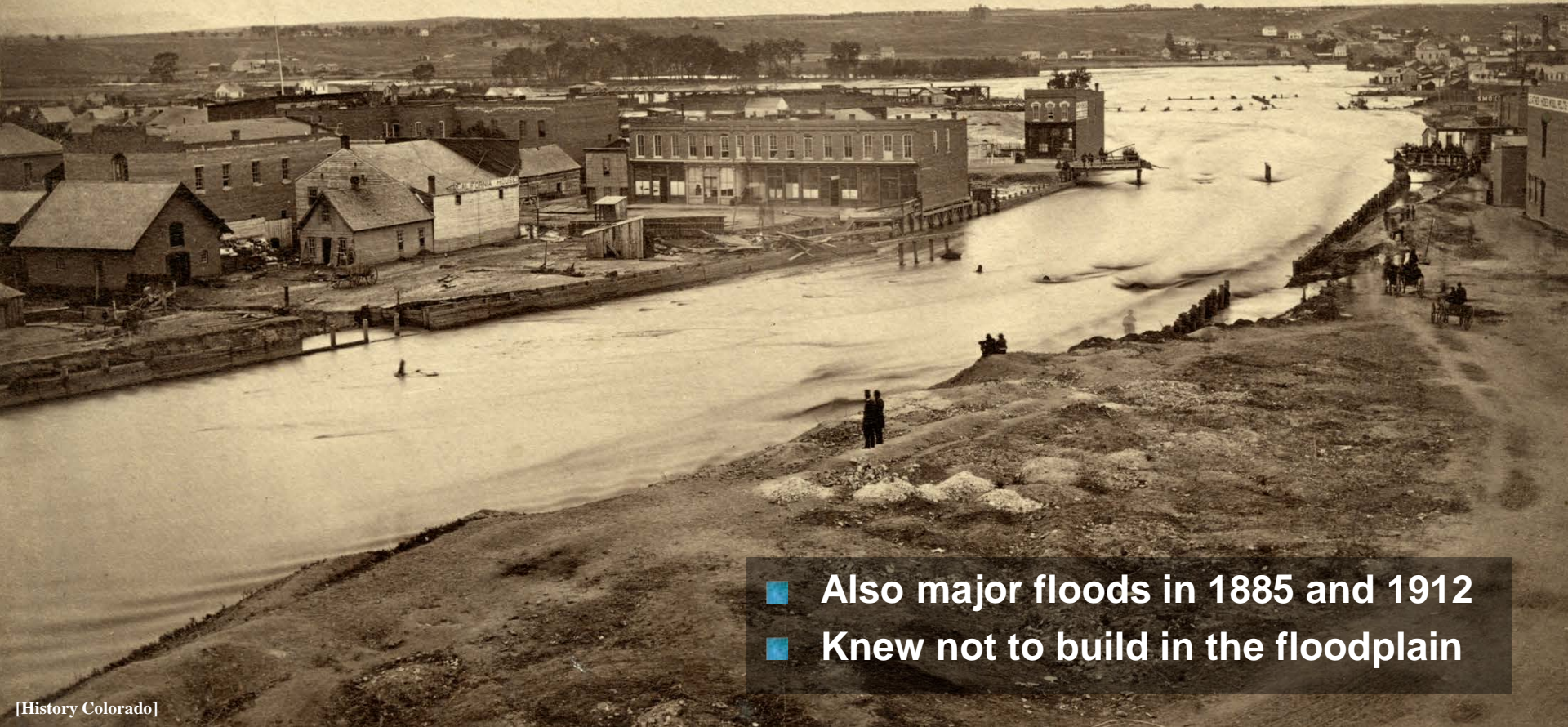
[History Colorado]

