

VERMONT  
Department of Environmental Conservation  
Dam Safety Program



Waterbury Dam

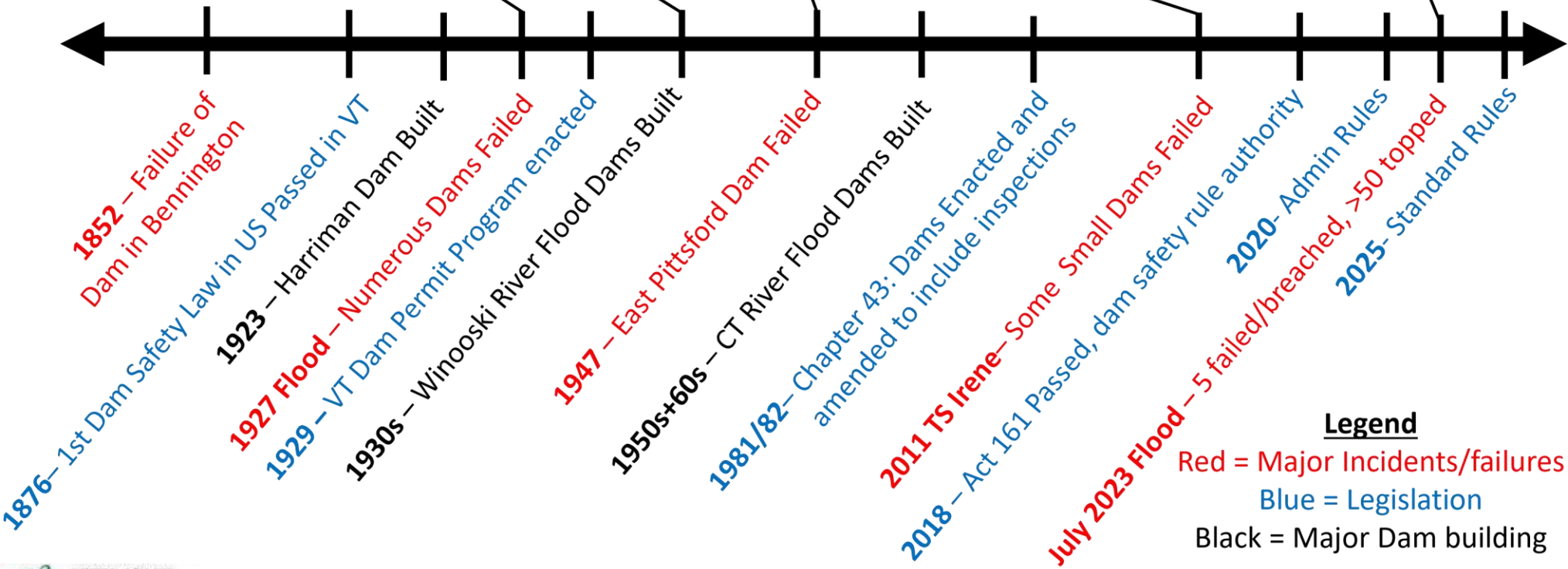
House Environment and Energy ANR Flood  
Recovery and Resilience Presentations

January 3, 2024

Ben Green, PE

Dam Safety Engineer  
VTDEC Dam Safety Program

# Brief History of Vermont Dams and Dam Safety



**Legend**  
 Red = Major Incidents/failures  
 Blue = Legislation  
 Black = Major Dam building



# Brief Program Overview

- Located in the Water Investment Division (WID) within VTDEC
- "The mission of the Vermont Dam Safety Program is to reduce risks to life, property, and the environment from dam incidents and dam failure through effective communication, education, regulation, and dam ownership"

- RESPONSIBILITIES:

- dam regulation
- dam ownership  lands management

- CURRENT STAFFING:

- (2) licensed engineer
- (2) staff engineers
- (1) program administrator/analyst
- Summer Temporary (pending funding)



Silver Lake Dam

- STATUTE/RULES:

- 10 V.S.A Chapter 43: Dams, Non-federal, non-power dams (Rules in development)
- DAM OWNERSHIP: 14 dams including the (3) Winooski River Flood Control Dams.

## Hazard Potential Classifications

- Potential for loss of life, property losses, lifeline losses, or environmental losses due to a dam failure or incident.

<b>Classification<sup>1</sup></b>	<b>Direct Loss of Life</b>	<b>Property Losses</b>	<b>Lifeline Losses</b>	<b>Environmental Losses</b>
<b>HIGH</b>	Probable or Certain (one or more) (extensive downstream residential, commercial, or industrial development)	Not considered for this classification	Not considered for this classification	Not considered for this classification
<b>SIGNIFICANT</b>	None expected	Major or extensive public and private facilities	Disruption of essential or critical facilities and access	Major or extensive mitigation required or impossible to mitigate
<b>LOW</b>	None expected	Private agricultural lands, equipment and isolated non-occupied buildings, non-major roads.	No disruption of services – repairs are cosmetic or rapidly repairable damage	Minimal incremental damage
<b>MINIMAL</b>	Same as LOW hazard, above			

1) Categories are based on overall dam performance and do not apply to appurtenances.

