

Intro to Dams in WI

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Topics to be Covered

- Definitions
 - Regulations
 - Terminology
 - Owner Responsibility
 - Dam Safety and Floodplain Management – Design and the Dam Failure Analysis
 - Hazard Ratings
 - Historic Failures
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A Dam Is.....

...Any artificial barrier, together with appurtenant works, built in or across a watercourse for the primary purpose of impounding or diverting water.

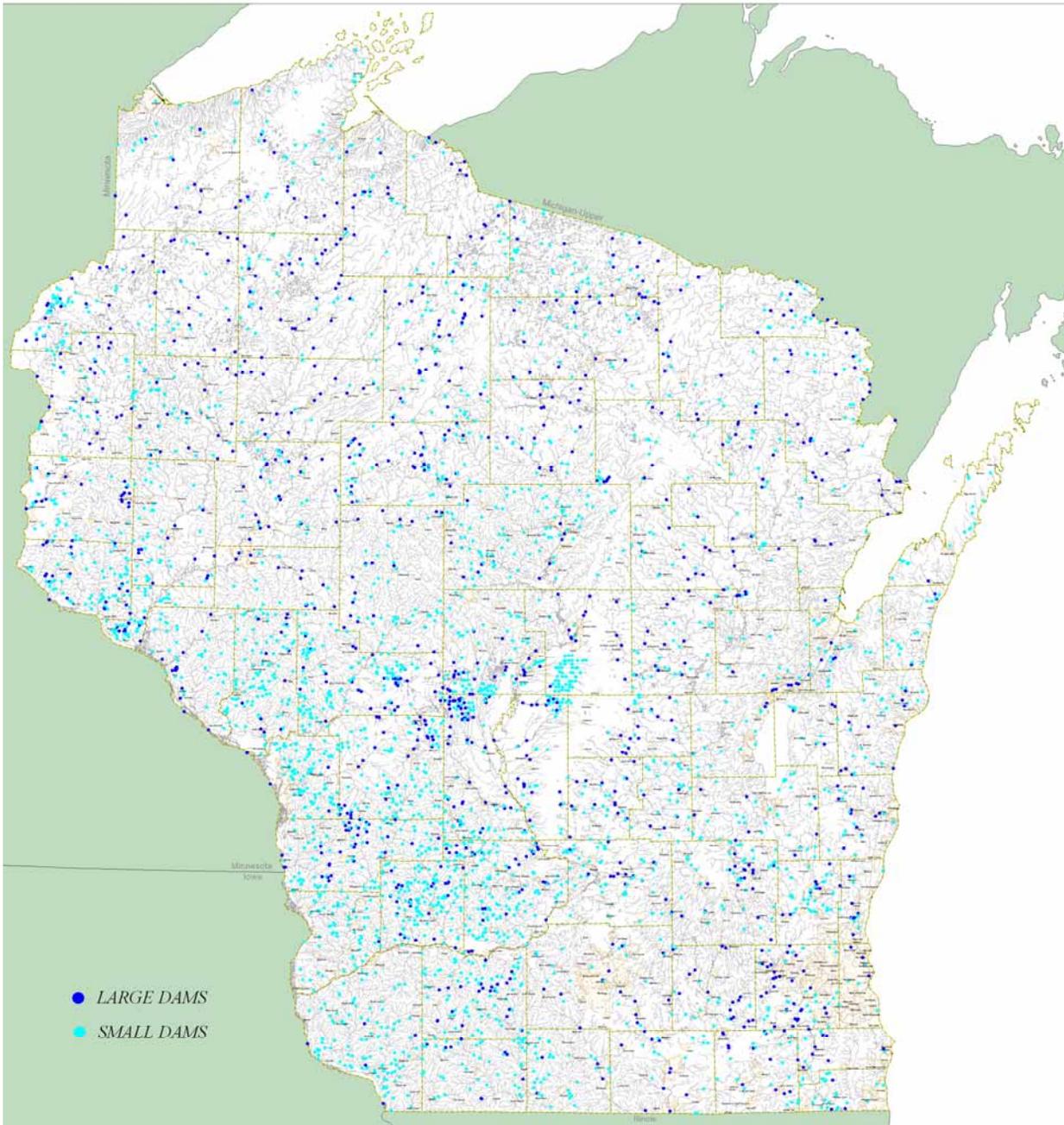


A Watercourse Is...