- First settled in 1858
- 19 fatalities

Castlewood Dam Failure, 1933



Previous Floods - 1878



- Also major floods in 1885 and 1912
- Knew not to build in the floodplain

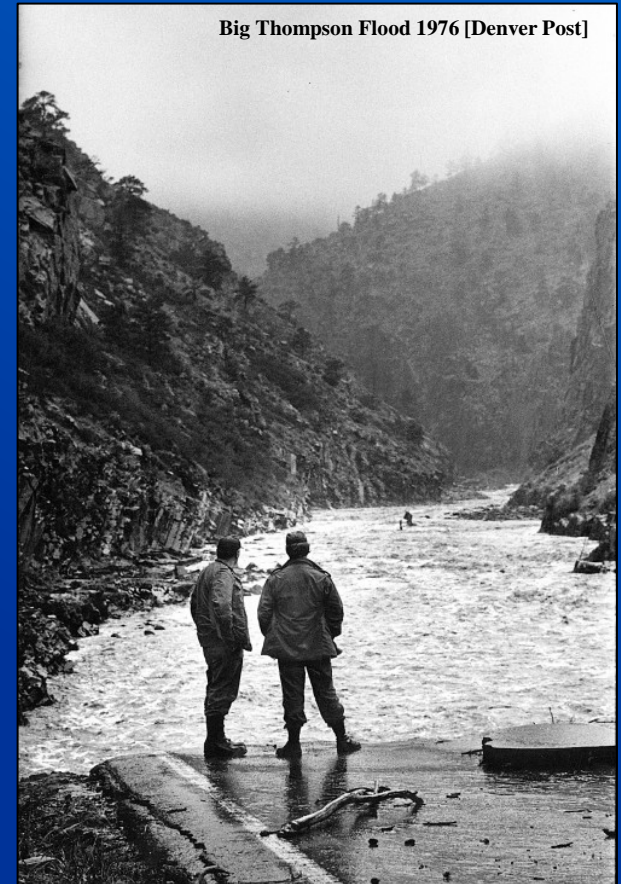
[History Colorado]

Castlewood Dam Failure, 1933



Time of Year in CO

- **July 24, 1896** – Cub Creek near Morrison, CO
 - 27 fatalities
- **August 3, 1951** – Buckhorn Dam Failure
 - 4 fatalities
- **July 31, 1976** – Big Thompson Canyon flood
 - 144 fatalities
- **July 28, 1997** – Fort Collins flood
 - 5 fatalities
- **July/August 2013** –
 - Manitou Springs flooding, Waldo Canyon
 - 2 fatalities from separate events

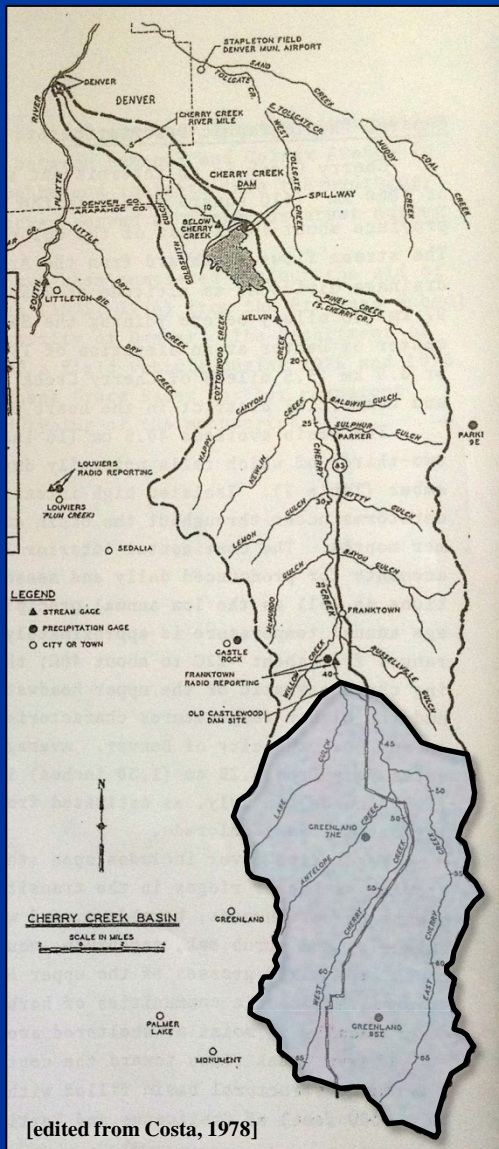


Castlewood Dam Failure, 1933



Basin

- Cherry Creek Basin = 410 mi²
- Castlewood Basin = 175 mi²
 - El. 6500 to 7500 feet

