

Dam Regulation In Wisconsin

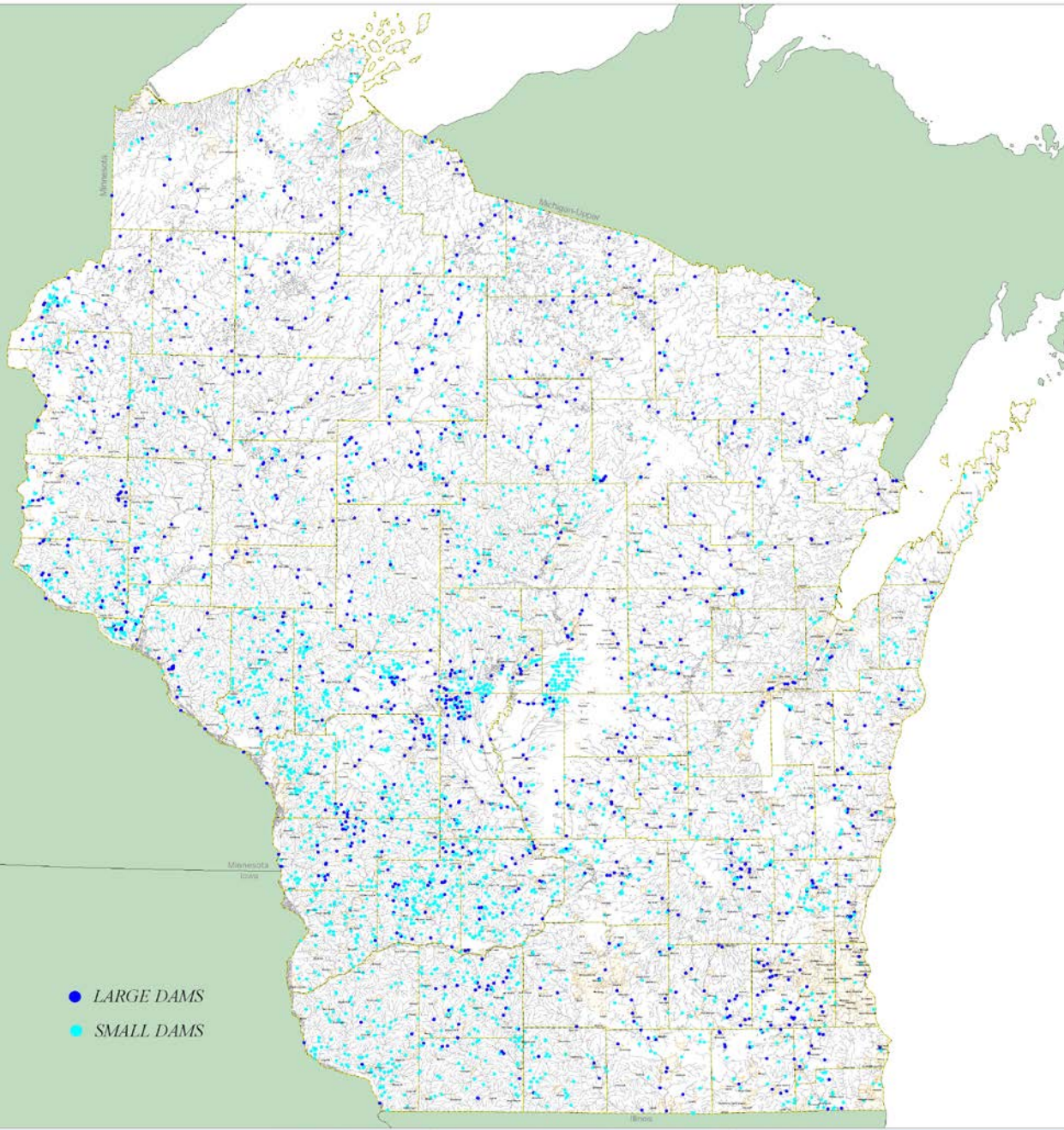


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WISCONSIN DAMS



Wisconsin
has over
3700 dams

- LARGE DAMS
- SMALL DAMS

Dams in Wisconsin

Benefits of Dams

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



Impacts of Dams

- Fragment river habitat
- Disrupt stream flow and flooding patterns
- Increase water temperature
- Decrease dissolved oxygen
- Block fish migration



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)



2002/ 5/22 11:04am



Reasons to Regulate Authority in Chapter 31, State Statutes

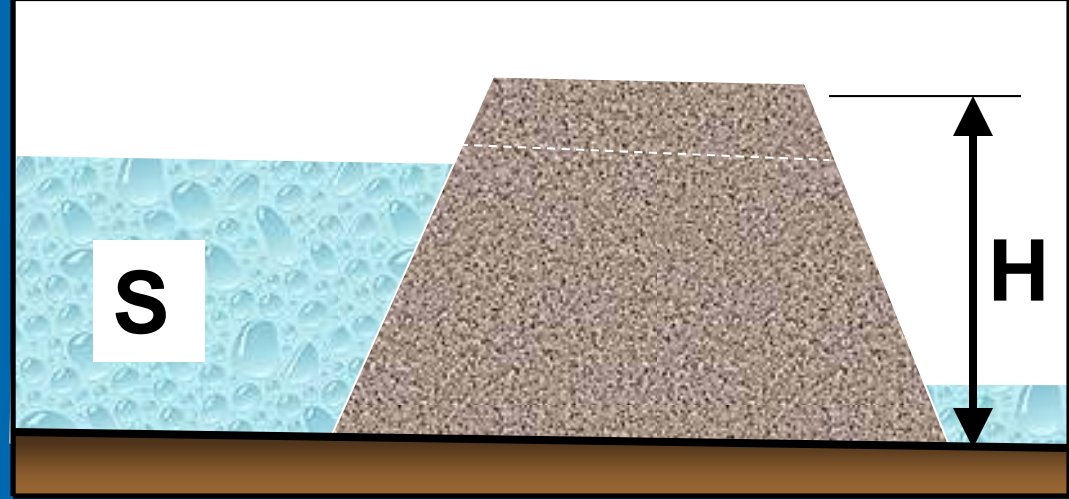
- Protection of public rights in navigable water - Public Trust Doctrine
- Protection of life, health and property from unsafe dams.

