

Vermont Dam Safety Program



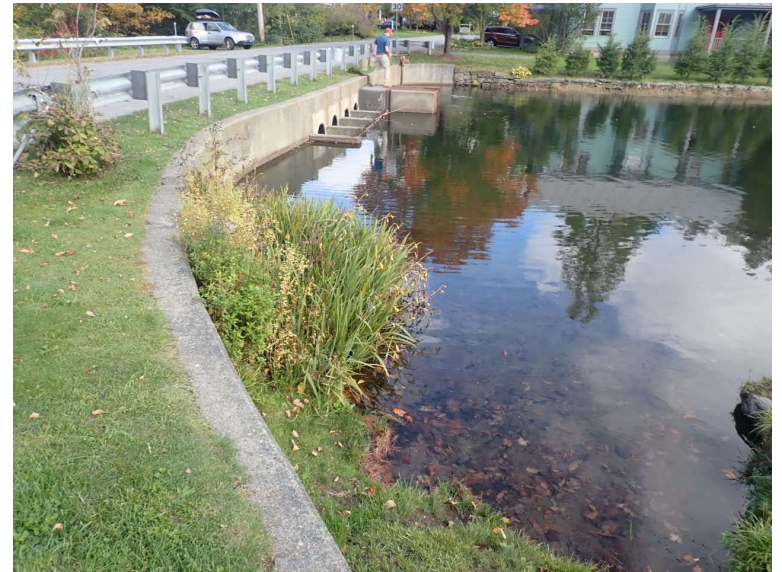
Crystal Lake Dam, Barton

ANR Dam Management with Beaver Impacts
House Committee on Environment
April 16, 2025

Ben Green, PE
Dam Safety Engineer
VTDEC Dam Safety Program

Brief Dam Safety Program (DSP) Overview

- Located in the Water Investment Division (WID) within VTDEC
- **"The mission of the DSP 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 engineers
 - (3) staff engineers/technician
 - (1) project manager
 - (1) program administrator
- **REGULATORY:**
 - 10 V.S.A Chapter 43: Dams, Non-federal, Non-power dams (Admin. Rules - 2020 / Standards Rules in development)
- **DAM OWNERSHIP:** 13 dams including the (3) Winooski River Flood Control Dams.



Silver Lake Dam

Vermont Dam Inventory / Natural Resources Atlas

- Contains ~1,119 records (active and historic sites)
- ~992 under jurisdiction of VTDEC (Non-Power, Non-Federal)
49 HIGH, 134 SIGNIFICANT, 248 LOW, ~561 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.)

*See DSP website for definitions of HIGH, SIGNIFICANT, LOW, and MINIMAL hazard potential dams



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 Capacity (cfs):	

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DSP Regulatory

Periodic Inspections

- Performed according to schedule:

Periodic Inspections ⁽¹⁾	
Hazard Classification	Frequency
HIGH	2 years
SIGNIFICANT	5 years
LOW	10 years
MINIMAL	None

- Determine condition rating.
- Currently/historically performed by Program Staff



Dam Orders (Permits)

- Construction, alteration, rehabilitation, removal of dams >500,000 cf.
- Receive/process about 5 per year.
- Review application, analyses, basis of design report, plans, & specs.
- Public Comment Period
- Issue Dam Safety Order with Conditions or deny application/Monitor Project



Curtis Pond Dam Rehabilitation, Calais

How Dam Safety Rulemaking Came to Pass In Vermont

- Pre-existing Law (Chapter 43)
 - Limited authorities
 - No Dam Safety Rules
- Dam Safety in VT lagging behind Federal Standards and surrounding States
- Aging Dam Inventory – Increasing number of dam safety concerns
- Benign Neglect Issues
- Trend of more severe and often extreme rainfall events
- Increasing risks of dam incidents or failures



Wolcott Dam Rehabilitation, Vermont, 2015

Dam Safety Rule Development

Administrative Rules (adopted in 2020):

- Definitions
- Dam Owner Responsibility
- Process for Owner Registration and dams recorded in Land records
- Hazard Potential Classifications
- Inspection Schedule and Compliance with Inspection Results

Standards Rules (under development):

- Standards Based Approach and Risk Informed Decision Making
- New Dam and Existing Dam Construction/Rehabilitation Design Requirements
 - Hydrology and Hydraulics
 - Geology, Geotechnical, and Seismic
 - Structural
- Dam Removal Requirements
- Dam Order Application Requirements
- Operation & Maintenance Manuals
- Dam Inspection Requirements
- Emergency Action Plan requirements (HIGH and SIGNIFICANT Hazard Dams)



Lake Groton Dam, Groton



Camp Wihakowi Dam Removal, Northfield, 2020

Administrative Rules

Dam Owner Obligation and Responsibility under Rule:

- Safe management and operation of their dam
- The significant financial undertaking required of dam ownership.
- Cooperation with the Department and compliance with this Rule.
- Rule Compliance does not relieve dam owner/operator from liability as a result of dam failure or mis-operation for injury to persons, including loss of life or damage to property of others.