A running stream of water; a natural stream fed from permanent or natural sources, including rivers, creeks, runs and rivulets. There must be a stream, usually flowing in a particular direction, though it need not flow continuously. It may sometimes be dry. It must flow in a definite channel, having a bed or banks, and usually discharges itself into some other stream or body of water. It must be something more than a mere surface drainage over the entire face of the tract of land, occasioned by unusual freshets or other extraordinary causes.

(Hoyt v. City of Hudson)

WISCONSIN DAMS



Wisconsin
has over
3700 dams

Reasons to Regulate Authority in Chapter 31, State Statutes

- Protection of public rights in navigable water - Public Trust Doctrine
- Protection of life, health and property from unsafe dams.

Statutes – Codes - Guidance

- Chapter 31, State Statutes
- NR 300 – Fees
- NR 330 – Signing
- NR 333 – Design Standards, Large Dams
- NR 116 - Floodplain Management Program (116.08)
- NR 335 – Municipal Grant Program
- NR 353 – Wetland Restoration Projects
- NR 336 – Small Dam Removal/Abd. Dam Grants
- NR 331 – Fish Passage

Dam Regulation

- Permitting new dams
 - Dam transfers
 - Levels and flows
 - Plan approval for repair/reconstruction/removal
 - Approve EAP and IOM documents Process abandonment permits
 - Safety Inspections
 - Emergency response
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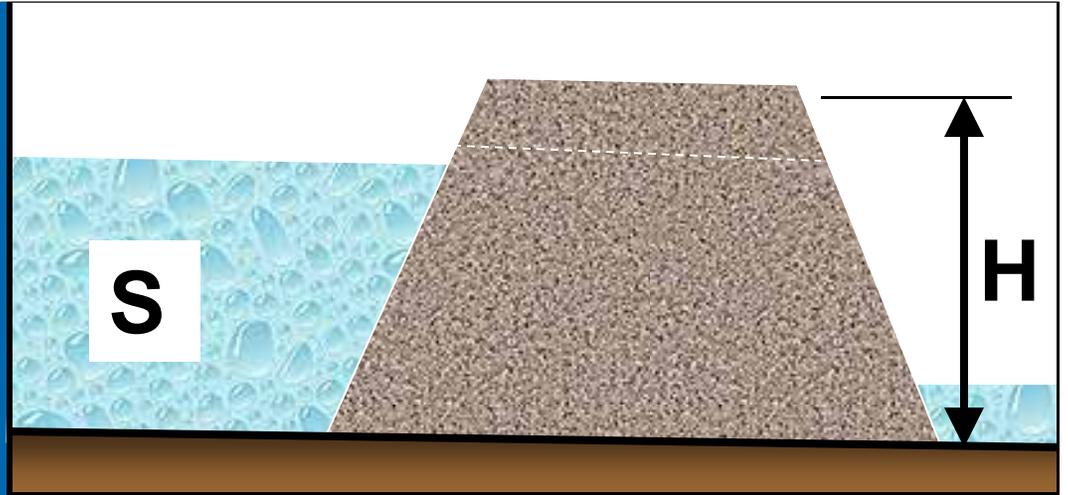
Classification

- Waterway Type - Public Trust
 - Navigable vs Nonnavigable

- Size - Public Safety
 - Large vs Small



Large Dam



Structural Height > 6 feet ...and...

Maximum Storage ≥ 50 acre feet

or

Structural Height ≥ 25 feet ...and...

Maximum Storage > 15 acre feet

or

Any dam that causes a significant threat to life or property

Basic Dam Terminology

- **Definition of a dam**
- **Spillway types**
 - **Primary / Principle**
 - **Uncontrolled / Fixed Crest**
 - **Gated**
 - **Auxiliary / Secondary /Emergency**
- **Other Common Dam Terms**
- **Gate Types**
- **Hydroelectric Generation**

Types Of Dams

- **Embankment**
 - Earth fill
 - Overtop Protected
- **Gravity**
- **Buttress**
- **Arch**
- **Masonry**
- **Timber Crib**