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

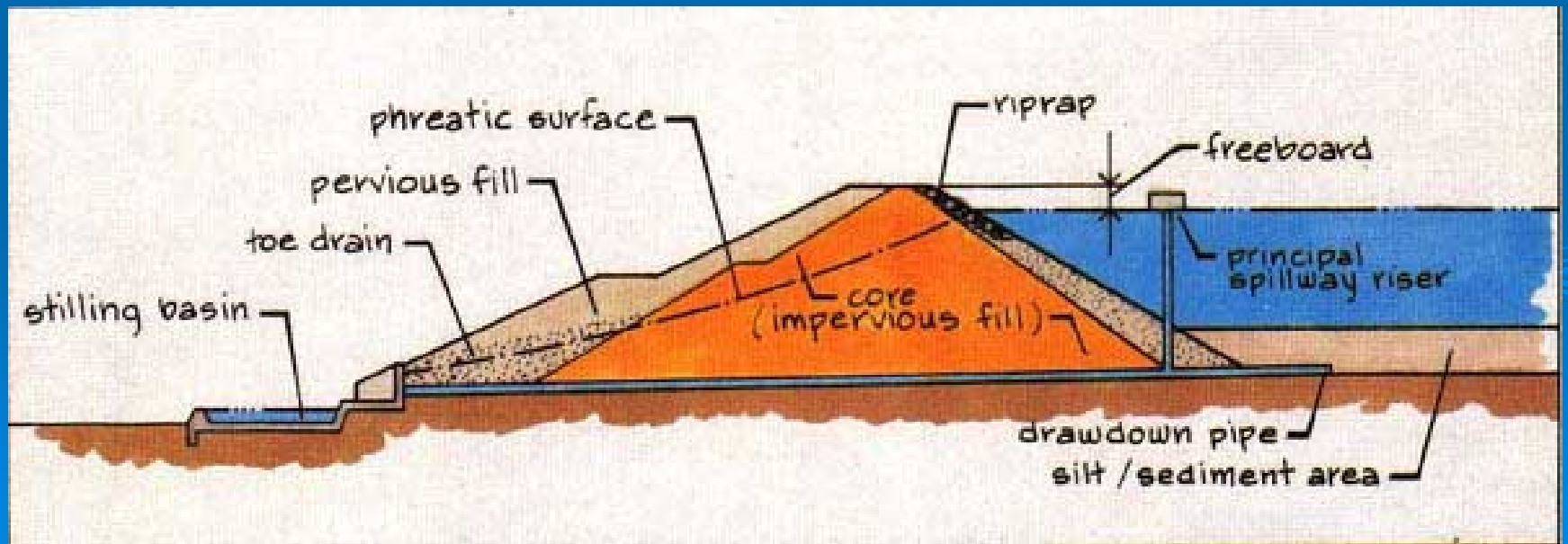
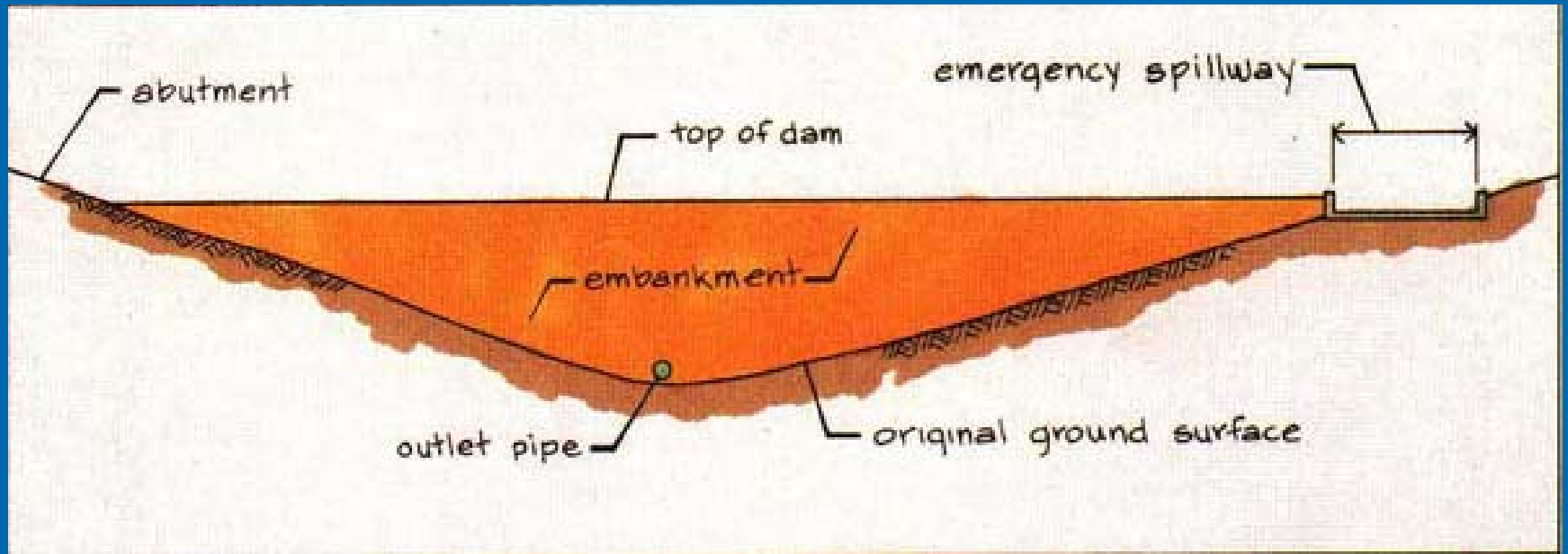
or

Structural Height ≥ 25 feet ...and...