- Independent of condition rating of the dam.

## Vermont Dam Inventory / Natural Resources Atlas

- Contains ~1,119 records (active and historic sites)
- ~992 under jurisdiction of VTDEC (Non-Power, Non-Federal)  
 44 HIGH, 133 SIGNIFICANT, 252 LOW, 563 MINIMAL or not rated
- ~21 PUC (Hydropower pre-1935)  
 4 HIGH, 4 SIGNIFICANT, 13 LOW, 1 not rated
- ~82 FERC (Power post-1935)  
 15 HIGH, 7 SIGNIFICANT, 46 LOW, 14 MINIMAL or not rated
- ~24 other dams are under jurisdiction of Federal Government (USACE, National Park Service, US Forest Service, etc.)

VERMONT OFFICIAL STATE WEBSITE  
 AGENCY OF NATURAL RESOURCES  
**DAMSINVENTORY**

HOME DAMS PERMITS CONTACTS MAINTENANCE LOGINS

View Dams Record

Edit Close Tools

Names/Location	Contacts	Permits	Reservoir	Dam	Construction/Reconstruction
StateID:	226 01				
Dam Type:	RE				
Construction Type:	Zoned Earthfill				
Core:	IEK				
Foundation:	RSK				
Low Level Outlet:					
Length:	2130.0				
Height (feet):	187.0				
Upstream Height (feet):	145				
Structural Height (feet):	187				
Hydraulic Height (feet):	183				
Maximum Discharge (cfs):	84000				
Principal Spillway:					
Principal Spillway Design Capacity (cfs):					
Principal Spillway Maximum Capacity (cfs):					
Auxiliary Spillway:					
Auxiliary Spillway Design					

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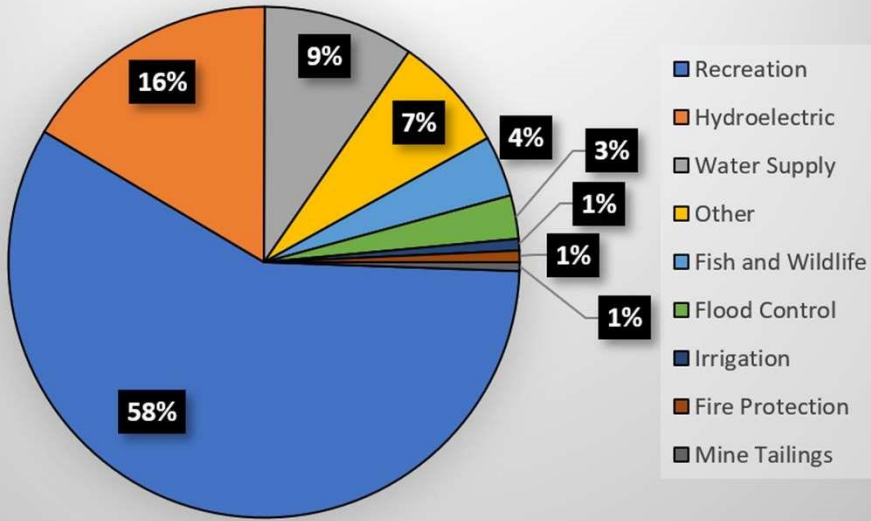




