



# Safe Dam? Yes You Can!

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Wisconsin Department of Natural Resources  
Dam Safety Program

# Recent Flooding Events

2017

2018

2019

Federally Declared  
Or  
Localized

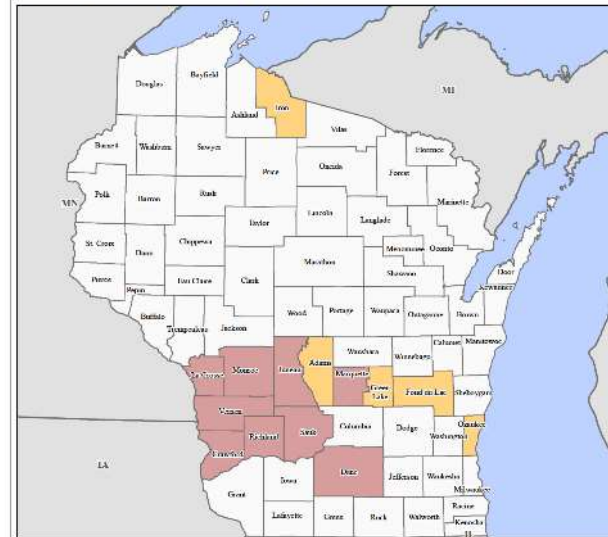
FEMA-4343-DR, Wisconsin Disaster Declaration as of 10/10/2017



FEMA-4383-DR, Wisconsin Disaster Declaration as of 08/10/2018



FEMA-4402-DR, Wisconsin Disaster Declaration as of 11/01/2018





Hillsboro Dam

**2018**

Coon Creek 23  
Dam





# Presentation

- Definition and Anatomy
- Prior and Present Day Uses
- Ecological Advantages and Impacts
- Regulation
- Ongoing Maintenance



## Definition of a Dam

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







# Wisconsin's Dams

## Benefits of Dams

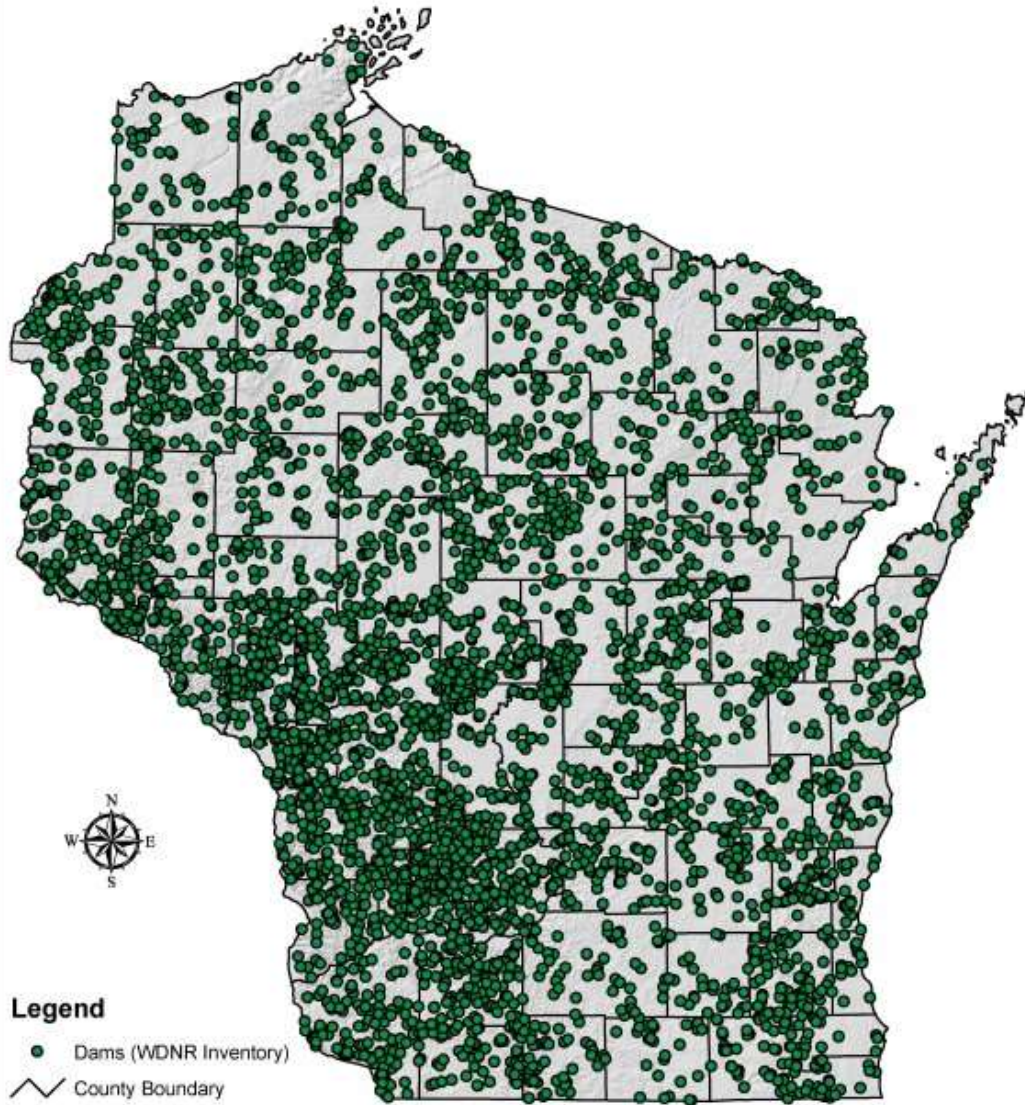
- + Power generation
- + Navigation
- + Reservoir/pond creation
- + Agricultural use
- + Waterfowl habitat
- + Flood control