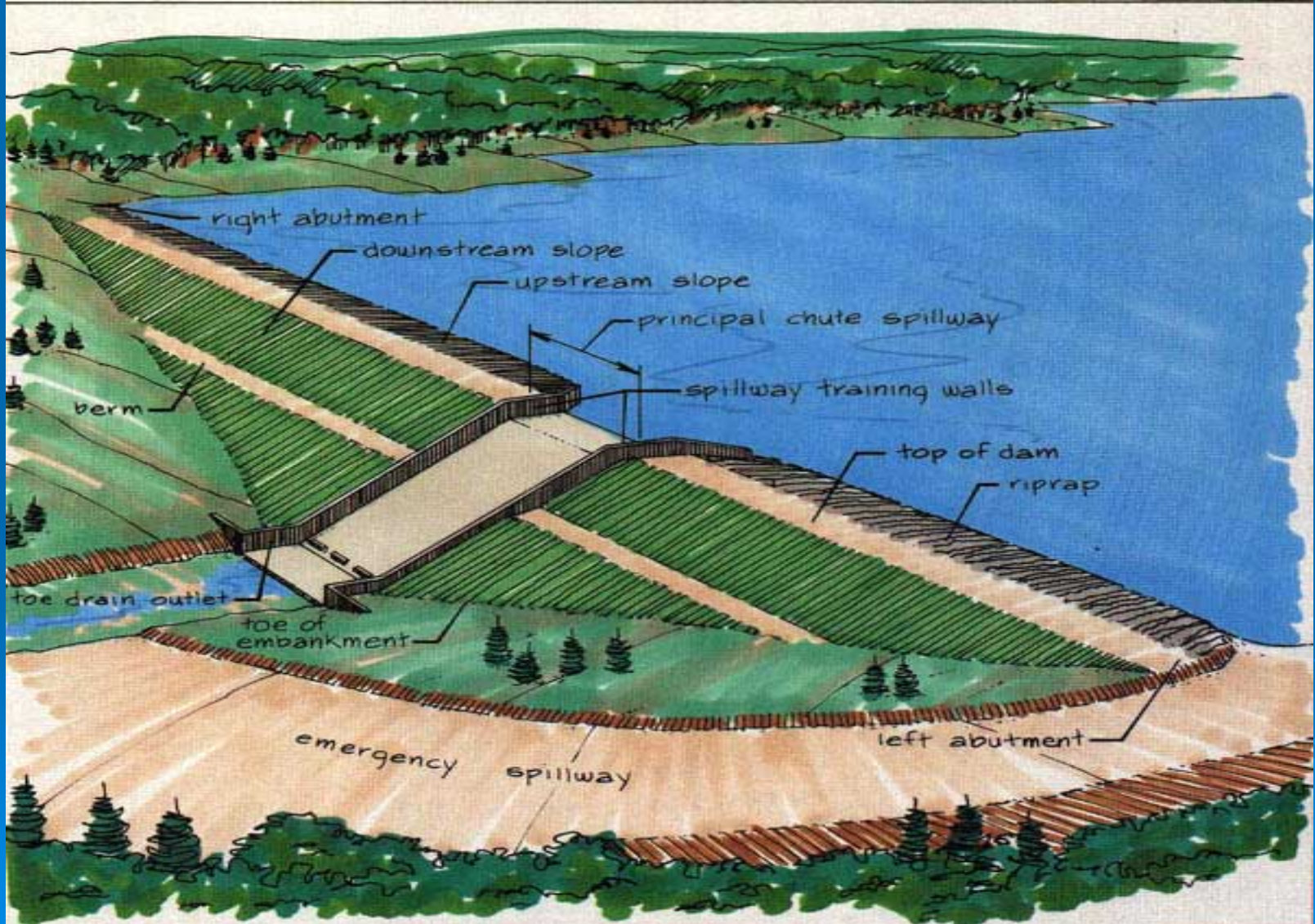
Maximum Storage > 15 acre feet

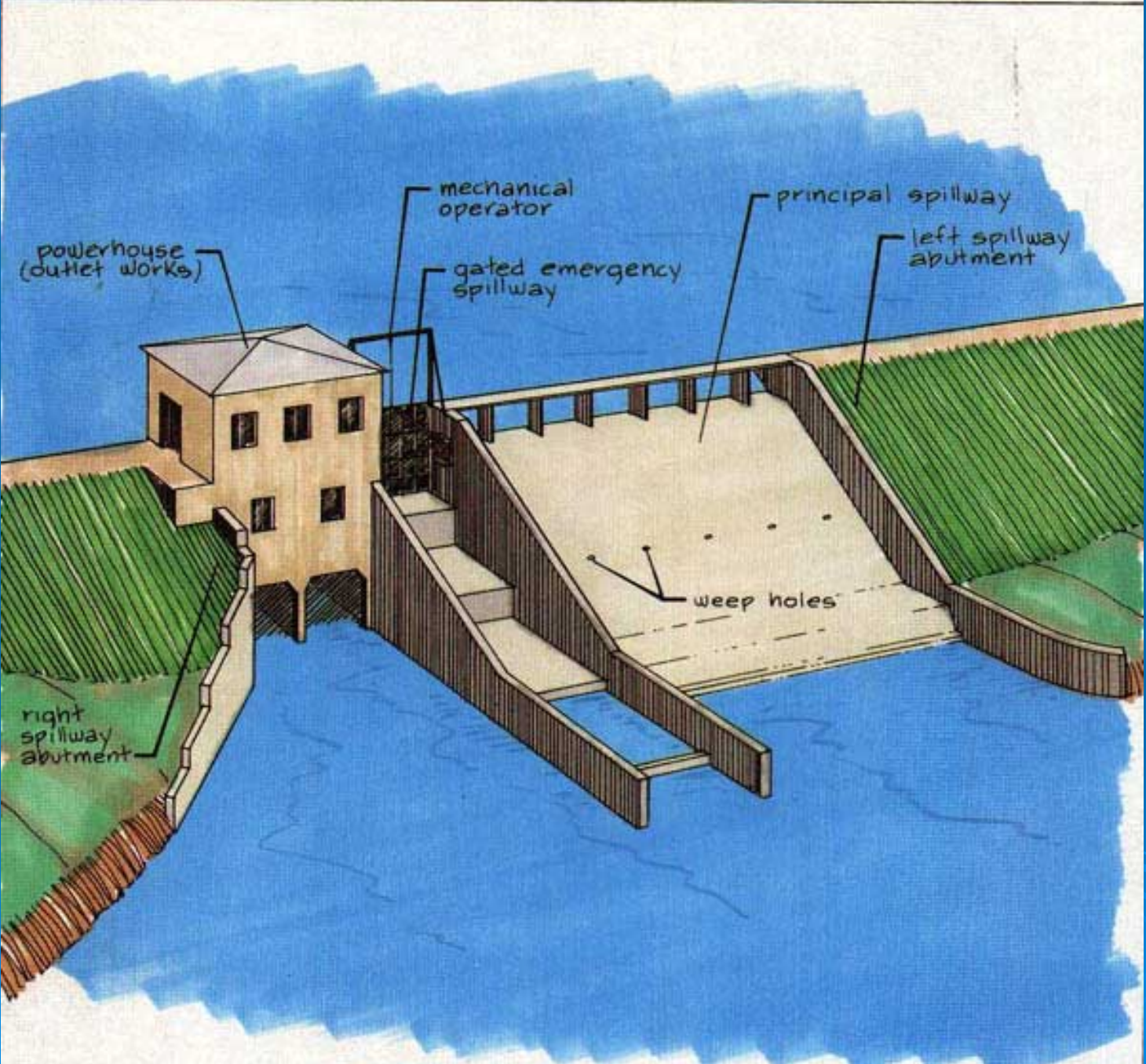
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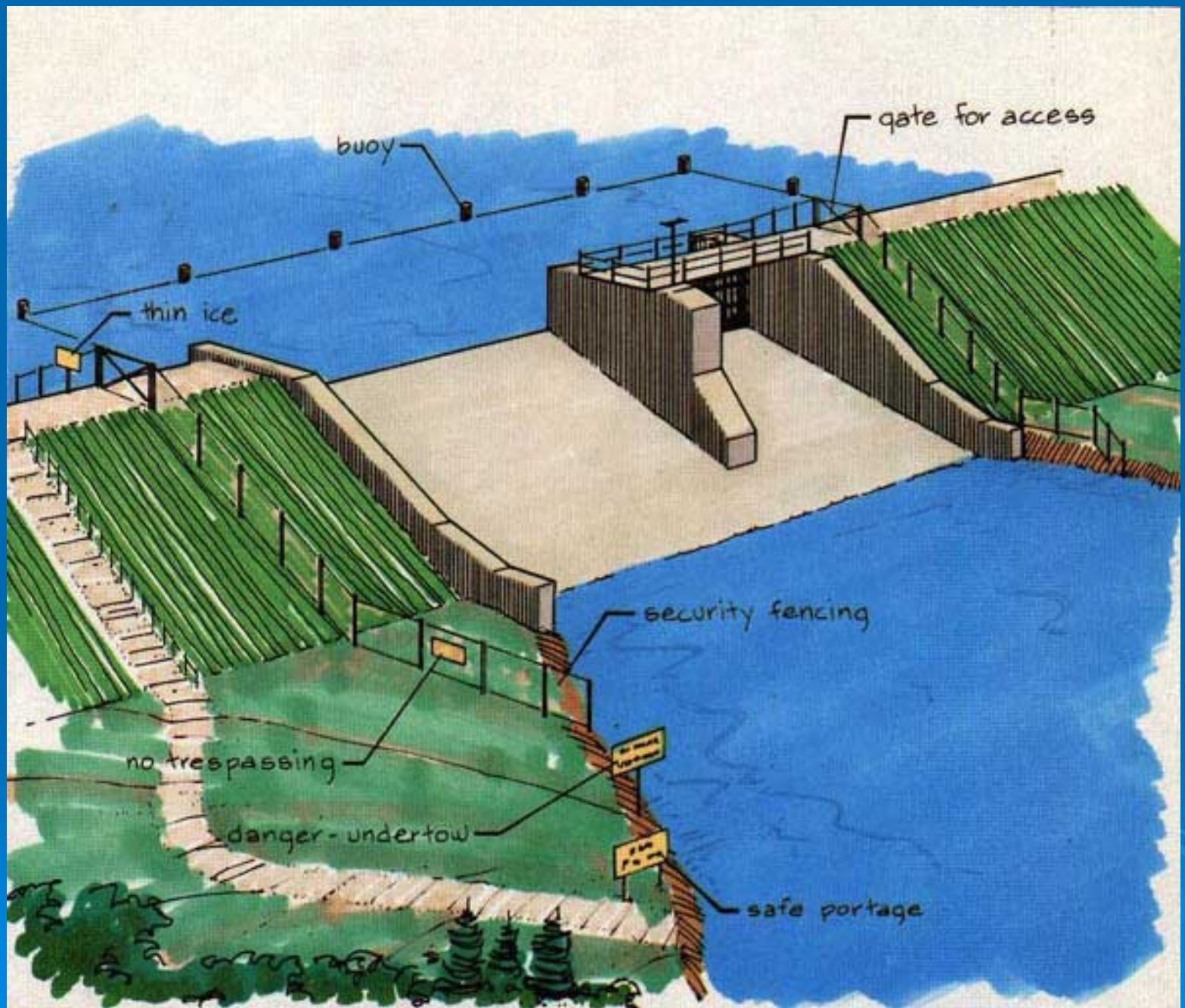
Any dam that causes a significant threat to life or property



Dam Parts







Statutes – Codes - Guidance

- Chapter 31, State Statutes
 - DNR responsible for regulation
 - 31.02 & 31.19 overarching responsibility/authority
- NR 300 – Fees
- NR 330 – Signing
- NR 333 – Design Standards, Large Dams
- NR 335 – Municipal Grant Program
- NR 336 – Small Dam Removal/Abd. Dam Grants

Dam Safety Program Responsibilities

- Issue permits/approve plans
- Conduct or review inspections
- Issue directives or orders to correct deficiencies
- Approve EAPs and IOMs
- Transfer dam ownership
- Emergency response
- Owner Education

Owner Responsibility

- Operate and Maintain in Safe Manner
- Perform Periodic Inspections
- Correct identified deficiencies
- Obtain Appropriate Permits/Approvals
- Prepare and Implement EAP/IOM Plans
- Take appropriate actions in an emergency
- Coordinate Operation with Others
- Keep Informed About Regulations

Dam Regulation

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

Primary responsibility of **WMEs** & WMSs

To find WME
for your county

Go to...

dnr.wi.gov

At search type...

dam safety staff

From main Dam
Safety page go to...

Resources heading

Look for...