Earth Fill Dam



Concrete Gravity Dam



Concrete Buttress



Masonry Buttress Dam



Concrete Arch



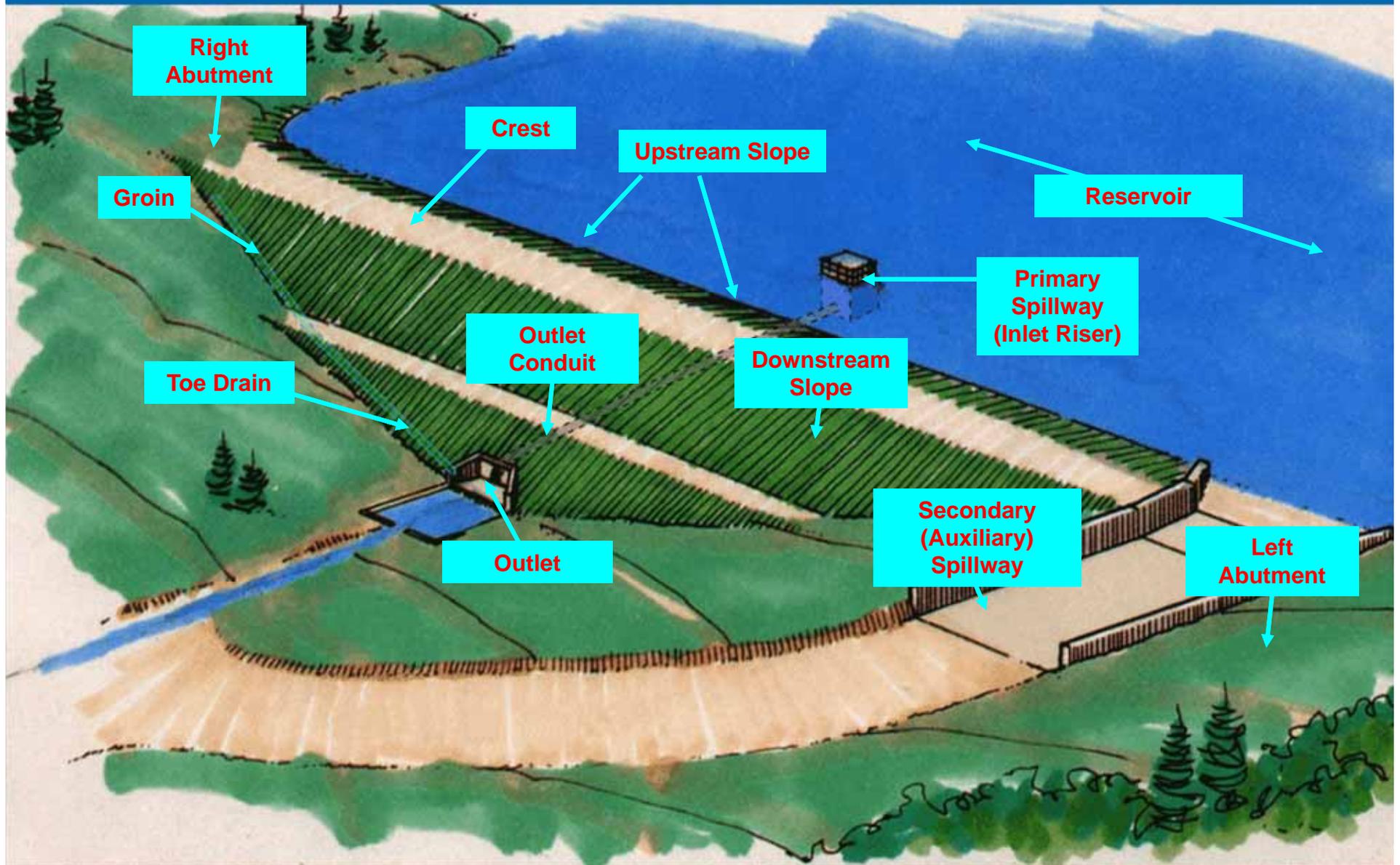
Timber Arch Dam



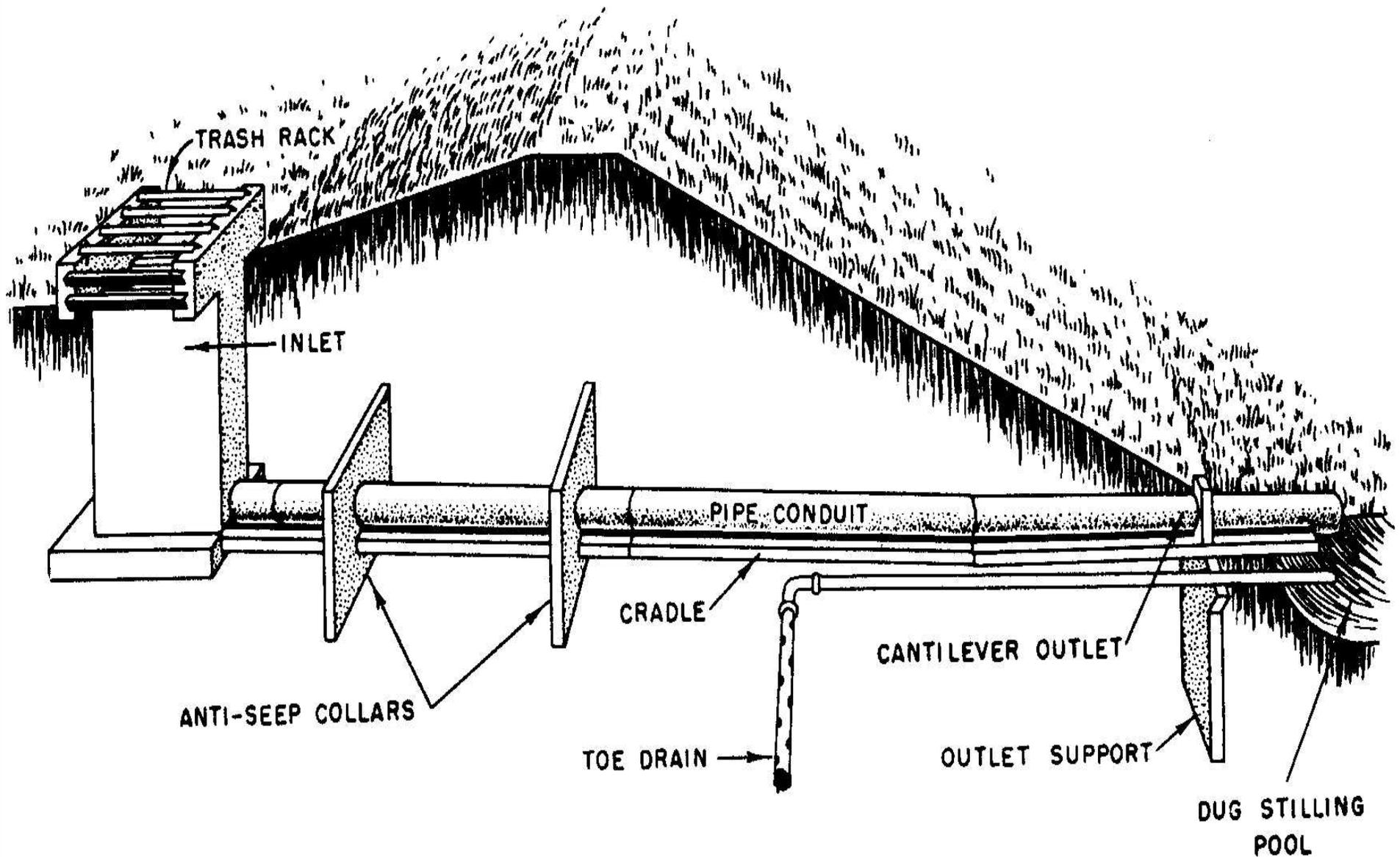
Timber Crib