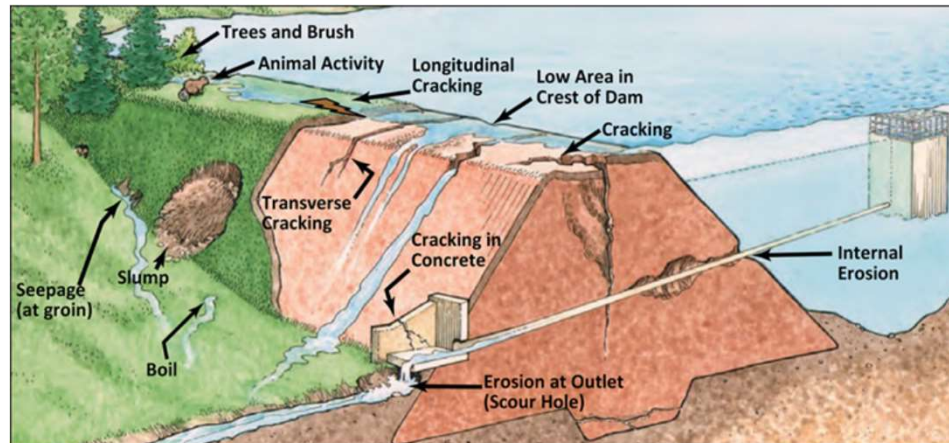


Gale Meadows Dam, Londonderry

Administrative Rules

Compliance with Inspection Results:

- If, based on inspection, Department determines maintenance, investigation and analysis, or repairs or reconstruction to a dam are needed to maintain dam in safe condition, Department shall notify Owner in writing and require work undertaken within the time period specified.
- If Owner does not strive to undertake required work, Department may bring enforcement and or require Owner to drain reservoir and maintain it drained until necessary work has been completed.



Source: FEMA P-911

ANR-Owned Dams

- ANR owns ~100.
 - DEC – 13 (including 3 flood control dams)
 - F&W - 66
 - FPR - 13

TYPICAL TASKS

- *Site visits and checks*
- *Operation and Maintenance*
- *Emergency Action Planning*
- *Flood monitoring/operations*
- *Incident Response*
- *Capital Planning*
- *Design, permitting, construction*
- *Project Management*
- *Debris removal*
- *Beaver conflicts*
- *Mowing and Brushing Contract*