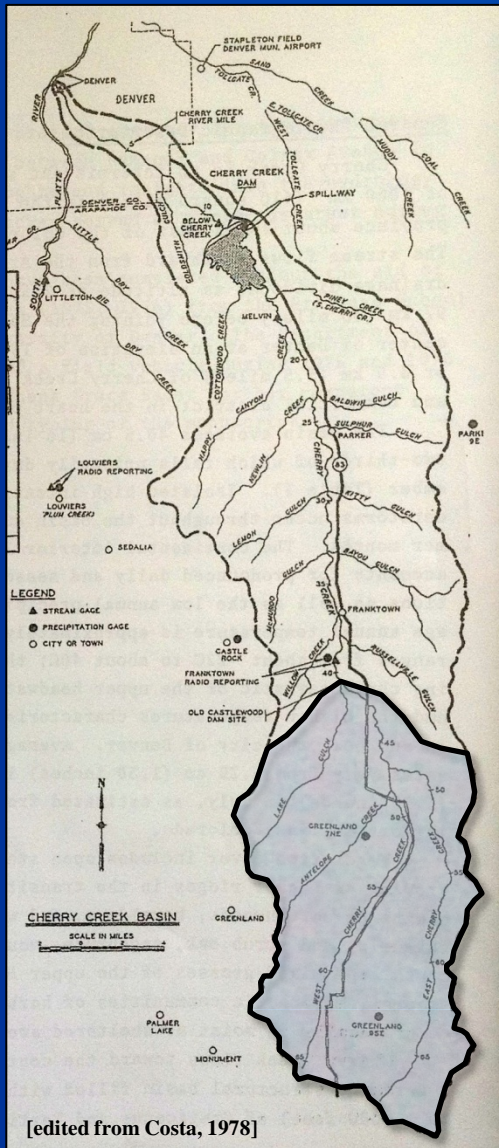


Castlewood Dam Failure, 1933



August 2-3, 1933

- Wet period for 3 to 7 days prior
- 4 to 9 inches of rain in approximately 3 hours
- Localized storm event