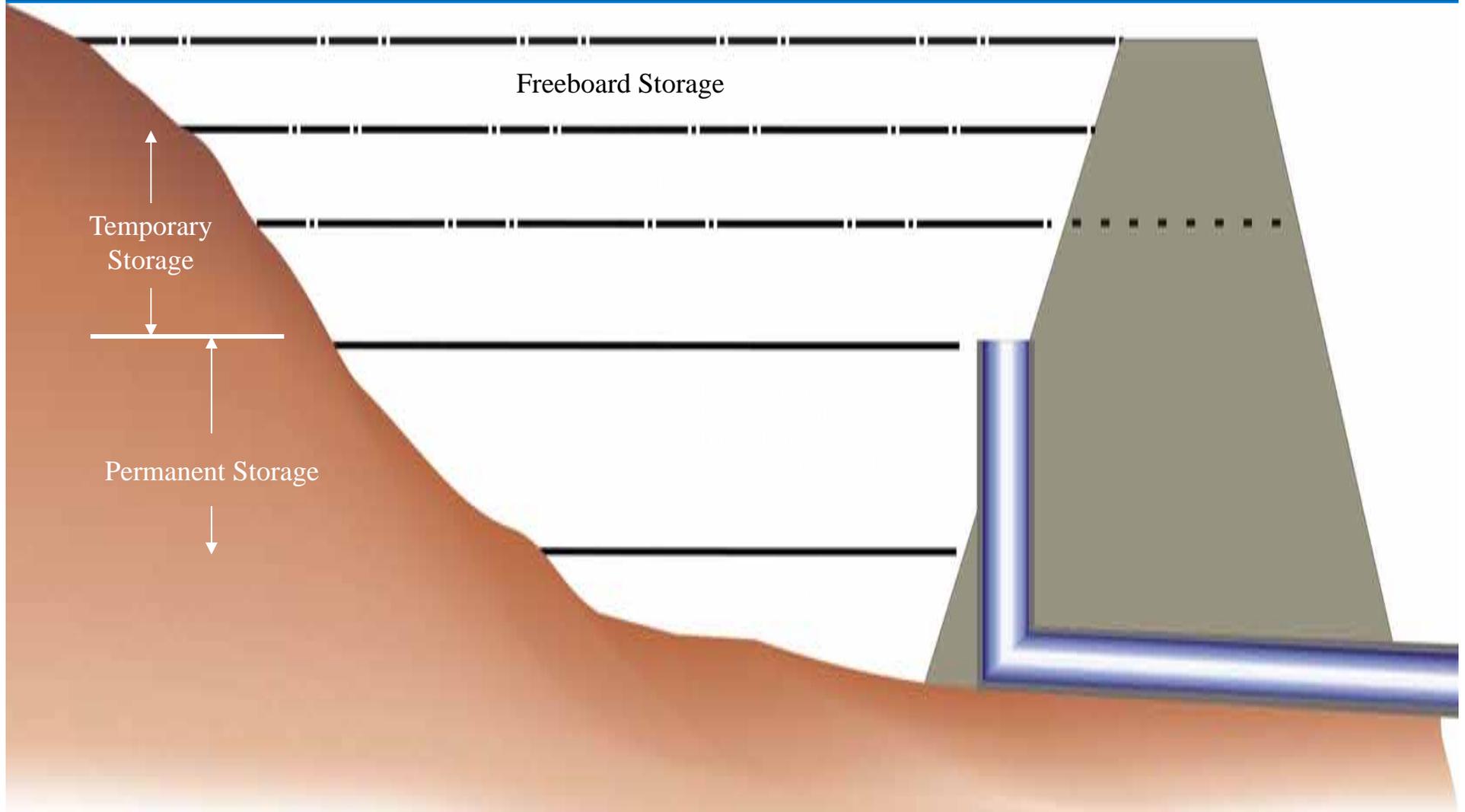
Parts of an Embankment Dam



Cross Section Terminology



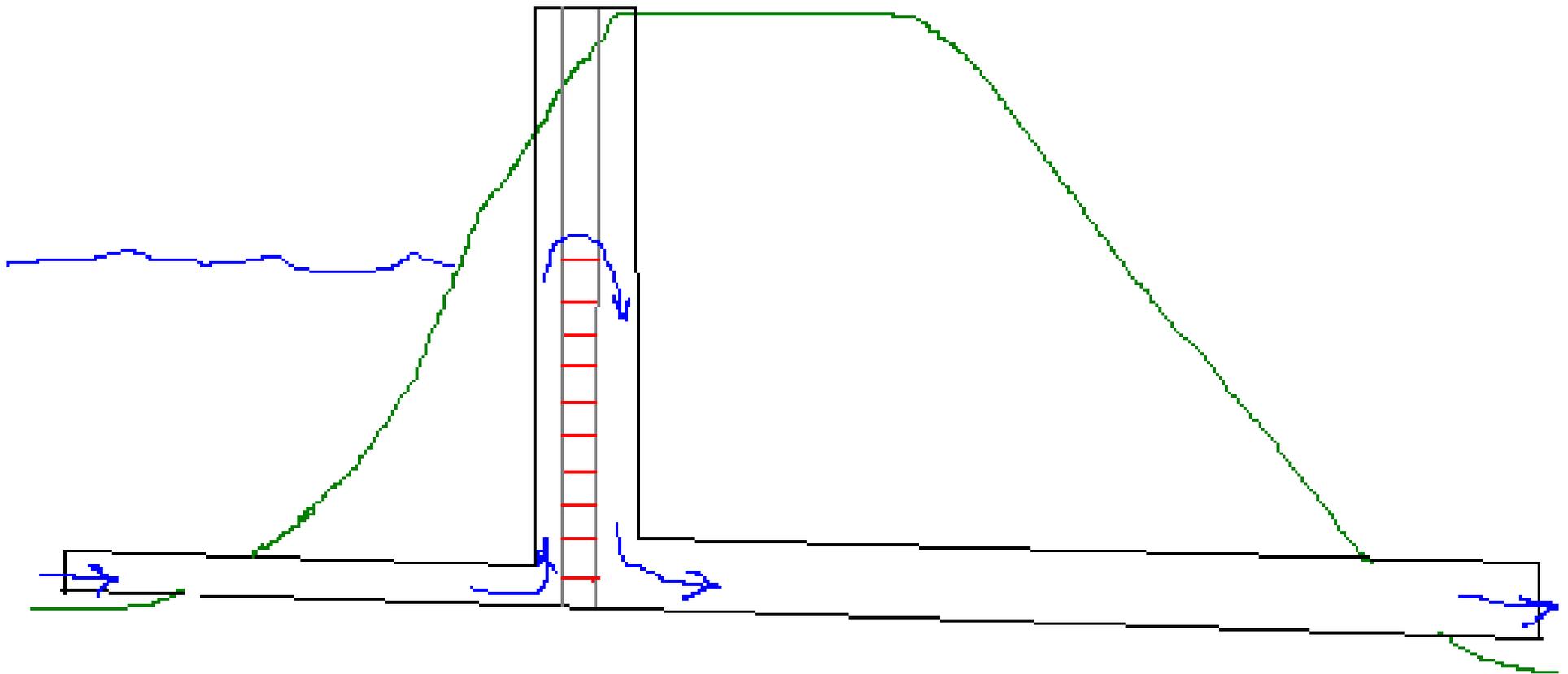
Storage Terminology



Spillways Types

**Primary (Principle) Spillway
Uncontrolled or Fixed Crest**

