

VERMONT
Department of Environmental Conservation
Dam Safety Program



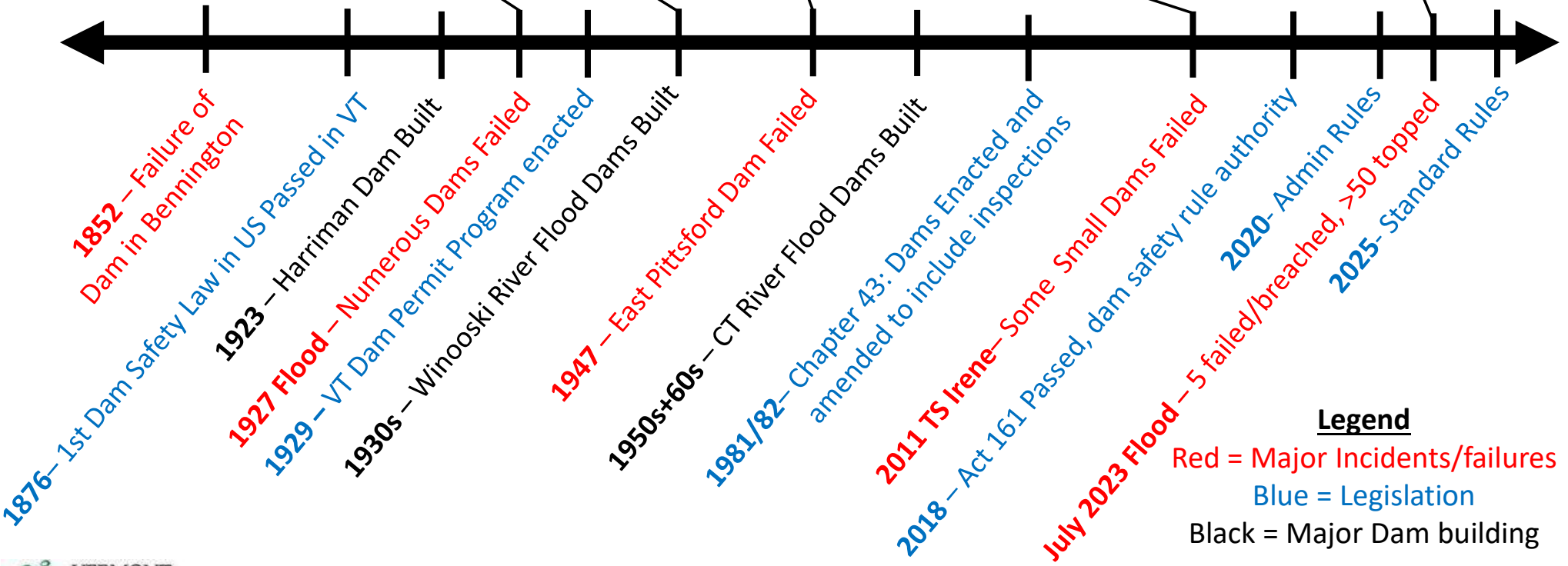
Waterbury Dam

**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)
- 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.



Silver Lake Dam

Hazard Potential Classifications

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

Classification¹	Direct Loss of Life	Property Losses	Lifeline Losses	Environmental Losses
HIGH	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
SIGNIFICANT	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
LOW	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
MINIMAL	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
DAM INVENTORY