Dam safety staff



Regulation Requirements

- An application for a permit or approval may be required to:
 - repair, enlarge, or alter a dam
 - construct or reconstruct a dam
 - remove or breach a dam
 - drawdown or maintain altered water levels
 - transfer ownership/financial responsibility
- Application must be done through ePermitting
- Don't forget other federal/state/local permits

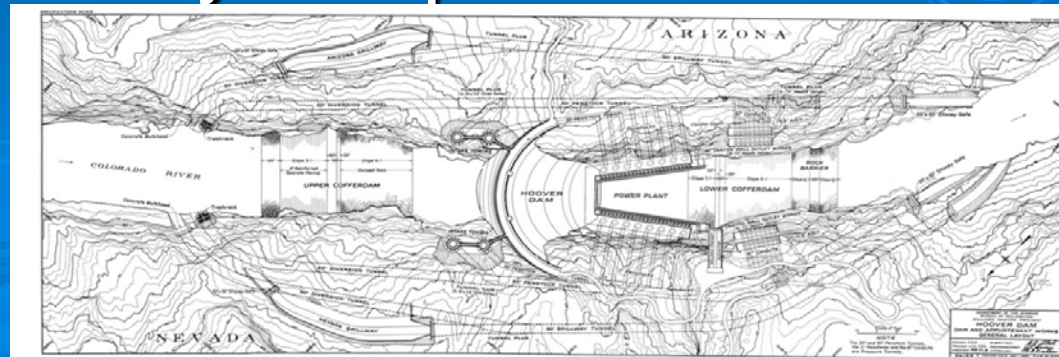
New Dam

- Application (with fee) & Checklist
- Ch 31.05 (permit), 31.33 (non-navigable), 30.19 (pond), Ch 31.12
- Public notice/hearing (navigable)
- WMS work on permit
- WME assess need to meet
NR 333/Plan Approval
review plans, write plan approval



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



Plan Approvals

- Application (with fee) & Checklist
- Ch 31.12, Ch. 31.13, Ch 31.18
- Public notice/hearing (may be reqd. navigable)
- Professional Engineer (alterations, repair, reconstruction)
- Stability analysis
- Procedure
 - Work with WME, should never be a surprise
 - May also require WMS review
 - WME write approval letter
- Maintenance/Repair vs Reconstruction



Transfers

- Application (with fee) & Checklist
- Ch 710.11, Ch 31.14, Ch 31.21
- Public notice/hearing (navigable)
- Establishing Financial responsibility
- For large dam, full inspection is required to establish conditions (could potentially use recent inspection)
- Differences between permitted dams and mill dams. Don't always do a formal transfer.
- Real estate disclosure law



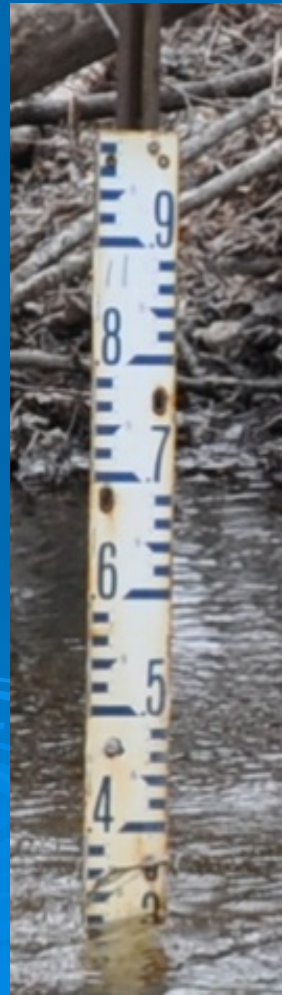
Dam Removal

- Application (with fee) & Checklist
- 31.18 (mill dam), 31.185 (permitted), 31.187 (abandoned)
- Plans by PE (drawdown, sequencing, site restoration, sediment, H&H)
- Public notice/hearing
- Removal programs



Levels and Flows

- Application (with fee) & Checklist (still using paper application)
- Ch 31.02 (levels and flow), 31.34 (minimum flow)
- Maximum, Minimum, or normal level
- Summer vs Winter
- Minimum Flow
- Drawdown (temporary)
- Public notice/hearing



Levels and Flow Process

- Public notice optional
- May hold informational hearing for input
- Field investigation
- If raising levels, maximum cannot be above OHWM unless applicant obtains flowage easements
- 31.13 for used to raise dam, requires public notice
- Issue order

Levels and Flow

Low Flow

- Ch 31.34 – 25% of natural low flow (unless discharging directly to another lake, pond or cranberry marsh). Assumed to be $Q_{7,10}$ which is often too low. Can require more or less flow.
- If impoundment level and dam outflow both drop during dry periods, preference is generally given to flow, even if pond level may go below minimum

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 inspect their dam periodically inspected by a 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

Purpose of Inspections

- Look for **CHANGE** in Conditions
- Identify O & M needs
- Identify small problems before they become big problems
- Identify early warning signs of failure

Dam owners should inspect their dam more frequently than state mandate

Inspection Process

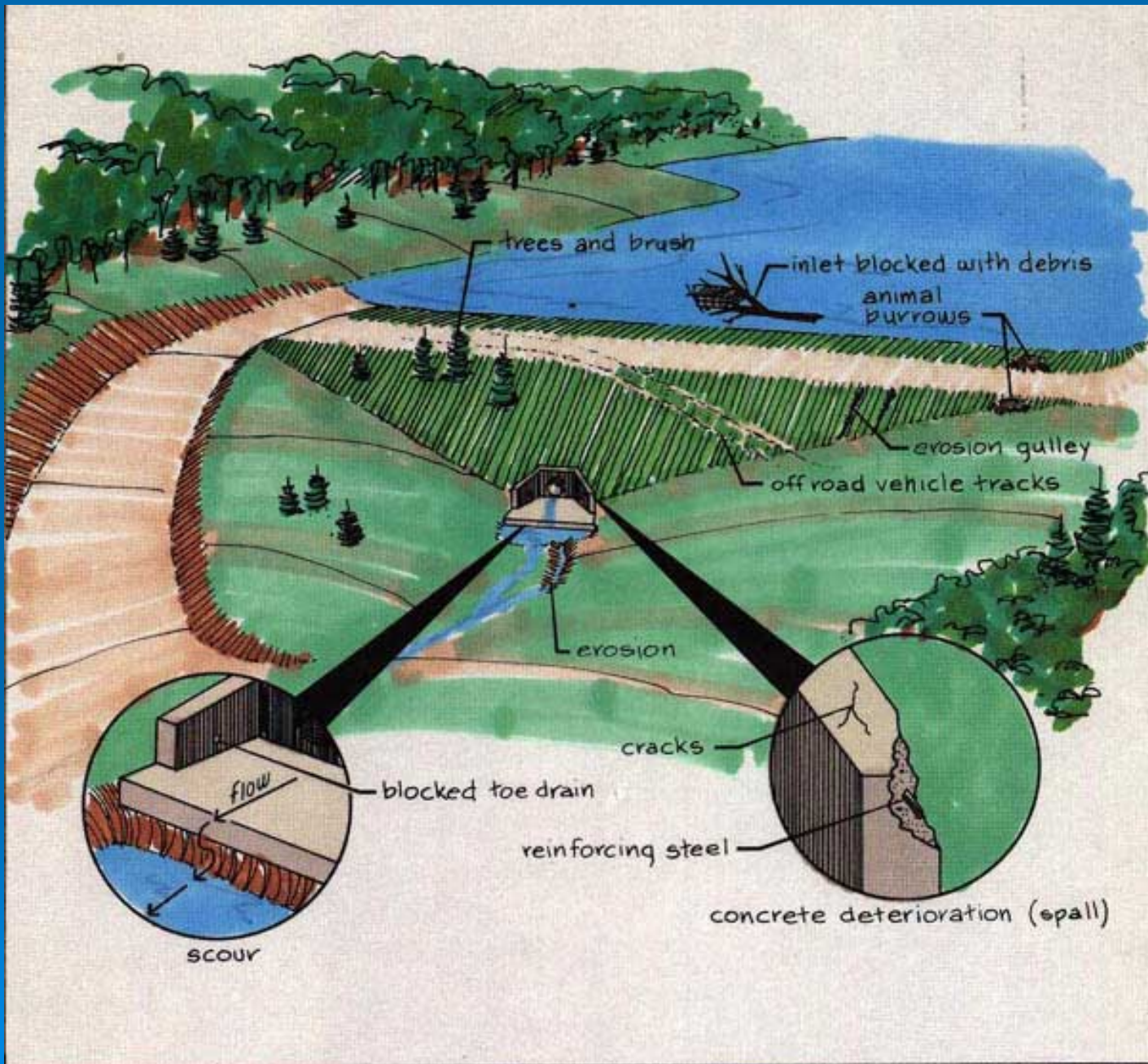
- Prior notification.
- Inspect with owner, if possible.
- Review conditions, regulatory violations, classifications, EAP.
- Recommend repair/maintenance.
- Letter report with directives.
- Follow-up with order, if necessary or requested

Inspection Activities

- Look for change
- Use checklist to:
 - Check water level
 - Look for downstream development
 - Walk all embankments
 - Check gate operation
 - Evaluate concrete portions of dam
 - Evaluate outlet structures
- Document with photographs
- Survey if necessary