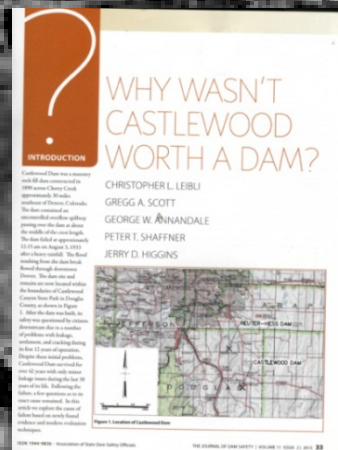


Castlewood Dam Failure, 1933



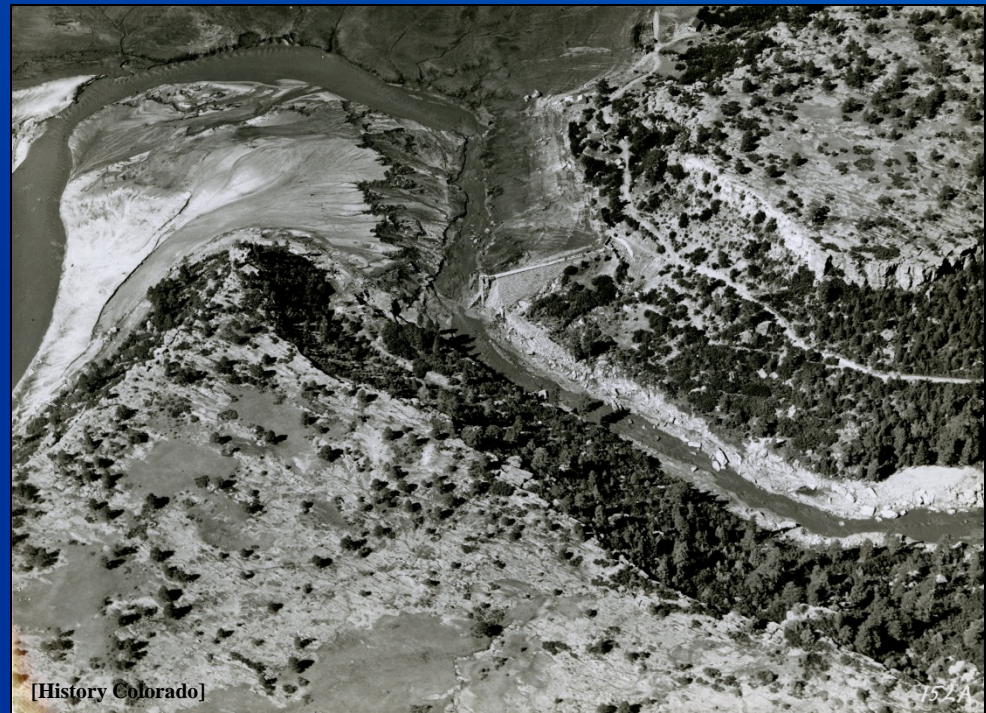
August 2-3, 1933: Timeline

- 11:15 pm – reservoir water level 6 feet below spillway crest
- Midnight – water level at crest of dam
- 12:15 am – water overtopping dam (~1 foot)
- 1:20 am - Castlewood Dam Breached