HOME DAMS PERMITS CONTACTS MAINTENANCE LOGINS

View Dams Record

Edit Close Tools

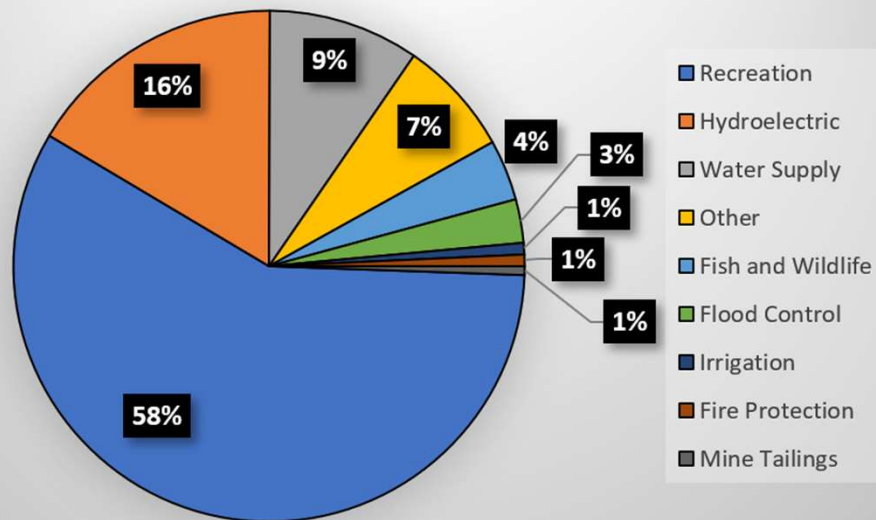
Names/Location	Contacts	Permits	Reservoir	Dam	Construction/Reconstruction
StateID:	226.01				
Dam Type:	RE				
Construction Type:	Zoned Earthfill				
Core:	IEK				
Foundation:	RSK				
Low Level Outlet:					
Length:	2130.0				
Height (feet):	187.0				
Upstream Height (feet):	145				
Structural Height (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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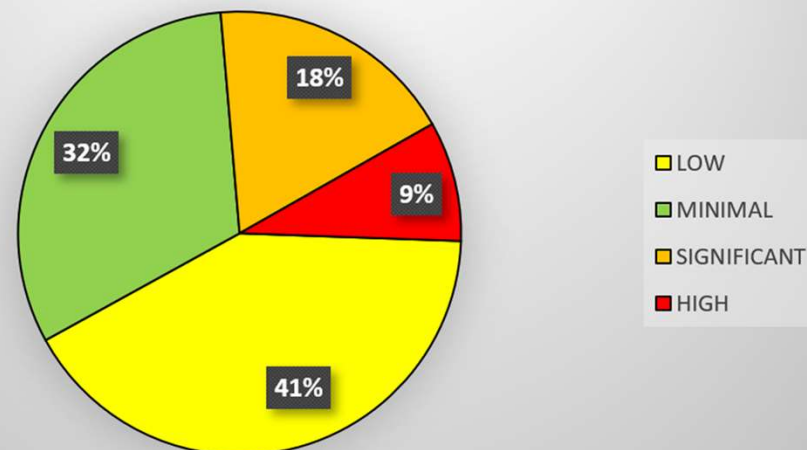