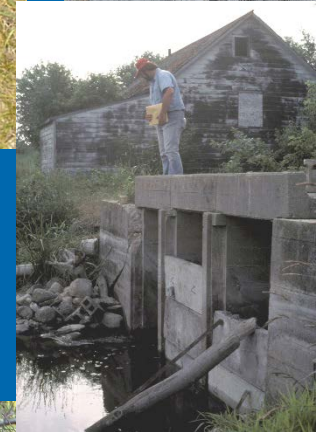
DAM INSPECTION CHECKLIST		Date _____
NAME OF DAM _____		FILE _____
OWNER'S NAME _____		TELEPHONE NO. _____
STREET OR ROUTE _____		
CITY, STATE, ZIP CODE _____		
COUNTY _____	DISTRICT _____	WATERWAY _____
WEATHER & SITE CONDITIONS _____		
INSPECTORS _____		
OTHERS _____		
CONTACT PERSON _____		
MISCELLANEOUS AREAS		
CHECK AREA	CHECK/CIRCLE CONDITIONS NOTED	OBSERVATIONS
MONITORING	plezometers	
	weirs	
	monuments/benchmarks	
GAGES	rainfall	
	pool level (op. range)	
	stream	
WATER SHED	slopes	
	land use	
	other impoundments	
D/S AREA	stream channel	
	channel crossings	
	flood plain zoning	
	development	
EMERG. PLAN	notification list	
	evacuation plan	
	materials/equipment	
	access road to dam	
HYDRO POWER	last date used	
	current cap.	
	condition of powerhouse	
BOATING SAFETY	upstream signs	
	portage signs	
General Comments, Sketches, & Field Measurements		

DAM INSPECTION CHECKLIST		Date _____
NAME OF DAM _____		FILE _____
INSPECTORS _____		
CHECK AREA	SPILLWAYS - DRAINS - OUTLETS	ACTION
AS INSPECTED	CHECK/CIRCLE CONDITIONS NOTED	OBSERVATIONS
		REPAIR MONITOR INVESTIGATE
PRINCIPAL SPILLWAY		TYPE:
INLET - RISER	trashrack/debris	
	gates/flashboards	
	cracks/deterioration	
FLOW - WAY	improper alignment	
	cracks/deterioration	
	joint deterioration	
	gates/operability	
STILLING BASIN/OUTLET	type	
	cracks/deterioration	
	seepage/piping	
	undercutting	
	erosion	
	debris	
EMERGENCY SPILLWAY		TYPE:
ALL AREAS	vegetation/cover	
	erosion	
	obstructions	
LAKE DRAINS/OTHER OUTLETS		TYPE:
DRAINS, OULETS	gates/valves	
	joints/flow surfaces	
	inlet tower	
	outlet area	
	operability	
TOE DRAIN	flow amounts	
	flow clear/muddy	
General Comments:		P. _____ of _____



Common Problems

- Trees and Brush
- Deteriorated Concrete
- Woody Vegetation
- Deteriorated Outlet Pipe
- Trees and Brush
- In-operable Gates
- Woody Vegetation
- Embankment Erosion/Seepage
- Trees and Brush



“Safe” vs “Unsafe” Dams

- A “Safe” Dam is compliant with Requirements in Ch. 31, NR 333, 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)

Safety Deficiencies

- A condition that impairs or adversely affects the safe operation of a dam.
 - Embankment cracks, erosion, or deep animal burrows.
 - Unusual seepage.
 - Dam instability.
 - Inadequate spillway capacity
 - Outlet weakness