Downstream Floodpath

- Immediately downstream
- $\sim 126,000 \text{ ft}^3/\text{s}$

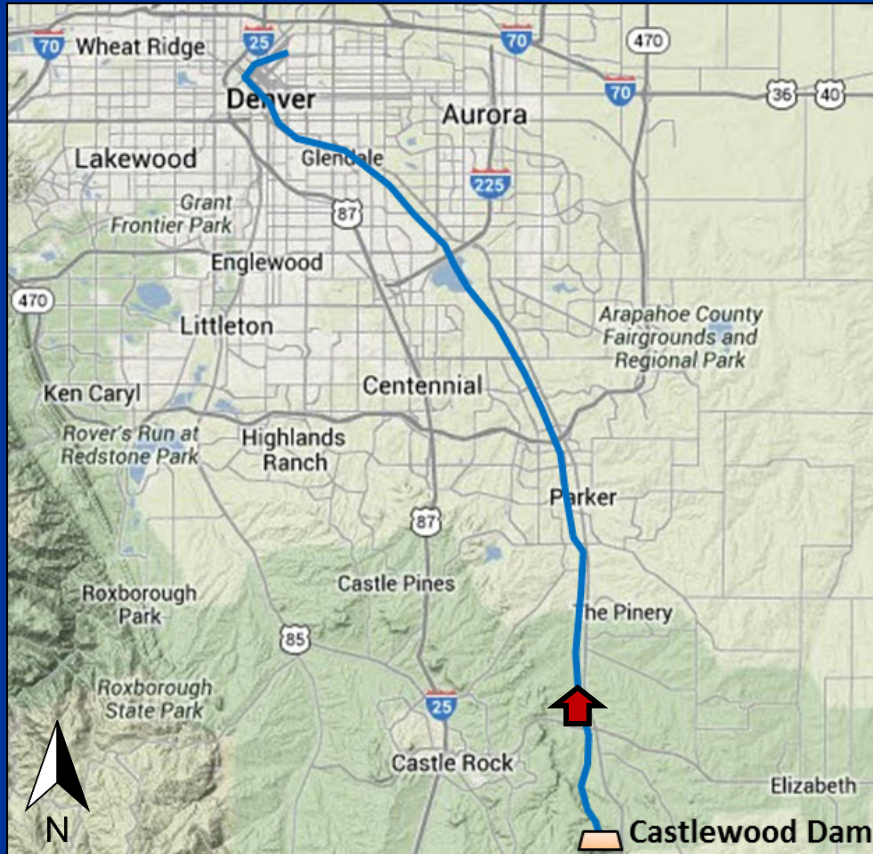


Castlewood Dam Failure, 1933



Downstream Floodpath

- Rural Farmland
- Washed out county bridges

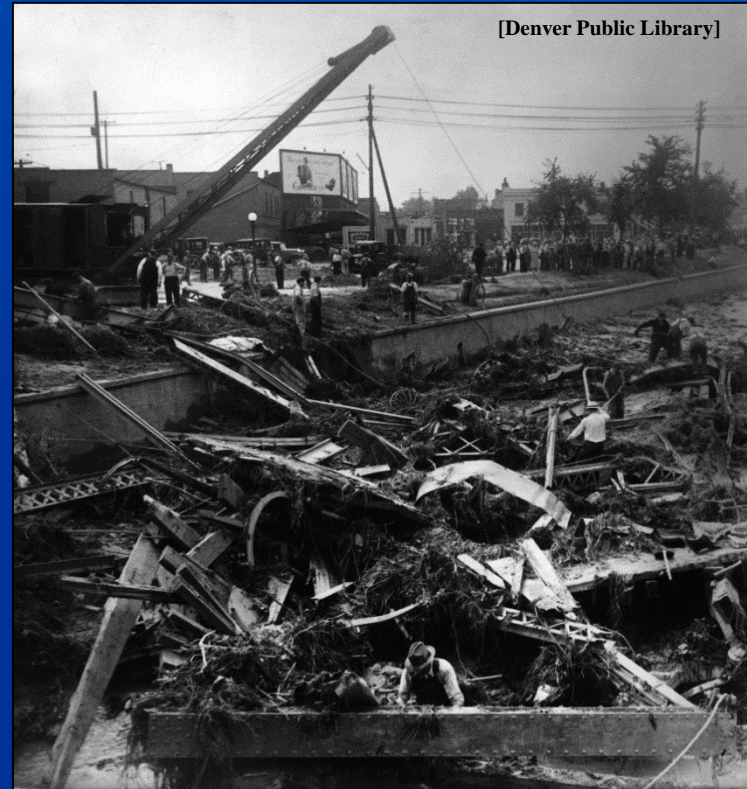
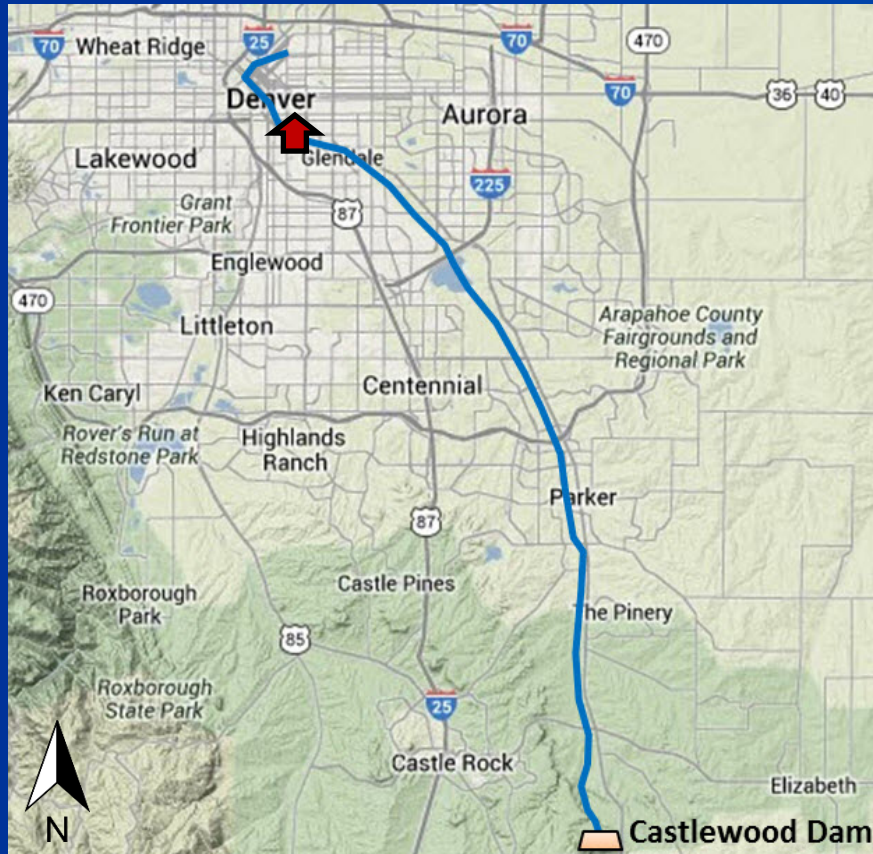