Vermont Dam Inventory / Natural Resources Atlas Continued

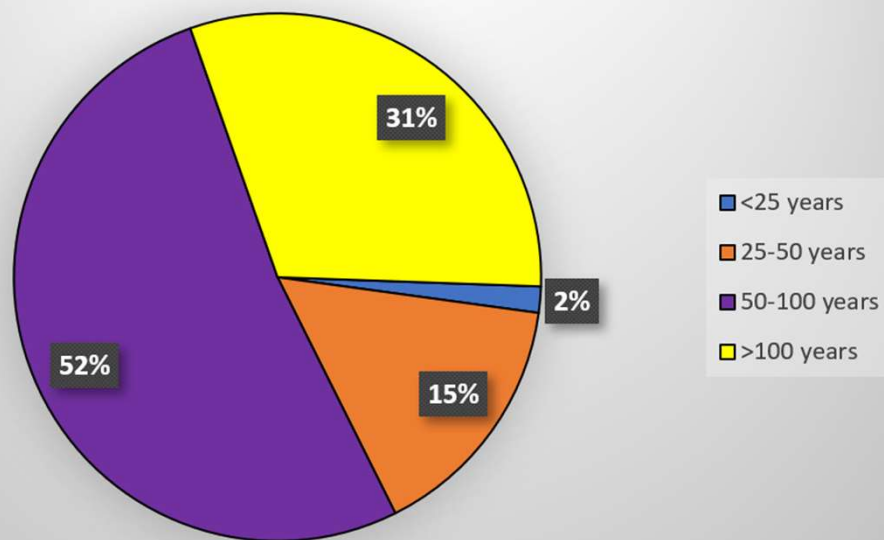
VT Dams - Purposes



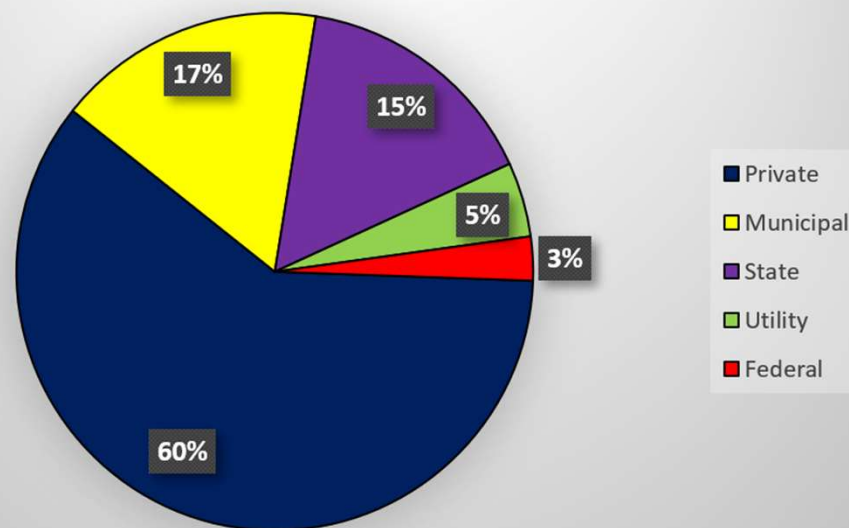
VT Dams - Hazard Potential Classification