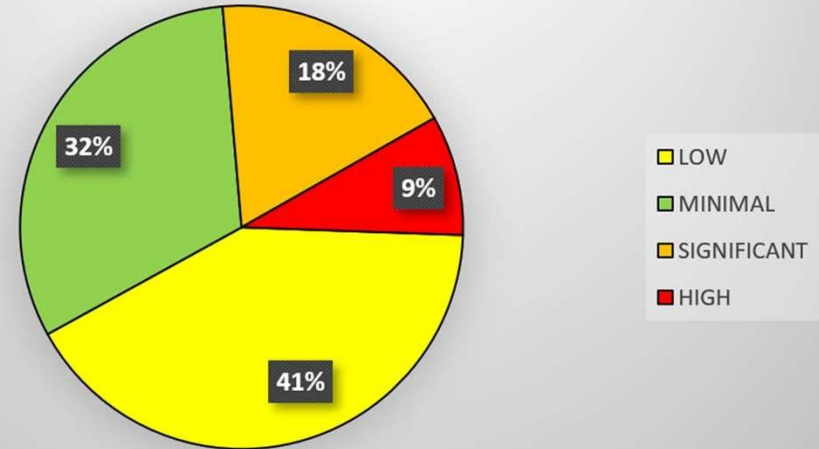


## Vermont Dam Inventory / Natural Resources Atlas Continued

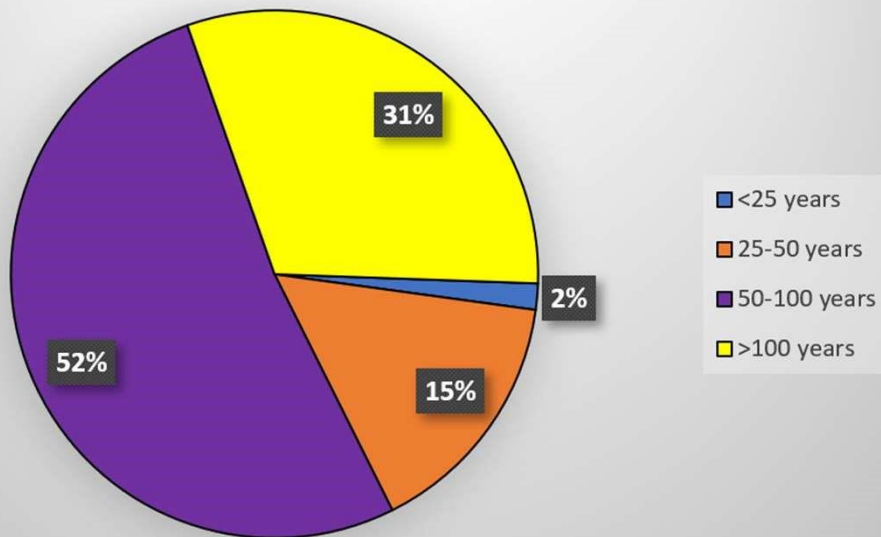
### VT Dams - Purposes



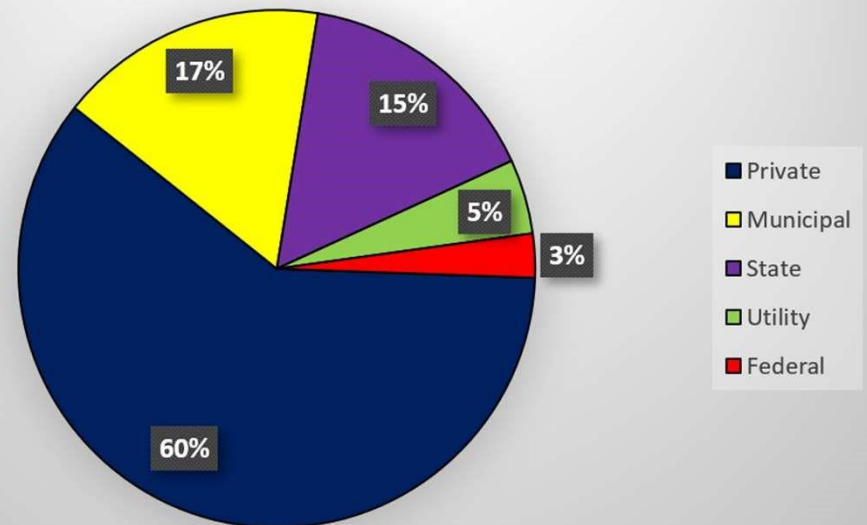
### VT Dams - Hazard Potential Classification



### VT Dams - Age



### VT Dams - Ownership Type



Regulatory – Key Initiative

Rulemaking – Act 161 of 2018



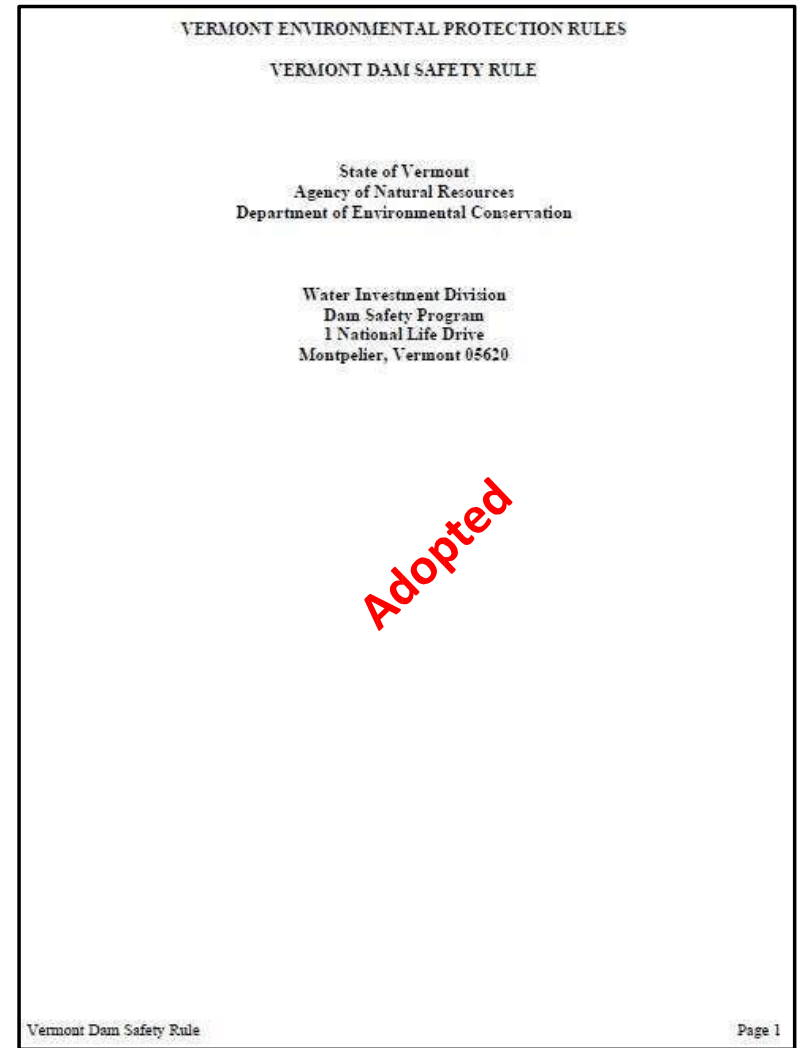
- Phase I, Administrative Rules adopted
- Phase II, Standards Rules in development
  - Siting, design, construction, alteration
  - Operation & Maintenance
  - Inspection, monitoring, record keeping, reporting
  - Repair or removal
  - Application for authorization
  - EAP requirements and guidance