Most Common Causes of Dam Failure

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

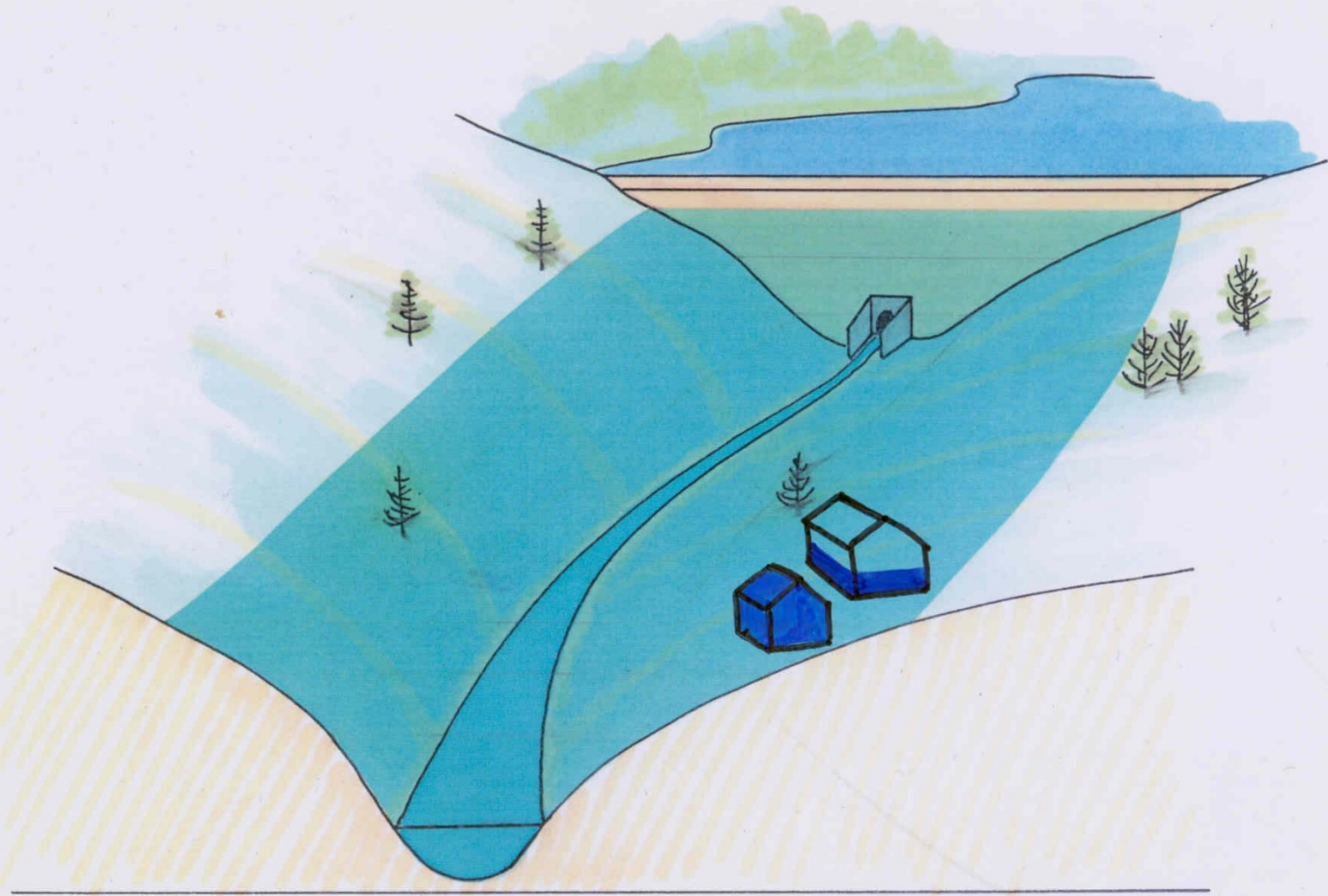


Dam Failure Analysis

- 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

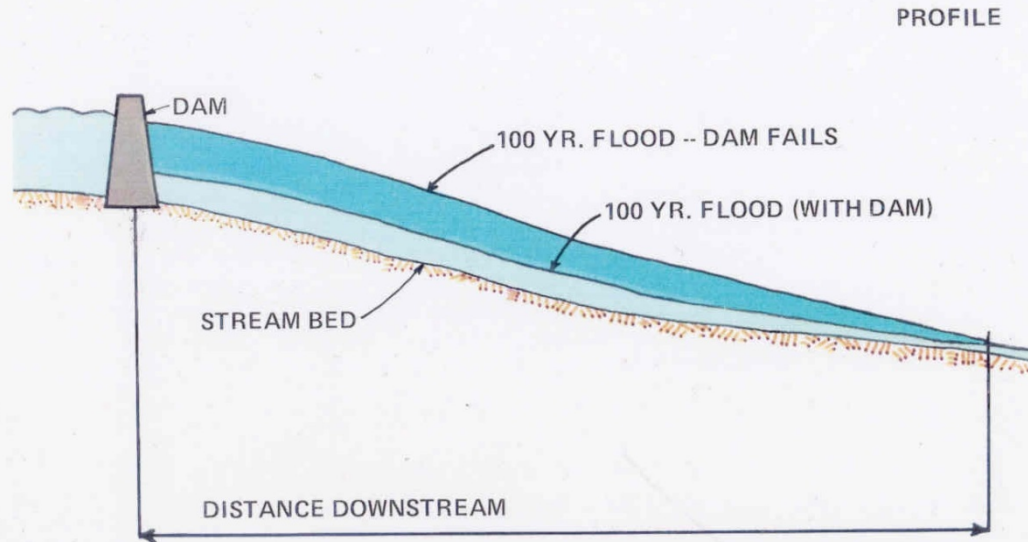
Dam Hazard Rating

- 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

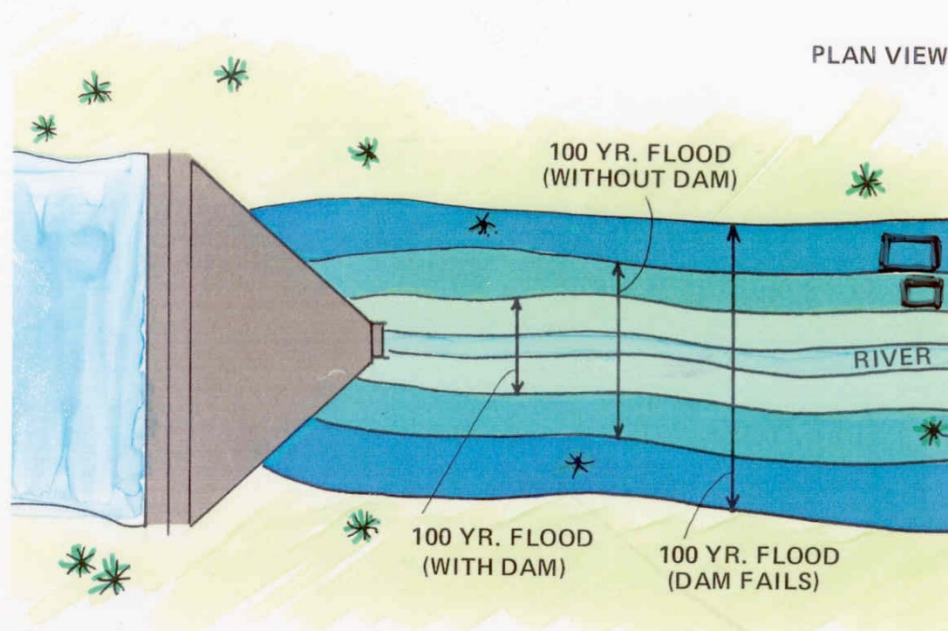


100 YEAR FLOOD -- DAM FAILURE

Dam Failure Profile

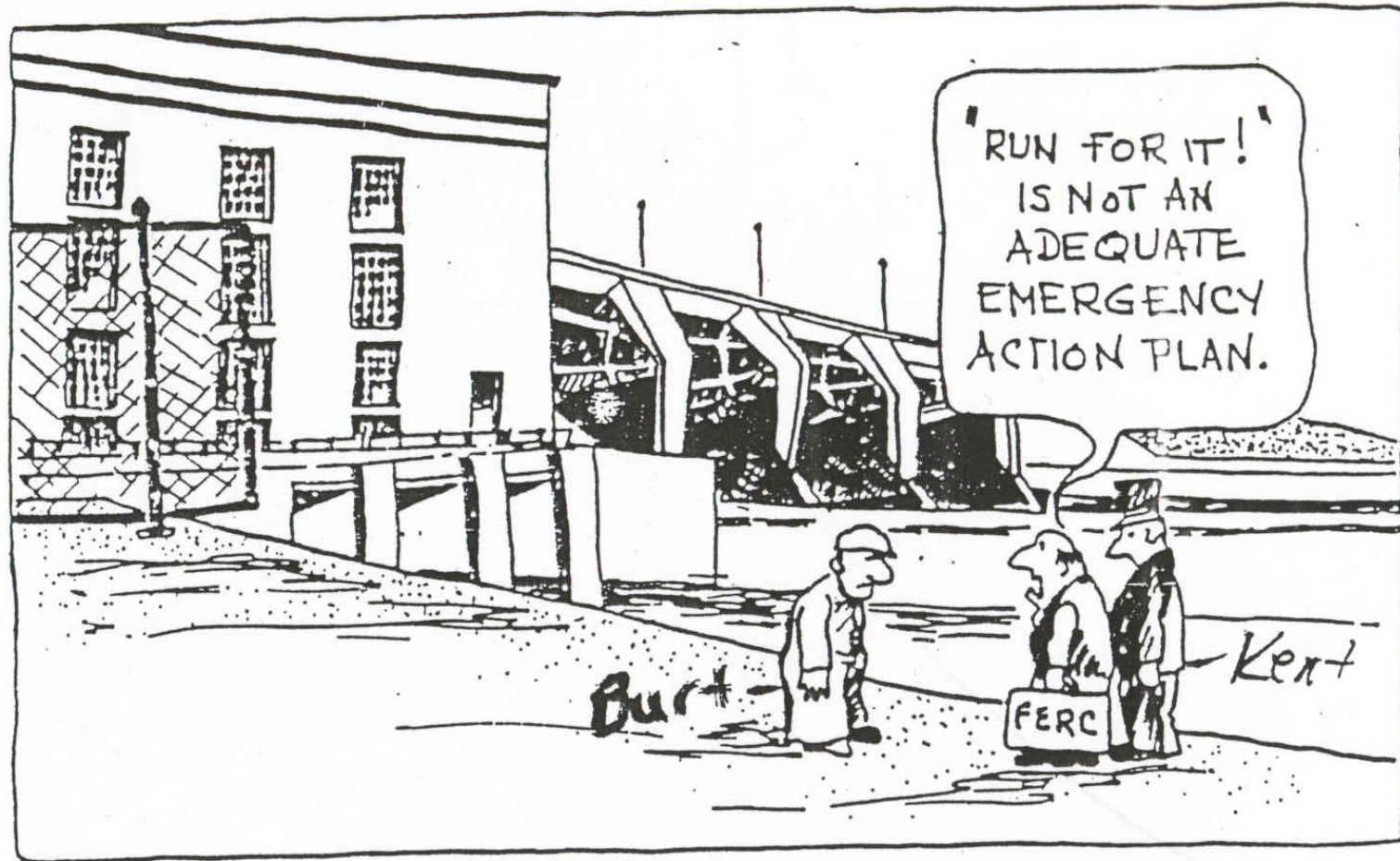


Inundation Area



EAP & IOM Requirements

- Emergency action plans (EAPs) and Inspection, Operation and Maintenance Plans (IOM) are required by the State for large dams...
 - At the time of initial dam construction
 - Upon reconstruction, substantial alteration or approval to raise and enlarge a dam
 - After a dam failure incident
 - Directive as a result of an inspection




Emergency Action Plan

- Formal Document - unique to each dam
- Identifies potential emergency conditions
 - potential failure, actual failure
 - flooding condition, no threat to dam
- Specifies procedures to:
 - mitigate problems at dam
 - notify effected population
- Provides information for local emergency managers

EMERGENCY RESPONSE

- Dam owner is usually the initial responder
- Local Emergency key to response (home rule)
- Local law enforcement is usually the authority for evacuations
- 1-800-943-0003, #1 DNR Duty Officer
- DNR has responsibility to provide technical assistance (SOP, orders)