Castlewood Dam Failure, 1933



Downstream Floodpath

- Reached outskirts between 5-6 am
- Two floodwaves (second was ~15 feet)

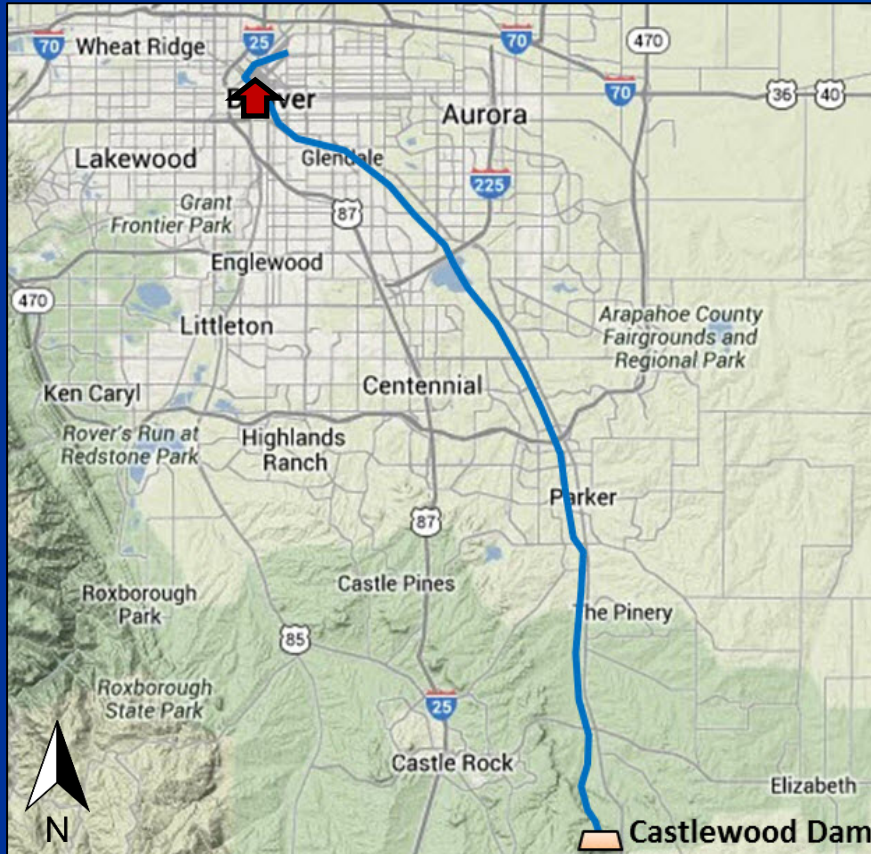


Castlewood Dam Failure, 1933

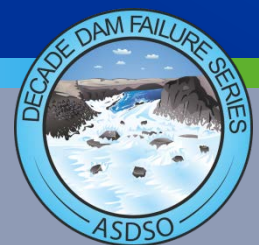


Downstream Floodpath

- 7 am (6 hours after dam breach)
- Discharge = 15,000 ft³/s at ▲
- Flooded businesses and homes



Castlewood Dam Failure, 1933



Warning Issued

- Dam tender lived at the site with his wife
- Heard the roar of water going over dam
- Tried to telephone, but wires were out
- Drove 12 miles to call Denver Police and telephone operators

- Warning sent out over telephone lines and radio
- Telephone operator called people along Cherry Creek telling them to “hurry to higher ground”



Parker telephone operator, Nettie Driskill [Horan, 1997]

Consequences

- 2 Fatalities
- \$1 Million in damage (property, crops, animals)
 - Approx. \$18 Million adjusted for inflation
- Why not more fatalities?
 - Dam tender on site
 - Good warning
 - Telephone Dispatch, Police and Fire, Word-of-mouth
 - Immediate downstream area was rural farmland
 - Did not destroy major residential structures
 - Some residents were aware of flood risk
 - Previous flooding - built away from floodplain
 - Felt Castlewood Dam was unsafe





Castlewood Dam Failure, 1933





Thank You!