- Extension to July 1, 2025 being pursued

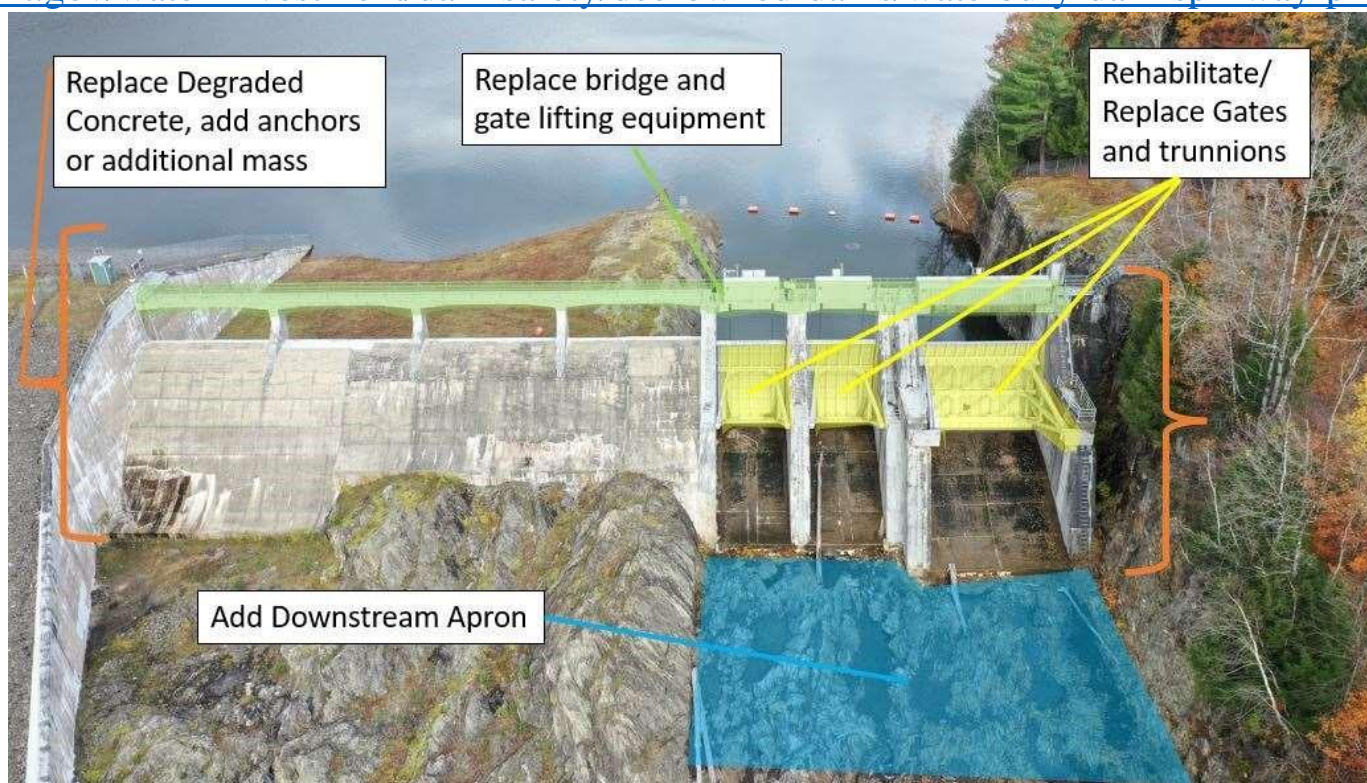
Dam Ownership – Key Initiative

Waterbury Dam - Spillway  
Replacement Project

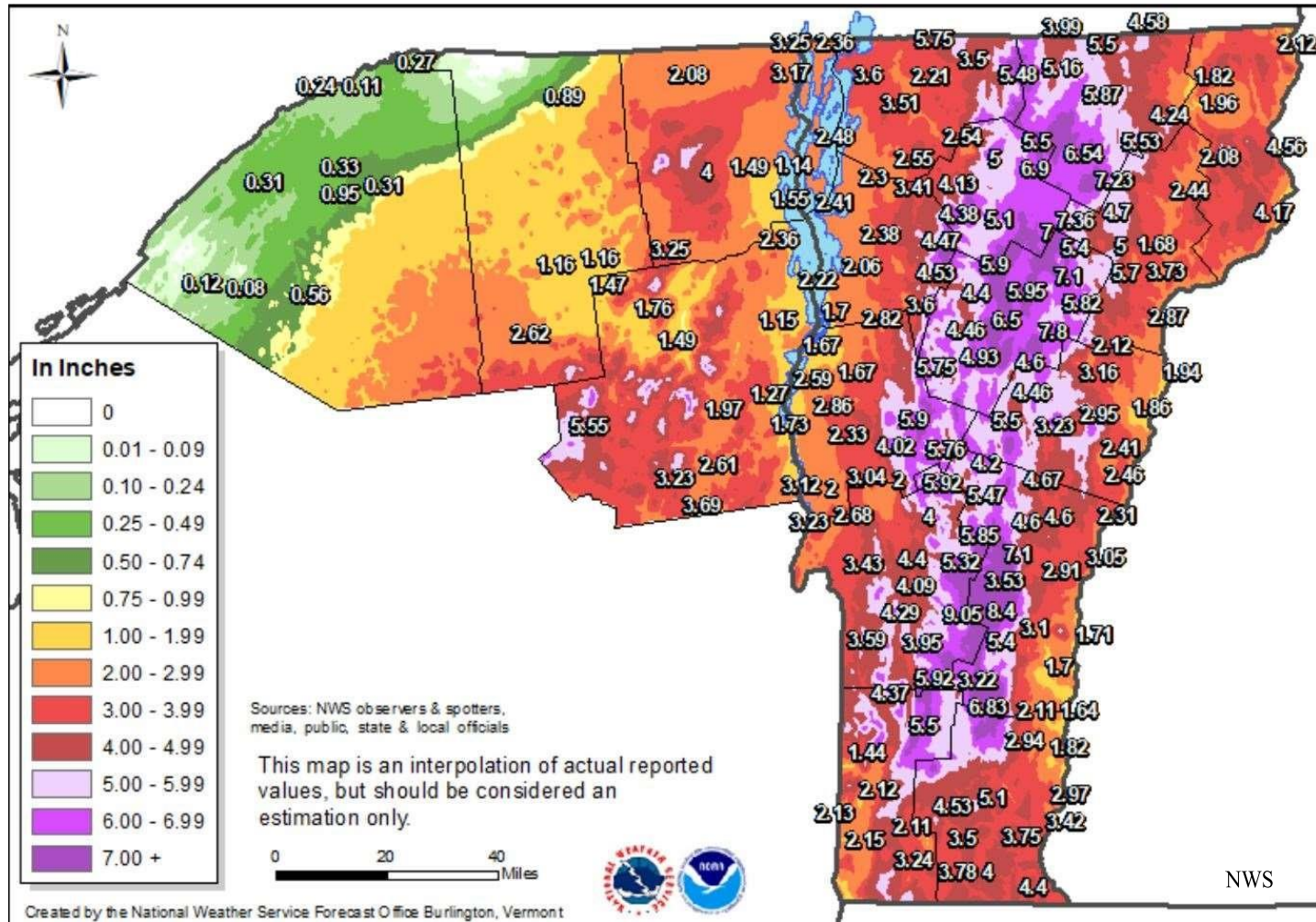
- In 2000s Radial Arm Flood Gate jamming, leading to Flood load restrictions on gates
- Section 1177, WIIN 2016 Funding, \$70-100M Project, US Army Corps New England



- General Assembly has allocated match needed for up to \$60M in Federal Funds
- Improvements to gates, concrete spillways, bridge, lifting equipment, discharge channel
- Mod. Study ~2023/2024, Design ~2025/2026, Construction ~2027/2028
- <https://dec.vermont.gov/water-investment/dam-safety/dec-owned-dams/waterbury-dam-spillway-project>



# Overview of July 2023 Flood Event on Vermont's Dams



- Wide ranging rainfall of 3 to 9 inches



## Overview of July 2023 Flood Event on ANR-owned dams

- Highest rainfall total in Calais, Vermont (9.2 inches) and 4 to 8 common along the Green Mountains
- July 9, Declared State of Emergency
- July 14, Federal Declaration of Major Disaster

### Winooski River Flood Control Dam Performance

- Wrightsville, P-El. 684.15 (10" below aux., ~50' above normal), 1<sup>st</sup> Pool-of-Record
- East Barre, P-El. 1,153.3 (11.7' below aux., ~28' above normal), 1<sup>st</sup> Pool-of-Record
- Waterbury, P-El. 604.33 (6.5' below action, ~15' above normal), 4<sup>th</sup> Pool-of-Record