Dam Failure Notification

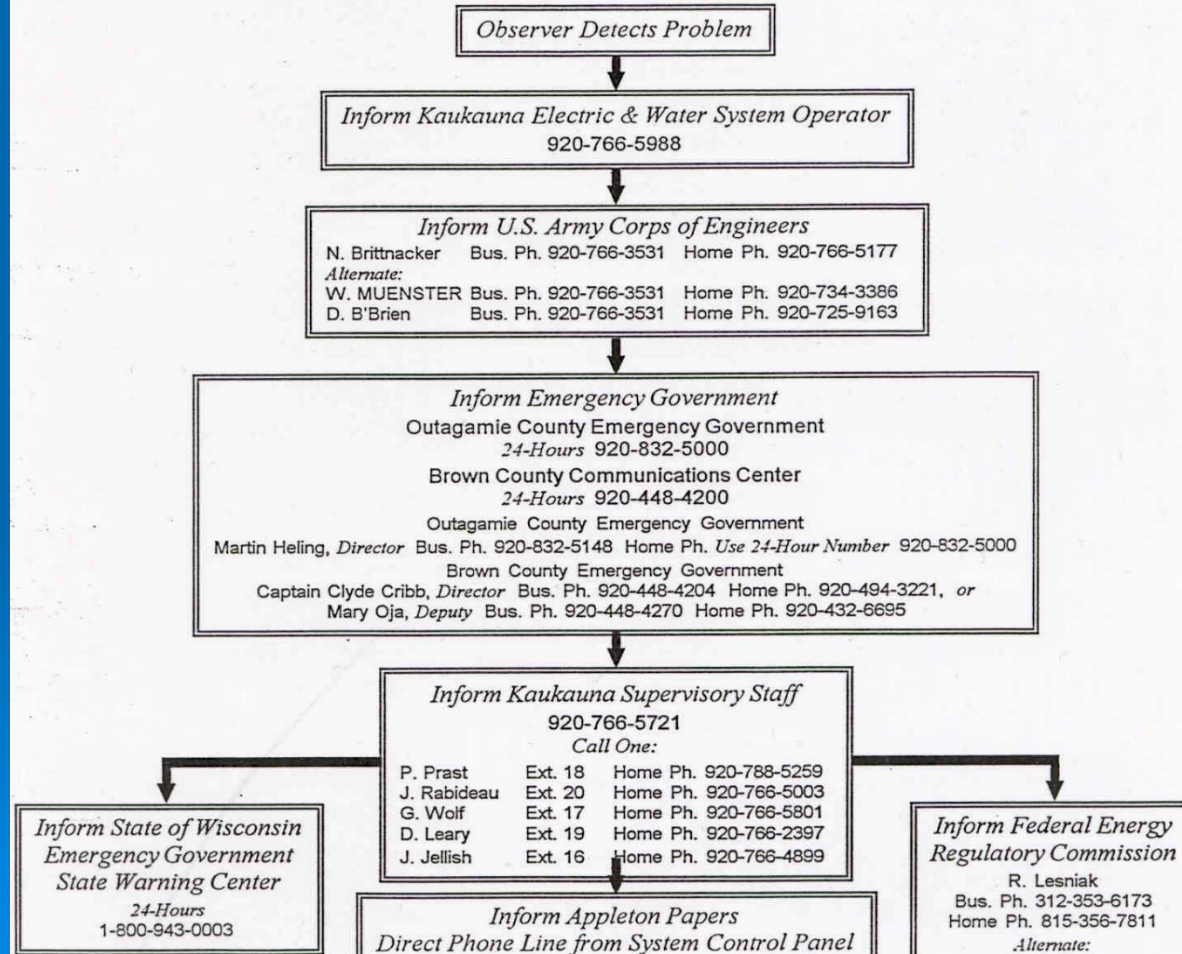
1. Name, title, callback number of reporter
 2. Name, location, county, river of dam
 3. Time of failure, if failure has occurred
 4. Present condition of dam (overtopping, seeping (clear/cloudy), concrete cracking, gate operability, downstream boils, breach, culvert failure)
 5. Who else contacted
 6. Areas threatened downstream
 7. Agencies/personnel on-site
 8. Weather conditions
- 

EAP Flow Chart

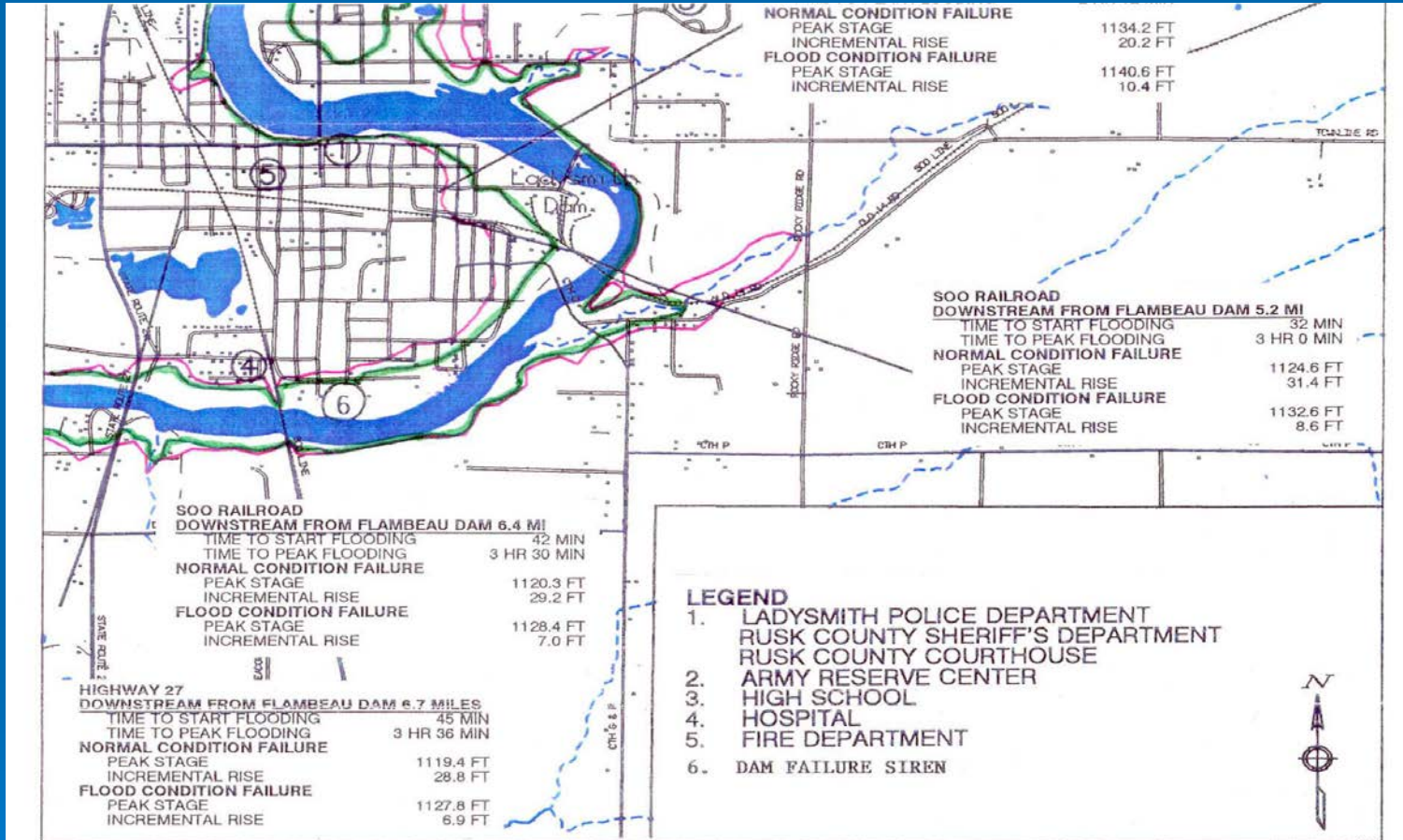
COMBINED LOCKS HYDRO EMERGENCY ACTION PLAN FAILURE MODE "A" - FLOW CHART OF RESPONSE

FAILURE IS IMMINENT OR HAS OCCURRED

DESCRIPTION: A rapid increase in flow is noticed and partial breaching of dam is occurring or complete dam failure has resulted in releasing water from the impounded lake.

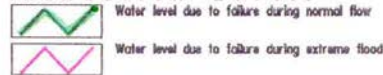


EAP Inundation Map



INUNDATION MAP FOR FAILURE OF FLAMBEAU DAM

Inundation Levels



The limits of flooding and the travel times shown on this map are approximations and should be used solely as a guideline for establishing evacuation zones. The actual evacuation zones may be greater or smaller than the shaded area shown on the map. Actual evacuation zones should be determined by local officials responsible for establishing specific evacuation procedures.

Job Number: D105-83C
 Date: December, 1993
 Composed by: hjh
 Checked by: hjh

SHEET No.

1

OF 17

IOM Plan

➤ Inspection

- Mandatory
- Routine (plan, customized checklist)
- After flood event


➤ Operation

- Authorized levels and minimum flow (log)
- Normal operation (who, what, when)
- Extreme events

➤ Maintenance

- Routine (mowing, trash racks....)
- Follow-up from inspection

Likely Enforcement Issues

- Safety deficiencies
 - Inspection (31.19, transfer, complaint)
 - Failure
 - Unauthorized Dam
 - Levels and Flows
 - Illegal transfer
- 

Resources

WONR - Dam Safety Program - Microsoft Internet Explorer provided by Wisconsin DNR

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Address http://www.dnr.state.wi.us/org/water/wm/dsfp/dams/index.html

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About Dam Safety

Program History
Regulations
Removals

Resources

Grants
Owner/Consultant Info
Emergency Response Info
Data Central
Staff

Related DNR Programs

Floodplain Management
Shoreland Management
Waterway and Wetland Permits

Wisconsin's Dam Safety Program

We Want Your Input

There are approximately 3,800 dams in the State of Wisconsin. Since the century, more than 700 dams have been washed out or removed. Since approximately 100 dams have been

Almost 60% of the dams in Wisconsin by a former company or private individual in the State of Wisconsin, 17% by a municipality such as a township or county government and 14% by other ownership types.

The federal government has jurisdiction over large dams in Wisconsin that produce hydroelectricity - approximately 5% of the dams. The Wisconsin Department of Natural Resources regulates the rest of the dams.