## Impacts of Dams

- Fragment & change river habitat
- Disrupt stream flow & flooding patterns
- Impact thermal regime
- Decrease dissolved oxygen
- Sedimentation
- Block fish & wildlife movement
- Liabilities

# Wisconsin Dams



## Legend

- Dams (WDNR Inventory)
- County Boundary

Map produced by:  
Wisconsin Department of Natural Resources

April 19, 2019

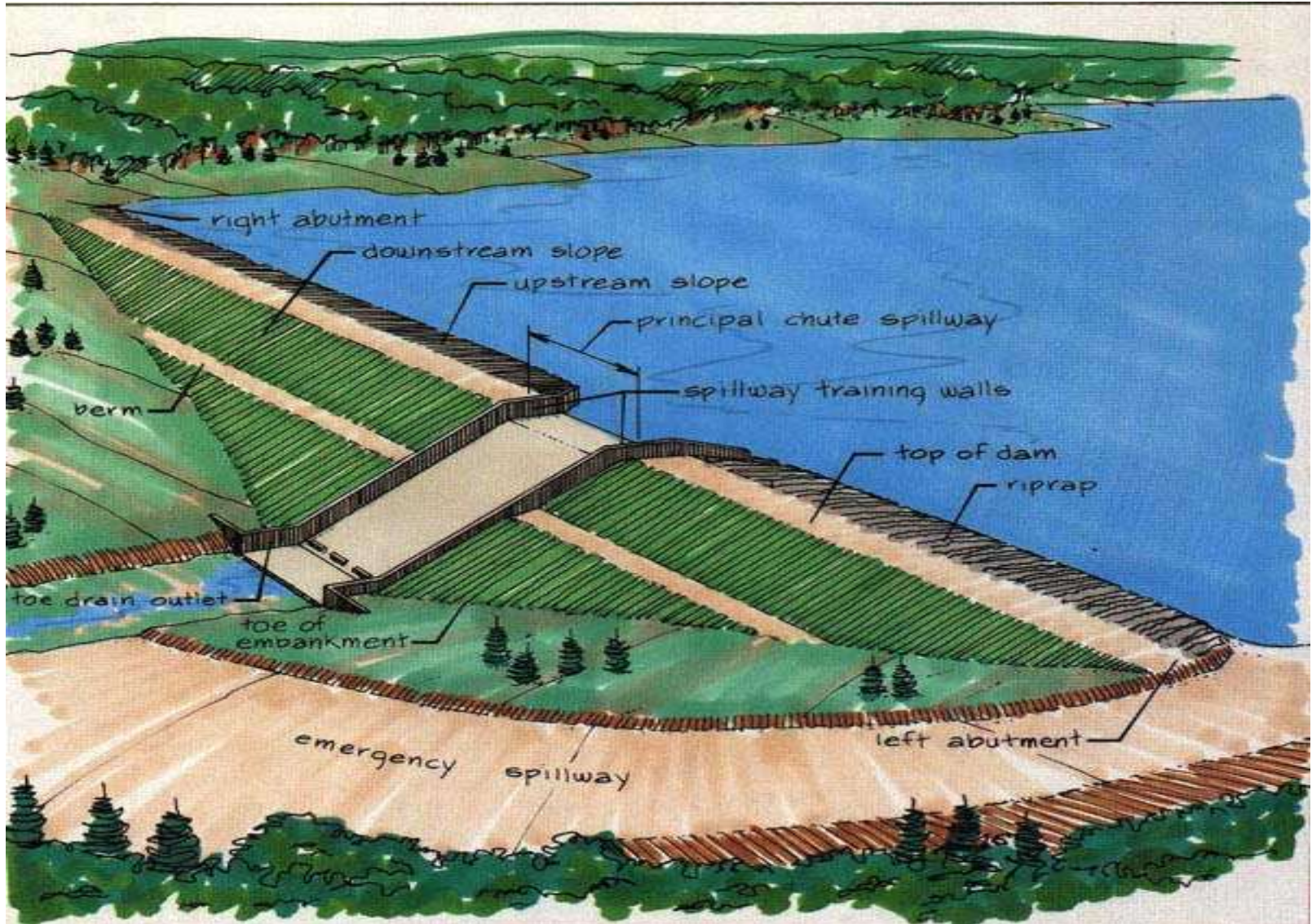
0 15 30 60  
Miles



Approximately  
4,000 total dams



# Dam Parts

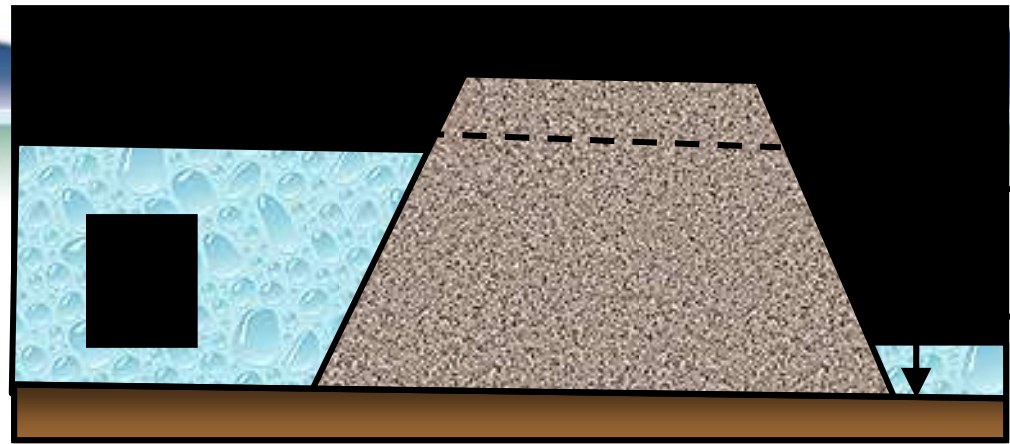




# Classification

- Waterway Type - Public Trust
  - Navigable vs Nonnavigable
- Size - Public Safety
  - Large vs Small

# Large Dam



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

Maximum Storage  $\geq 50$  acre feet

or

Structural Height  $\geq 25$  feet ...and...

Maximum Storage  $> 15$  acre feet

or

Any dam that causes a significant threat to life or property





# Dam Hazard Rating

- Hazard potential classifications are:
  - **High hazard** – possible 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



# Wisconsin Dam Regulation Dam Safety Program

How do we ensure the state's dams are operated and maintained in a safe manner?