# Overview of July 2023 Flood Event on ANR-owned dams

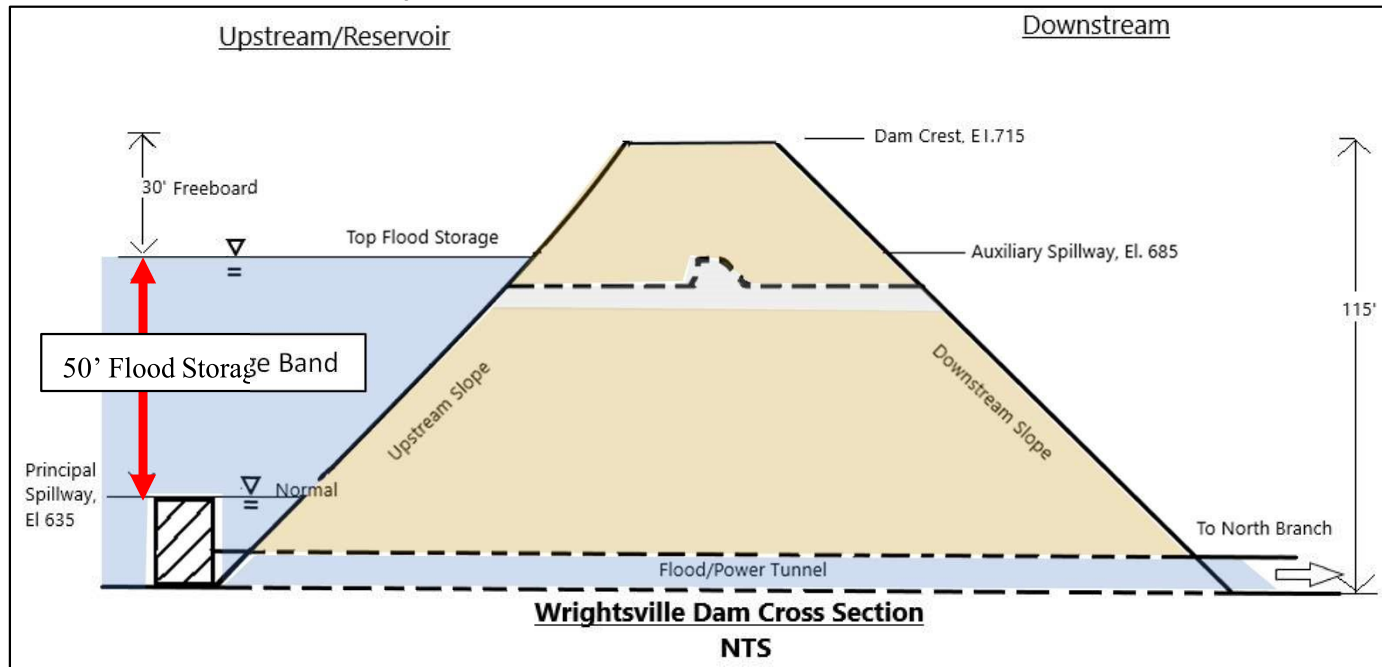
- Continual Storm Monitoring
- On-the-fly inundation mapping and emergency coordination
- Post-Event Inspections, August 2 Inspections with USACE
- Post –Event Tunnel Inspections at Wrightsville & East Barre
- Request for USACE Support for Study of Wrightsville and East Barre
- Waterbury Dam Interim Risk Reduction

## Wrightsville Dam Performance

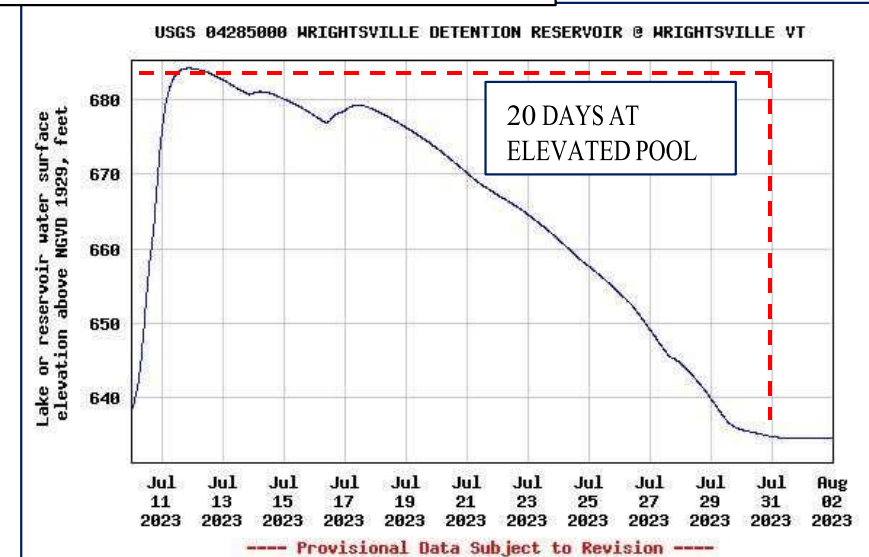
- **Wrightsville, P-El. 684.15 (10” below aux., ~50’ above normal), 1<sup>st</sup> Pool-of-Record**