VT Dams - Age



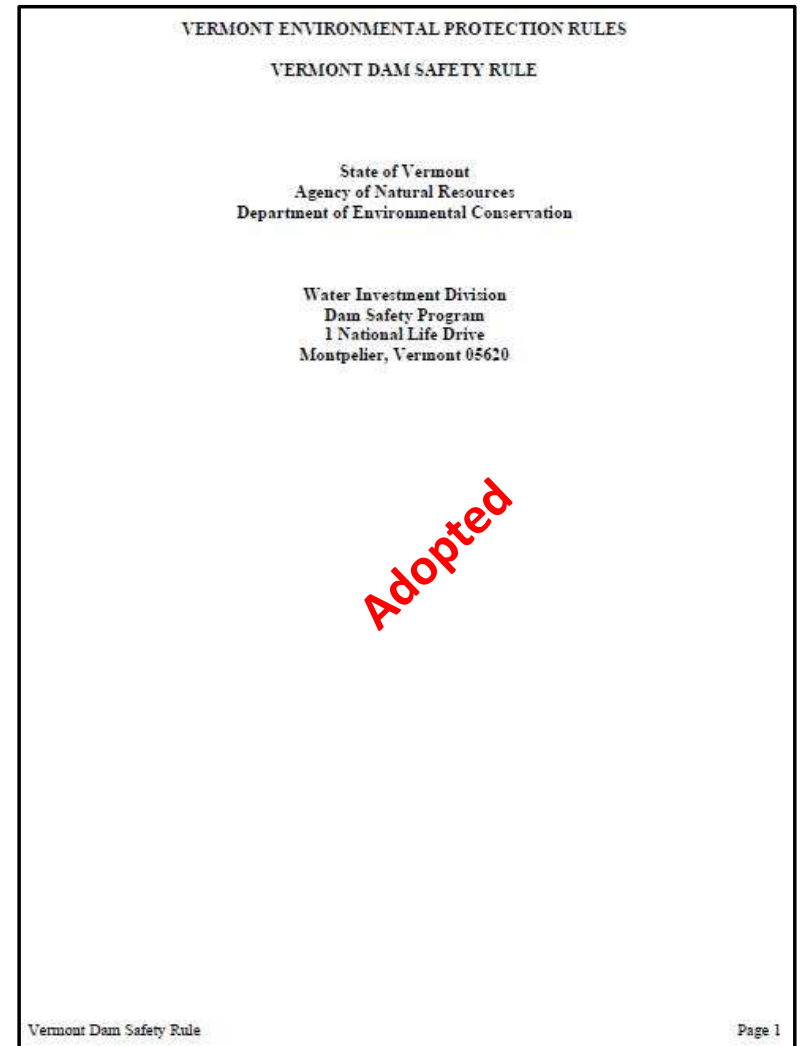
VT Dams - Ownership Type



Regulatory – Key Initiative

Rulemaking – Act 161 of 2018

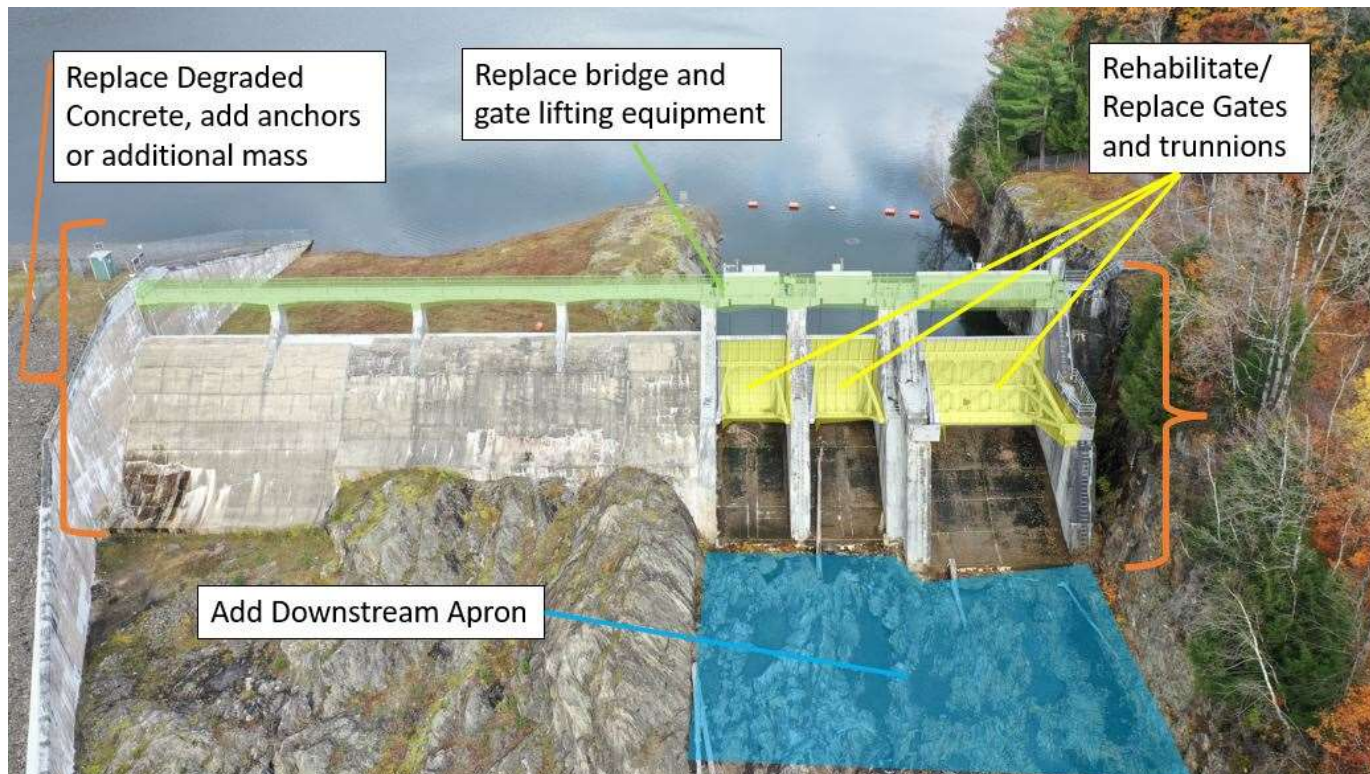
- Phase I, Administrative Rules adopted
- Phase II, Standards Rules in development
 - Siting, design, construction, alteration
 - Operation & Maintenance
 - Inspection, monitoring, record keeping, reporting
 - Repair or removal
 - Application for authorization
 - EAP requirements and guidance
- Extension to July 1, 2025 being pursued