A dam with a structural height of over 25 feet or more, or a structural height of 15 feet or more and impounding more than 15 acre-feet or more,

Query/Selection Results - Microsoft Internet Explorer provided by Wisconsin DNR

Dam Locations

Name	Field File No	Ferc License No.	Status	Dam Size	Owner Type	Owner Name	Hydraulic Height (feet)	Structure Height (feet)	Impoundment Surface Area (acres)	Impoundment Storage Capacity (ac ft)
ONEIDA GOLF AND RIDING CLUB	5.04			SMALL	PRIVATE OWNERSHIP	ONEIDA GOLF AND RIDING	2.0	4.0	1.0	5.0

Turn Overview On
Zoom to entire state
Back to last extent
Print current map

Identify Dam
Grab and Move

Map: 670581.01, 454949.69 -- Image: 400, 24 -- ScaleFactor: 4.824342396331527

Wisconsin Legislation - Folio - Microsoft Internet Explorer provided by Wisconsin DNR

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Address http://folio.legis.state.wi.us/cgi-bin/om_isapi.dll?clientID=78427&infobase=stats.info&1=ch%2031&jump=ch%2031&software=Browse_Frame_Pg

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- Chapter 14
- Chapter 15
- Chapter 16
- Chapter 17
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- Chapter 19
- Chapter 20
- Chapter 21
- Chapter 22
- Chapter 23
- Chapter 24
- Chapter 25
- Chapter 26
- Chapter 27
- Chapter 28
- Chapter 29
- Chapter 30
- Chapter 31
- Chapter 32
- Chapter 33
- Chapter 34

Updated 01-02 Wis. Stats. Database
UNOFFICIAL TEXT

DAMS AND BRIDGES 31.02

CHAPTER 31

REGULATION OF DAMS AND BRIDGES AFFECTING NAVIGABLE WATERS

31.01 Definitions.	31.23 Forfeiture; private bridges and dams.
31.02 Powers and duties of department.	31.25 Notices; abatement.
31.03 Permits for the Lower Wisconsin State Riverway.	31.25B Dam removal; opportunity for hearing.
31.04 Permits for dams.	31.26 Civil liabilities.
31.04B Permits for dams that affect drained lands.	31.29 May employ hydraulic engineer and assistants.
31.05 Applications for permits to construct.	31.30 Dams on Irwin River.
31.06 Hearing.	31.30B Dams on the Lower Wisconsin State Riverway.
31.07 Applications for permits to operate and maintain existing dams.	31.30T Dam on Milwaukee River.
31.08 Hearing.	31.30W Portage levee; opening and canal.
31.09 Proposals to accompany applications.	31.31 Dams on non-navigable streams.
31.09B Water power permits; condition precedent.	31.32 Dams not to injure other dams or sites.
31.10 Permit not to be valued.	31.33 Jurisdiction of department.
31.11 Certificate of terms and forfeiture of permits.	31.34 Flows of water regulated.
31.12 Map, profile and plans.	31.35 Dams in areas leased by county; restrictions; control by circuit judge; sales.
31.13 Raising or enlarging existing dams.	31.36 Levee commissioners.
31.14 Proof of ability to maintain dams required.	31.38 Municipal authority to construct and maintain dams.
31.18 Obligation of owners of bridges and dams.	31.38B Dam safety; aid program.
31.18B Permits to shut down dams.	31.38T Dam rehabilitation project.
31.18T Abandoned dams.	31.39 Fees for permits, approvals and hearings.
31.19 Inspection of dams; orders.	31.39B Parties to a violation.
31.21 Transfer of permit.	

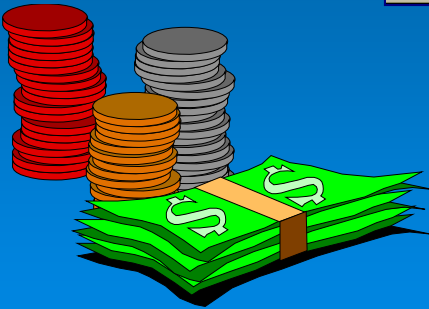
31.01 Definitions. Terms used in this chapter are defined as follows:
(1) "Corporation" means a private corporation organized under the laws of this state.
(2) "Department" means the department of natural resources.

supervision of the department and to the orders and regulations of the department made or promulgated under this chapter.
(3) The department or any member or any agent or employee thereof shall at all times be accorded free access to any and all parts of any dam and appurtenances constructed or maintained in

Search Clear Search [Search Help]

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Done



Dam Funding

Dam owners have ultimate responsibility for the bringing their dams into compliance with all applicable requirements. The legislature has provided funding in the past to assist some owners with these responsibilities.

- NR 335 - Municipal Dam Grants
- NR 336 - Dam Removal Grants
- Federal Programs

Websites

www.dnr.wi.gov

- Dam Safety
 - Dam Permits (ePermitting)
 - Waterway Permits(ePermitting)
 - Surface Water Data Viewer
- 

Search for a dam.

Learn about dams.

Prepare for an inspection.

Find a consultant.

A dam is a barrier that impounds water and generally serves the primary purpose of retaining water. Wisconsin law defines a dam as "any artificial barrier in or across a watercourse which has the primary purpose of impounding or diverting water and includes all appurtenant works, such as a dike, canal or powerhouse".

Owners



- † [Emergency response](#)
- † [Responsibilities of a dam owner](#)
- † [Inspections](#)
- † [Hiring a consultant](#)
- † [Permits and approvals](#)
- † [Selling property with a dam](#)
- † [Emergency action plan \(EAP\)](#)
- † [Inspection, operation and maintenance plan \(IOM\)](#)
- † [Dam failure analysis \(DFA\)](#)
- † [Grants](#)
- † [Locate my dam](#)

General information



- † [Dams overview](#)
- † [History of dams in Wisconsin](#)
- † [Frequently asked questions](#)
- † [Regulations](#)
- † [Hydroelectric generation](#)
- † [Abandonment and removal](#)
- † [Locating a dam](#)

Consultants



- † [Inspections](#)
- † [Permits and approvals](#)
- † [Grants](#)
- † [Dam failure analysis \(DFA\)](#)
- † [Emergency action plan \(EAP\)](#)
- † [Inspection, operation and maintenance plan \(IOM\)](#)
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Resources



- † [Grants](#)
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- † [Projects of special interest](#)
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- † [Definitions \(illustrated\) \[PDF\]](#)
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The Clarks Mill Dam, Town of Cato, Wisconsin

Customer Service

Find where to go with your dam or floodplain question!

▶ [Customer Service](#)

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[Dam safety related updates](#)

[All DNR related updates](#)

Emergencies

For reporting dam emergencies:
STATE WARNING CENTER
1-800-943-0003
Press 1, Ask for DNR Duty Officer



Lake Delton in Sauk County empty after CTH A failure. (June 2008)

Contact information

[DNR Dam Safety](#)
DNR Dam Safety Program,
WT/3
101 South Webster Street
PO Box 7921
Madison WI 53707-7921

[Meg M. Galloway, P.E.](#)
Chief Dam and Floodplain
Section
(608) 266-7014
meg.galloway@wisconsin.gov

[William D. Sturtevant, P.E.](#)
State Dam Safety Engineer
(608) 266-8033
william.sturtevant@wisconsin.gov

Resources

- Top buttons
 - Search
 - Learn
 - Prepare
 - Find
- Owners
- Resources
- Cust. Service
- Gov. Delivery
- Emergencies

Owner Resources

- Dam Website
- Quarterly Newsletter
- Owner Workshops
- ASDSO Owner Resources
(damsafety.org)

Dam Files

- Field Files – inspections, failures, levels, formal documents
- Correspondence Files
- Plan Files
- Corps Report
- Grant File
- EAP
- IOM

Remember...

...Be Dam Safe





NR 353 and Dams (continued)

- If dam is large because of deep ditch with small embankment, will consider partial ditch fill prior to dam construction to make it fit short form criteria.



“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 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 inspect their dam periodically inspected by a 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

Dam Inspection

- Submit report within 90 days
 - Results of inspection
 - Identified deficiencies
 - Recommendations
- Inspection schedules have been established and can be viewed on website
<http://dnr.wi.gov/topic/Dams/damSearch.html>
search on dams, click owner tab, click Dam Search

Key Issues

- Inspection frequency
- Owner responsibility
- Statewide consistency
- Guidance
 - Unauthorized dams
 - Raised culverts
 - Transfer process
- National Issues
 - Dam security
 - Identifying deficient dams
 - Levee Safety

Dam Regulation



Staff Resources

- Central Office Staff
- Peer Mentor
- Engineer training plan
- Dam / Floodplain Team
- Dam Intranet site
- Water Regulation Handbook
- Advanced technical training, FEMA/ASDSO