# Overview of July 2023 Flood Event on ANR-owned dams



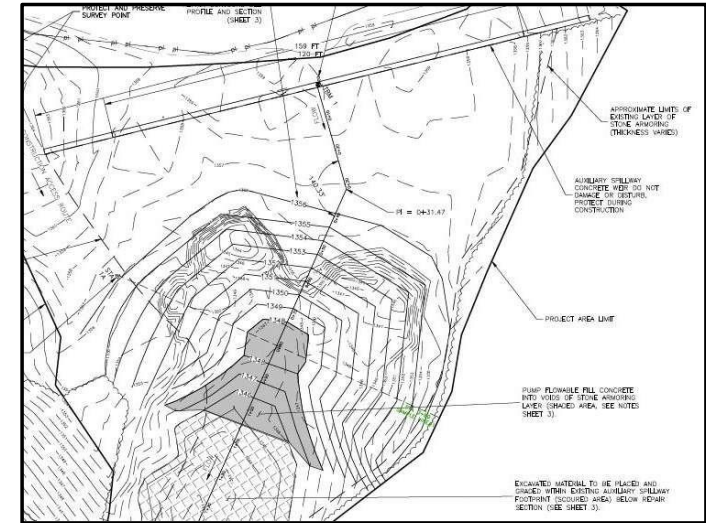
- 50' flood storage pool nearly full.
- 30' freeboard, full flood pool to dam crest.
- At risk of activating aux. spillway, flooding along North Branch to the Winooski River.
- Request for USACE Support to evaluate feasibility of improved operational flexibility



Other DEC, FPR, and F&W Dam Performance

# Overview of July 2023 Flood Event on ANR-owned dams

- DEC-Owned (3 of 14)
  - o Minor erosion near spillway at Noyes Pond Dam
  - o Waterbury Dam – center gate and bridge (pre-existing but flood control related)
  - o Wrightsville Dam
    - Right spillway wall mortar damage/stone missing.
    - Minor scouring of concrete tunnel at upstream end.
    - Operational Flexibility Feasibility Study.
- FPR-Owned (5 of 15)
  - o Minor erosion, leakage, and debris issues.
- F&W Owned (17 of 76):
  - o Gale Meadows Dam, major Aux. Spillway erosion
  - o Others minor erosion, leakage, debris issues.





# Overview of July 2023 Flood Event on ANR-owned dams

Gale Meadows Dam Aux. S/W damage and temp. repair



# Overview of July 2023 Flood Event on Regulated Dams

DSP Actions:

## RAPID INSPECTIONS

- Rapid Inspection of 390 Non-Power, Non-Federal Dams
- Emergency Management Assistance Compact (EMAC) supported with staff from NY

Power Authority, NY Dam Safety, and MA Office of Dam Safety

## FOLLOWUP INSPECTIONS

- Inspection of 65 Non-Power, Non-Federal Dams flagged as part of Rapid Inspection. • 5 FAILED/BREACHED DAMS (2 SIGN, 3 LOW HAZARD POTENTIAL)

# Overview of July 2023 Flood Event on Regulated Dams



Hands Mill Dam, Washington, SIGN Hazard



South Woodbury Pond Dam, Woodbury, SIGN Hazard



DSP Actions Continued:



# Overview of July 2023 Flood Event on Regulated Dams



Lyons Pond Dam, Peru, LOW Hazard

# Overview of July 2023 Flood Event on Regulated Dams

Quinn Lower Dam, Wallingford, LOW Hazard



Dow Pond Dam, Middlebury, SIGN Hazard



Clarks Sawmill Dam, Cabot, LOW Hazard



# Overview of July 2023 Flood Event on Regulated Dams

DSP Actions Continued:

## ONGOING REGULATORY WORK

- 5 FAILED/BREACHED DAMS (2 SIGN, 3 LOW)
- <50 dams with notable damage
- ~57 dams were overtopped
- Working through ~50 dams with storm damage
- Emergency Action Plans, Temporary Repairs, increased monitoring, Risk reduction measures at ~8 dams and counting.



East Calais Mill Dam, East Calais, SIGN Hazard

# Overview of July 2023 Flood Event on Regulated Dams

## CURSORY COST ESTIMATES OF DAMAGES

- Est. costs of maintenance, temp. stabilization, & compliance (not necessarily storm damage).
- Storm Maintenance, ~\$600k
- Temporary Stabilization, ~\$1M
- Compliance Costs, ~\$60 M