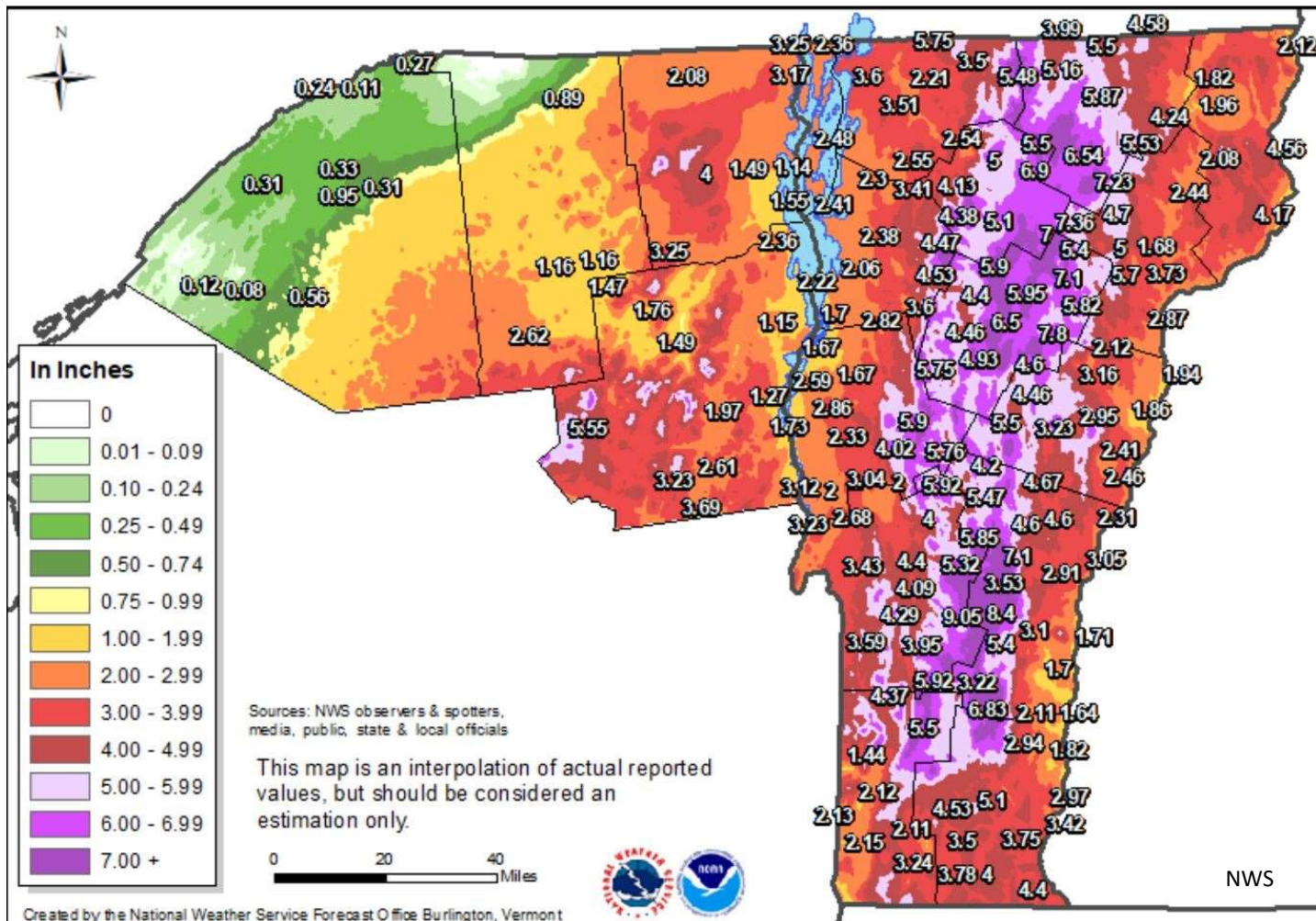
Dam Ownership – Key Initiative

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
- 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