Whistle Tube Spillway



Ogee Spillway



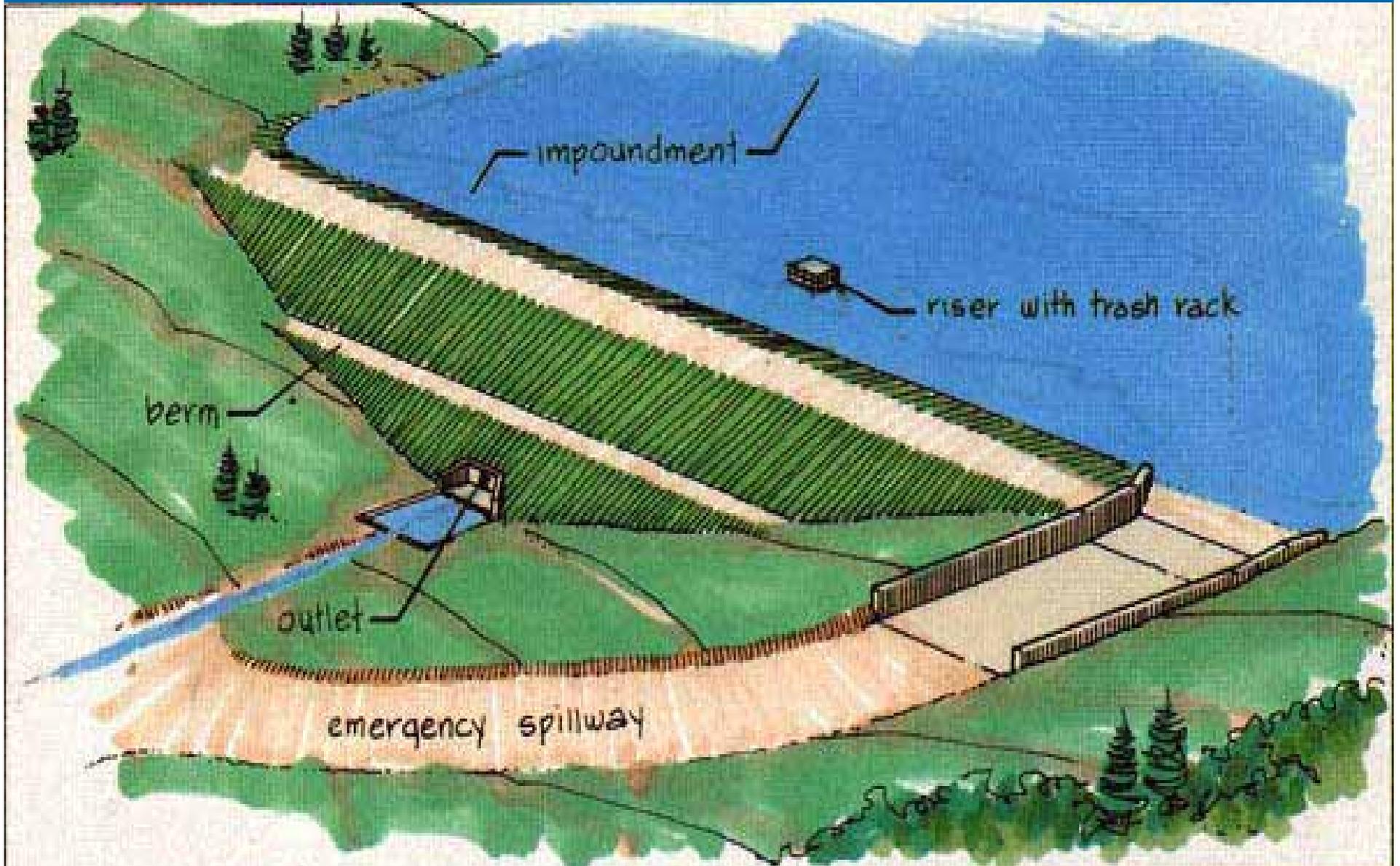
Labyrinth Spillway



Gated Spillway



Auxiliary (Emergency) Spillway







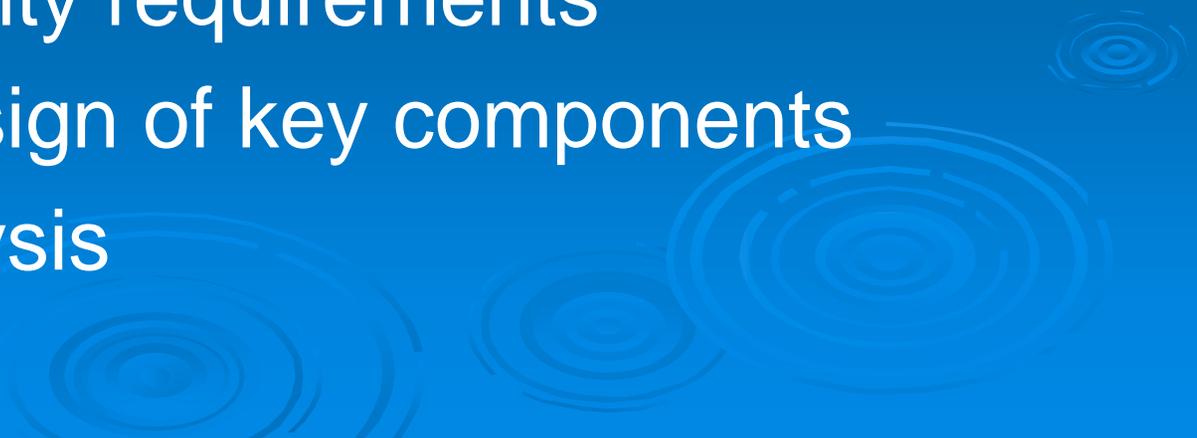




Owner Responsibility

- Operate and Maintain in Safe Manner
- Perform Periodic Inspections 31.19
- Prepare and Implement EAP/IOM Plans
- Obtain Appropriate Permits/Approvals
- Coordinate Operation with Others
- Keep Informed About Regulations

Dam Design

- Watershed hydrology and hydraulics
 - Soils investigation
 - Consideration of desired functions of impoundment
 - Hazard assessment
 - Design capacity requirements
 - Structural design of key components
 - Stability analysis
- 