# Wisconsin Dam Regulation Dam Safety Program

Dams are regulated for:

- Protection of life, health and property from unsafe dams
- Protection of public rights in navigable waters (Public Trust Doctrine)







# Wisconsin Dam Regulation Dam Safety Program

## Statute and Codes

- Chapter 31, State Statutes
- NR 300 – Fees
- NR 330 – Signing
- NR 333 – Design Standards, Large Dams
- NR 335 – Municipal Grant Program
- NR 336 – Dam Removal/Abandoned Dam Grants
- NR 353 – Wetland Restoration Projects



# Wisconsin Dam Regulation Dam Safety Program

- Plan approvals for existing dams
  - Repair, alter, reconstruction, removal, drawdown, raise/enlarge
- Conduct safety inspections
- Issue directives to correct deficiencies, as needed
- Review and approval Dam Failure Analyses
- Provide emergency response



# Wisconsin Dam Regulation Dam Safety Program

- Review and approve dam ownership transfers
- Process abandonment permits
- Regulate water levels and flows
- Permit new dams
- Emergency Action Plans
- Inspection, Operation & Maintenance Plans





# Dam Inspection

- Dam inspection is a key element of a dam safety program
- The State may/must enter and inspect (Ch 31.19)
  - Mandatory 10-year inspection (Significant & High Hazard)
  - On discretion or upon complaint
  - To ascertain compliance or enforce conditions of approval
  - determine water levels or appropriate operation



# Dam Inspection

- Owners of large dams are required to have their dam periodically inspected by a professional engineer (P.E.) at a frequency based on hazard
  - High = every 2 years (4 x between DNR inspections)
  - Significant = every 3-4 years (2 x between DNR inspections)
  - Low = once every 10 years

# Common Problems

- Trees and Brush
- Deteriorated Concrete
- Woody Vegetation
- Deteriorated Outlet Pipe
- Inoperable Gates
- Embankment Erosion
- Seepage







# Owner Responsibilities

- Perform periodic inspections
- Operate and maintain in safe manner
  - Completing repairs
- Obtain appropriate permits/approvals
  - Repair plans prepared by WI Professional Engineer (PE)
- Prepare and implement EAP/IOM plans
- Coordinate operation with others
- Keep informed about regulations

# "Safe" vs "Unsafe" Dams

- A "Safe" Dam is compliant with Requirements in NR 333 and NR 116
  - Design Spillway Capacity
  - Appropriate Zoning for Hazard
  - Adequate Stability
  - Approved EAP & IOM



- An "Unsafe" Dam has deficiencies which could result in the improper operation or failure of a dam (capacity, stability, seepage, animal burrows, erosion, vegetation, ownership)



# 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



100 YEAR FLOOD - DAM FAILURE



# Common Causes of Dam Failure

- Overtopping
- Structural failure
- Stability failure
- Cracking
- Poor maintenance
- Piping



# Structures not regulated by State

- Hydropower dams regulated by Federal Energy Regulatory Commission (FERC)
- Army Corps (ACOE) dams
- Water control structures not on a watercourse (ex: stormwater ponds)
- Cranberry dams

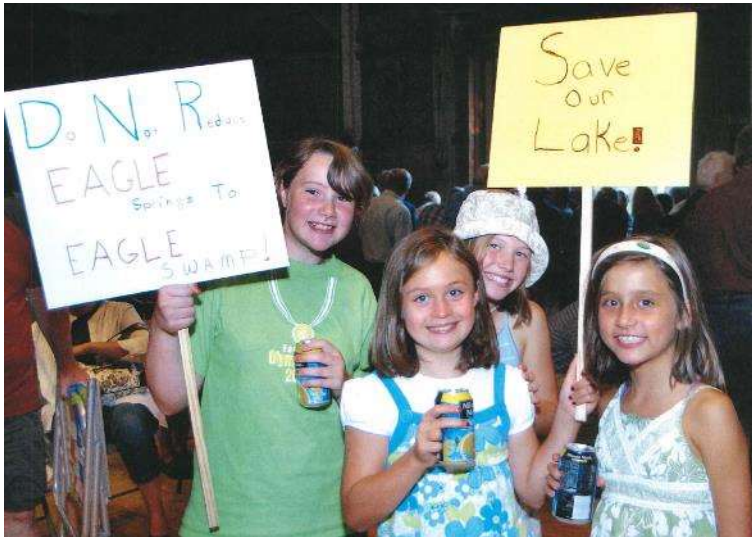




# Resiliency

With increases in large rainfall events, maintaining a dam in a safe and reasonable condition becomes even more important!

# Questions?



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