Overview of July 2023 Flood Event on ANR-owned dams

Winooski River Flood Control Dam Performance

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

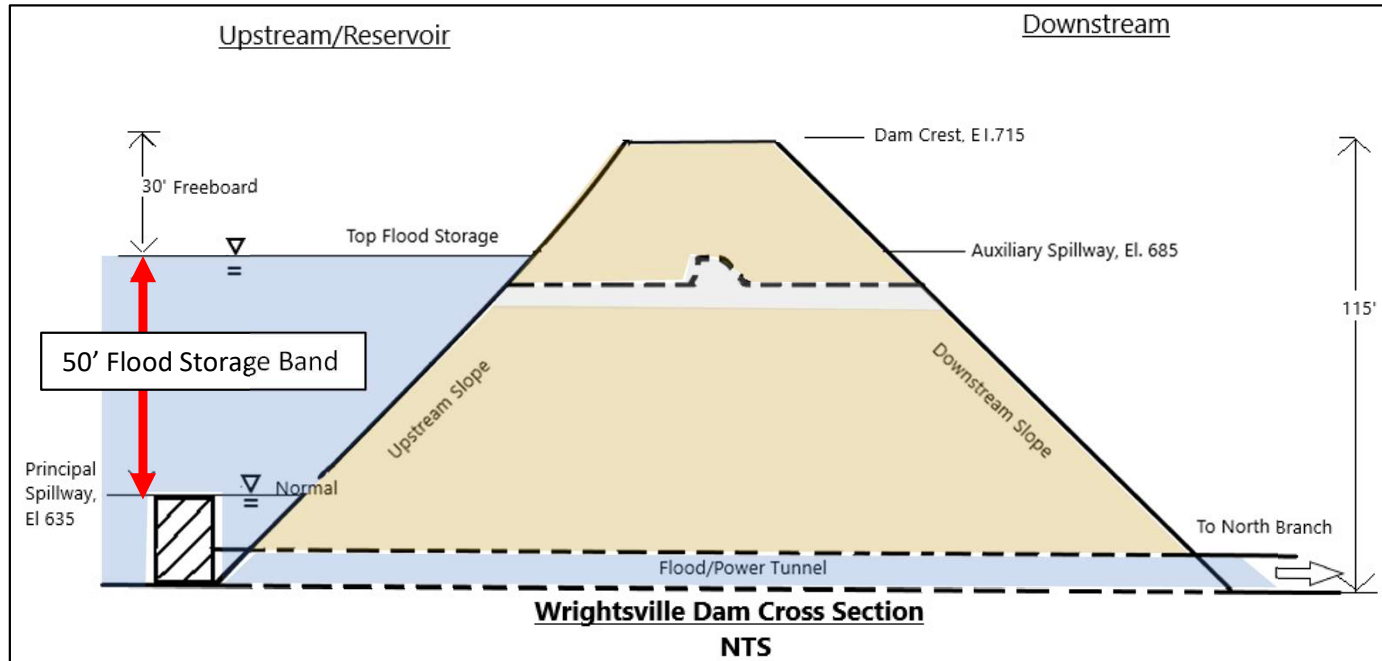
- Continual Storm Monitoring
- On-the-fly inundation mapping and emergency coordination
- Post-Event Inspections, August 2
Inspections with USACE
- Post –Event Tunnel Inspections at
Wrightsville & East Barre
- Request for USACE Support for Study
of Wrightsville and East Barre
- Waterbury Dam Interim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



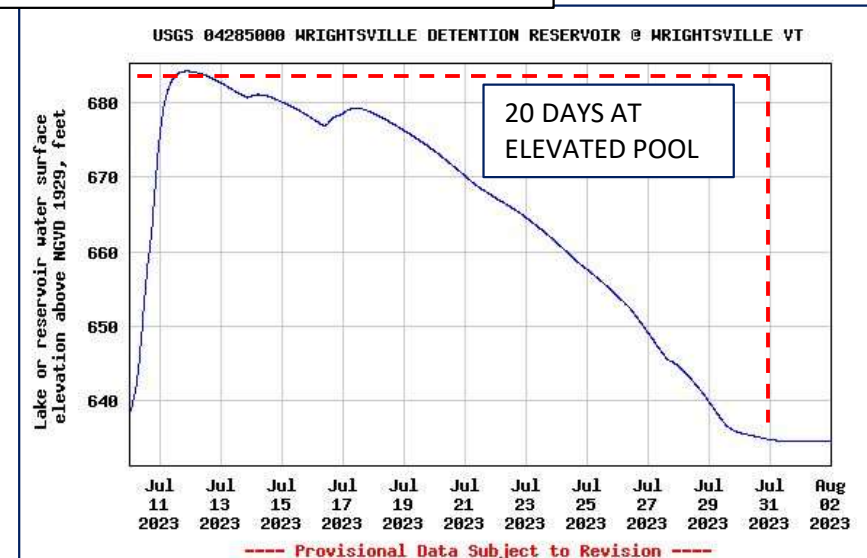
Overview of July 2023 Flood Event on ANR-owned dams