Dam Failure Analysis

- Used for three purposes
 - Identify the inundation area and determine the hazard potential
 - Determine the design capacity requirements
 - Incorporate into the Emergency Action Plan
- Data intensive analysis done by engineering consultant

Dam Hazard Rating

- Hazard potential classifications are:
 - **High hazard** – probable loss of life
 - **Significant hazard** – significant property damage but no loss of life
 - **Low hazard** – no loss of life or significant property damage
- Base hazard rating on existing development and land use controls, not condition of the dam

Historic Dam Failures



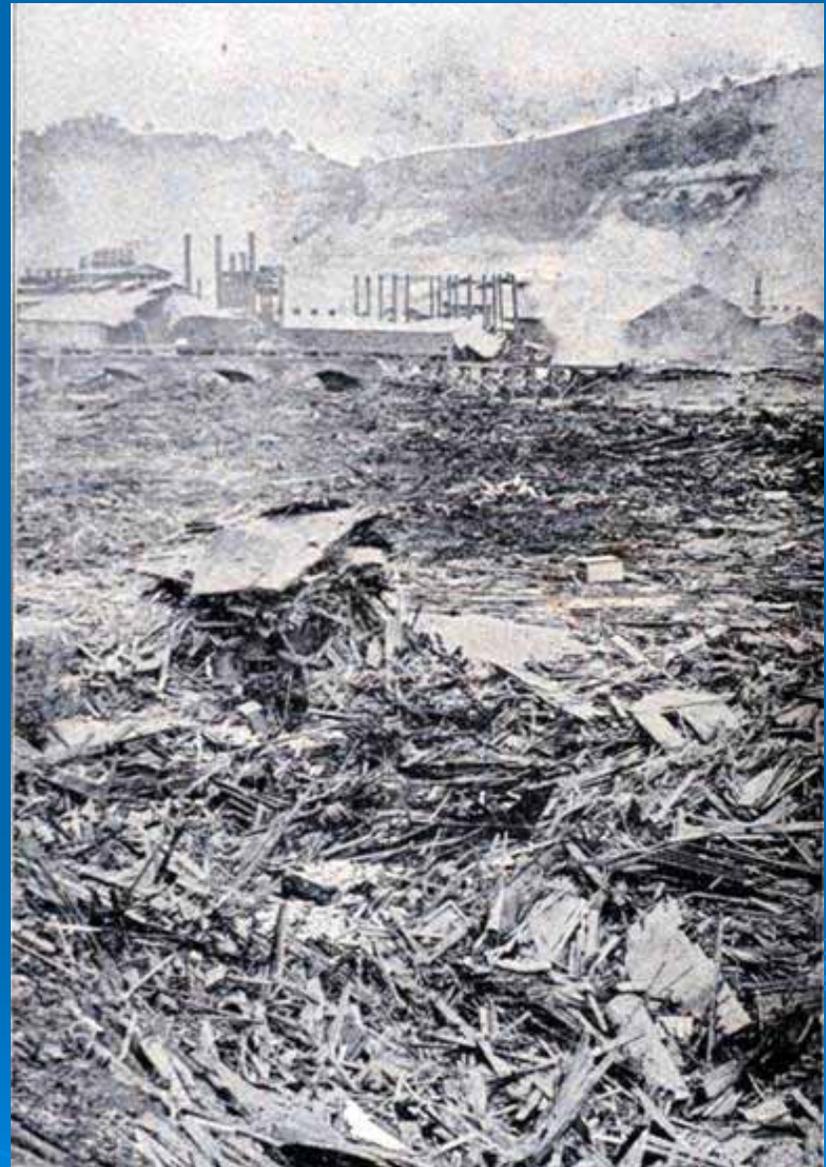
- National Weather Service

Johnstown

Pennsylvania
May 31, 1889

Failure of the South Fork Dam caused an estimated \$17 million in damages.

Fatalities: 2,209



- *National Weather Service*

Baldwin Hills

California - December 14, 1963

Damages: > \$21 million

Fatalities: 5



- Richard Levine

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

Toccoa Falls

Georgia - November 5, 1977

Damages: \$2.5 million

Fatalities: 39



- *National Weather Service*

Remember...

...Be Dam Safe