Vatters Dam, Northfield, SIGN Hazard



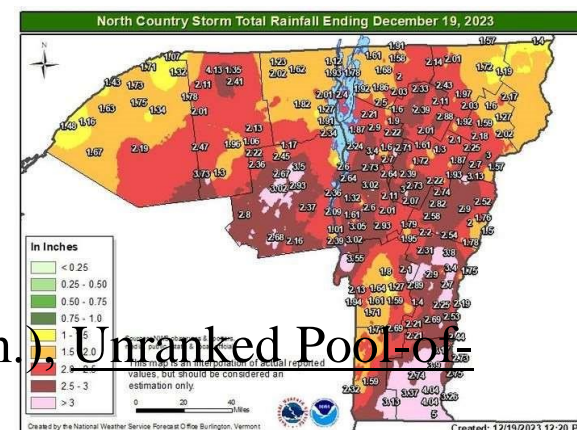
# Overview of December 2023 Flood Event

## Rain on Snow Event:

- 2 to 4” of Rain with 1 to 2” Water Equivalent Snowmelt

## Winooski River Flood Control Dams Performance:

- Wrightsville, P-El. 663.19 (~21’ below July, ~28’ above norm.) Unranked Pool-of-Record
- East Barre, P-El. 1,149.42 (~4’ below July., ~24’ above norm.), Near 2nd Pool-of-Record
- Waterbury, P-El. 604.01 (~4” below July, 6.8’ below action, ~15’ above normal), 6<sup>th</sup> Poolof-Record (4<sup>th</sup> & 6<sup>th</sup> in 2023, Pools 3<sup>rd</sup> through 6<sup>th</sup> all in the last 12 years)

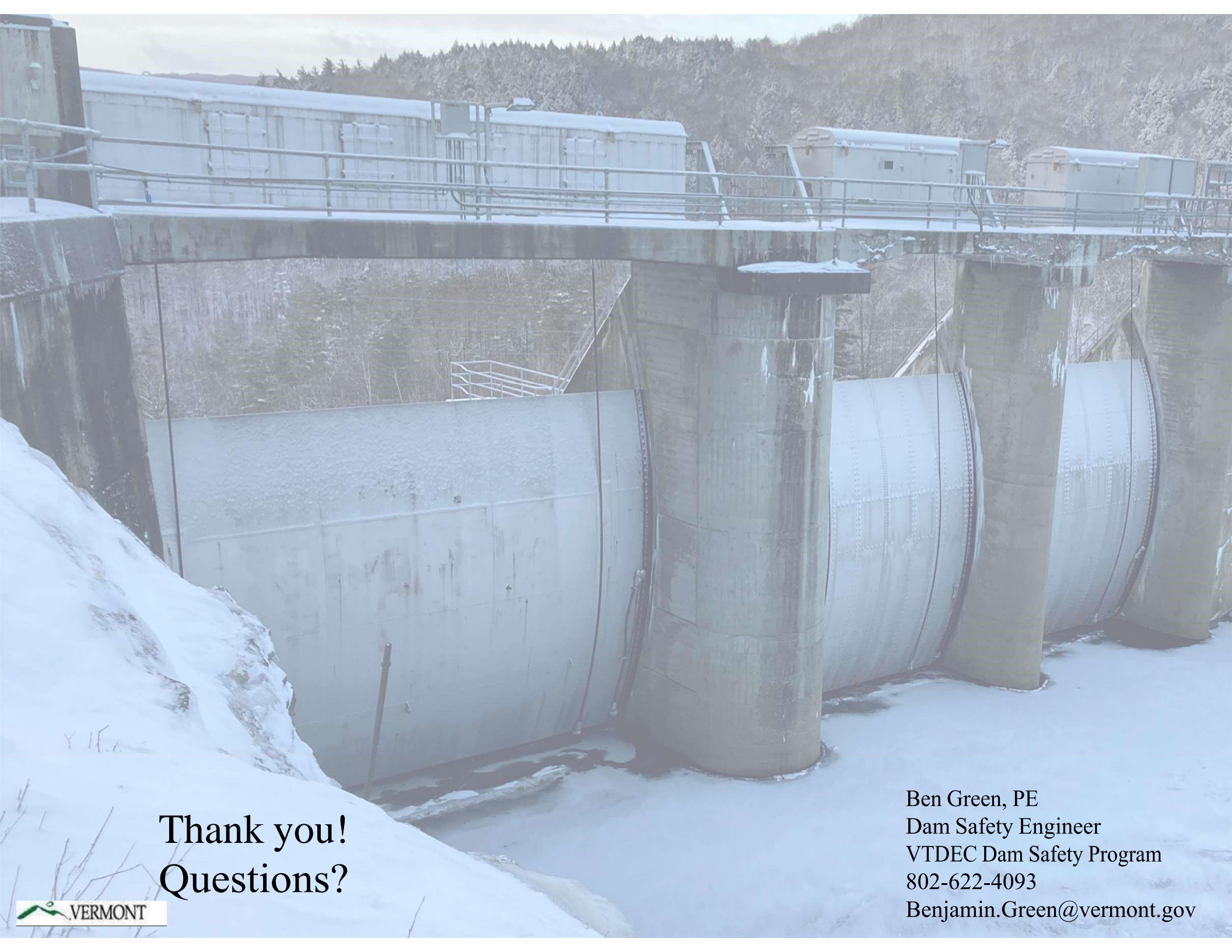


- Clogging of principal spillway (Glen Lake Dam) that was cleared by FPR.

#### Regulated Dams:

- No major issues reported
- Several near S/W activation/Overtopping
- Email and Direct Phone Calls to targeted HIGH and SIGNIFICANT Dam Owners





Thank you!  
Questions?

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