Wrightsville Dam Performance

- Wrightsville, P-El. 684.15 (10" below aux., ~50' above normal), 1st Pool-of-Record



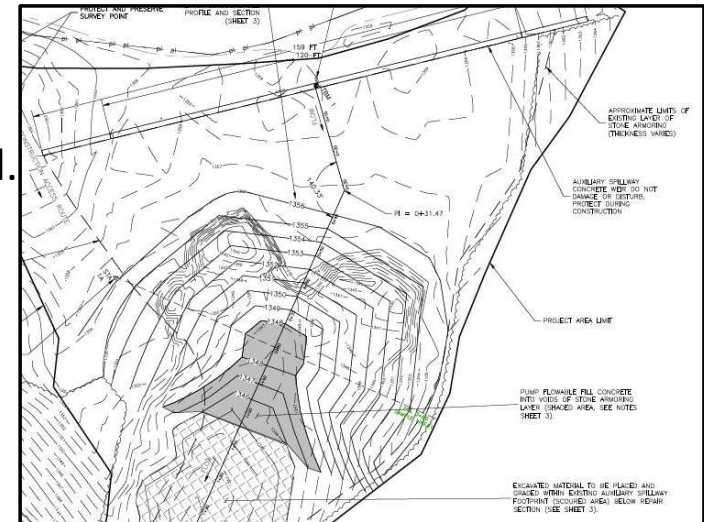
- 50' flood storage pool nearly full.
- 30' freeboard, full flood pool to dam crest.
- At risk of activating aux. spillway, flooding along North Branch to the Winooski River.
- Request for USACE Support to evaluate feasibility of improved operational flexibility



Overview of July 2023 Flood Event on ANR-owned dams

Other DEC, FPR, and F&W Dam Performance

- DEC-Owned (3 of 14)
 - Minor erosion near spillway at Noyes Pond Dam
 - Waterbury Dam – center gate and bridge (pre-existing but flood control related)
 - 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)
 - Minor erosion, leakage, and debris issues.
- F&W Owned (17 of 76):
 - Gale Meadows Dam, major Aux. Spillway erosion
 - Others minor erosion, leakage, debris issues.



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)



Hands Mill Dam, Washington, SIGN Hazard



South Woodbury Pond Dam, Woodbury, SIGN Hazard

Overview of July 2023 Flood Event on Regulated Dams

DSP Actions Continued:



Quinn Lower Dam, Wallingford, LOW Hazard



Clarks Sawmill Dam, Cabot, LOW Hazard



Lyons Pond Dam, Peru, LOW Hazard



Dow Pond Dam, Middlebury, SIGN 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.

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



East Calais Mill Dam, East Calais, SIGN Hazard

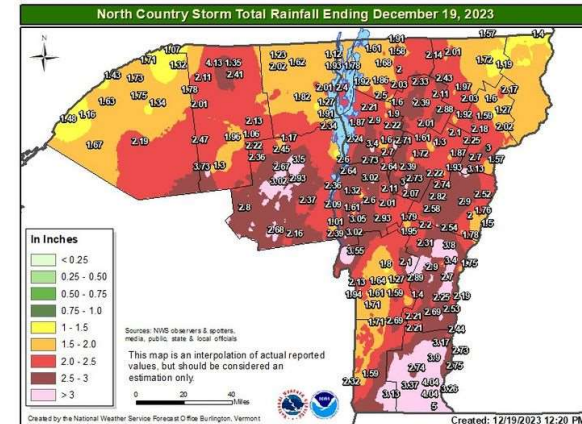


Vatters Dam, Northfield, SIGN Hazard

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), **6th Pool-of-Record (4th & 6th in 2023, Pools 3rd through 6th all in the last 12 years)**

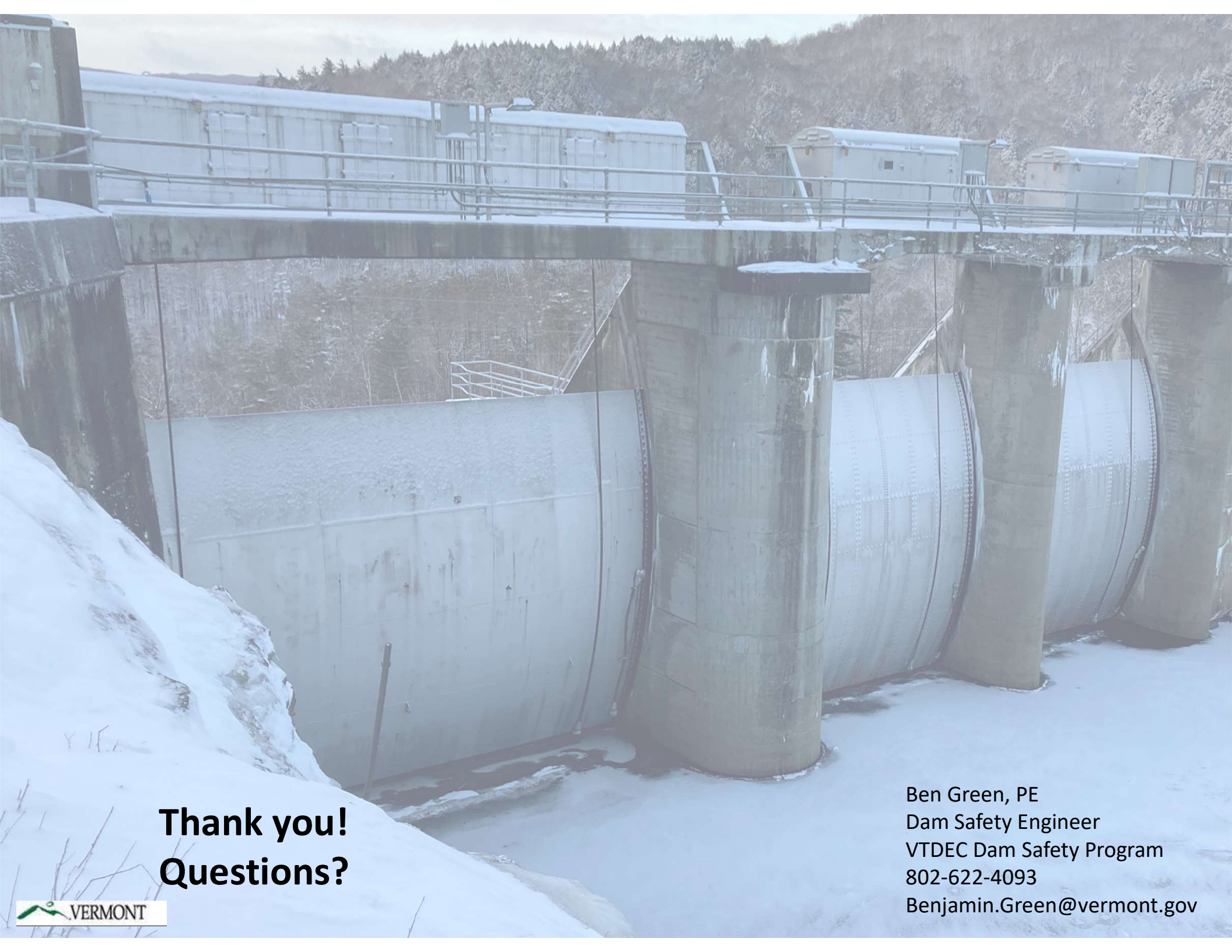
ANR-Owned Dams:

- No major issues noted
- Minor activation of a spillway under July Flood repair construction (Gale Meadows Dam)
- 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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