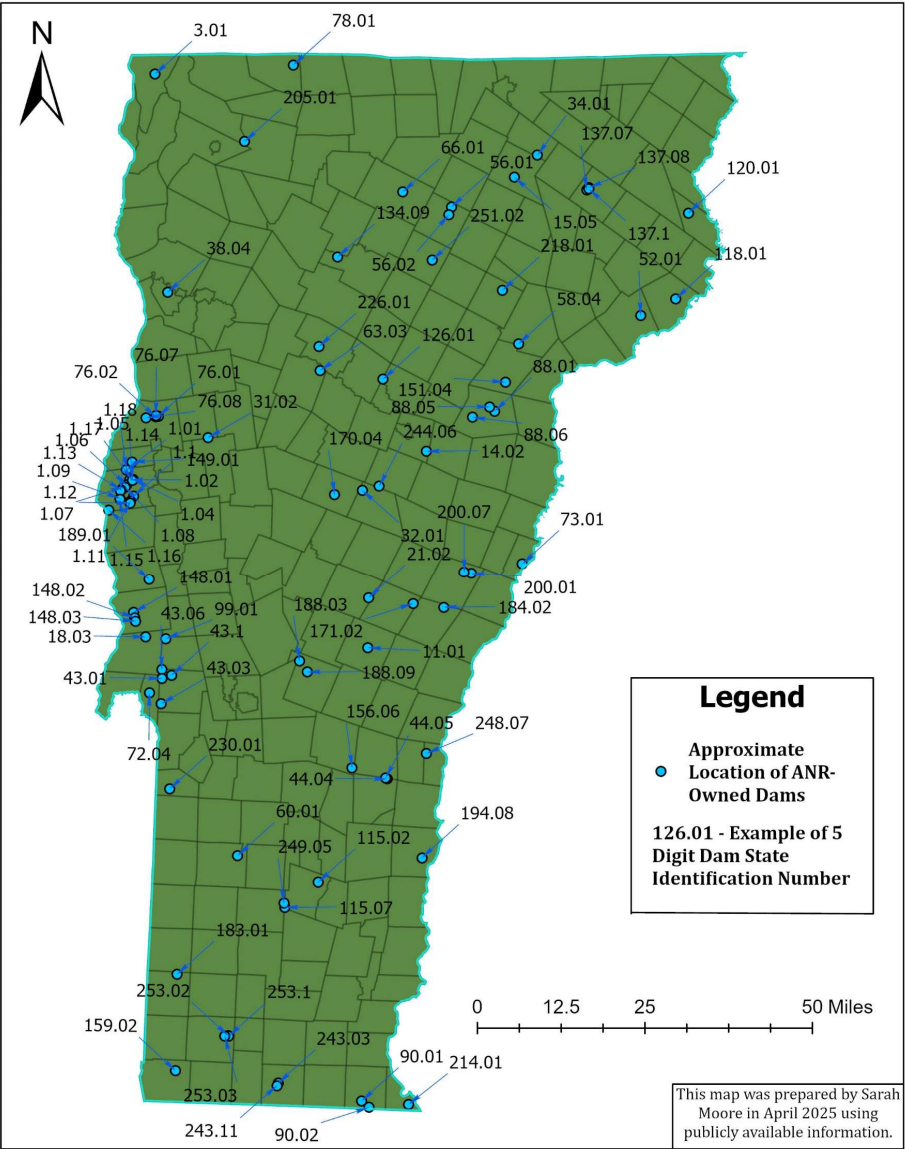


Lake Bomoseen Dam, Castleton



Waterbury Dam Tunnel

ANR-Owned Dams



ANR-Dam Ownership Challenges

- ~40% of ANR-owned Dams in POOR/UNSATISFACTORY Condition
- ~80% are more than 50-years old
- Increasing frequency of severe storm events
- Rough estimate, more than \$25M to rehabilitate ANR dams (Excluding Flood Dams)
- Upcoming dam safety rules/compliance



Upcoming/Ongoing Dam Safety Work at ANR-Owned Dams

- Maintenance Contracting
- ANR-Owned HIGH and SIGNIFICANT Hazard Dam Risk Assessment
 - Rehabilitation Construction
 - Lake Carmi Dam
 - Rehabilitation Design
 - Noyes Pond Dam, Groton
 - Silver Lake Dam, Barnard
 - Comprehensive Assessments
 - Little Hosmer Pond Dam, Craftsbury
 - Gale Meadows Dam and Dike, Londonderry (F&W)
 - 6 additional Dams
 - Geotechnical Explorations
 - Emergency Action Plan Updates
 - Risk Reduction Measures – Prison Pond Dam, Windsor
 - Waterbury Dam Spillway Project with USACE
 - Wrightsville and East Barre Dams
 - Geotechnical Exploration and Internal Erosion Study
 - Operational Flexibility/Flood Protection Improvement Project
 - Tunnel and Gate Maintenance Project



Knapp Site No. 1 Dam, Cavendish



Prison Pond Dam, Windsor

Examples of Typical Dam Maintenance

- Mowing and brushing on dam and 15 feet beyond annually.
- Maintaining spillways free of debris (including beaver debris)
- Test operate low-level outlets and gates
- Filling animal burrows
- Repairing minor erosion
- Repairing riprap protection
- Maintain seepage collection systems
- Monitoring the dam regularly



Fairfield Swamp Pond Dam, Swanton



Tetreault Dam, Addison



Kent Pond Dam, Killington



CCC Pond Dam, Addison

Maintenance Issues related to Beaver Activity

- Based on DSP records, dams negatively impacted by beaver activity:
 - ~13% of all regulated (500k+ in size) dams of municipal or private ownership
 - ~21% of ANR-owned dams
- Clogging of principal and auxiliary spillways
 - Restrict spillway capacity, reduce ability of dams to safely pass high flows
 - Result in higher normal and flood pool levels that stress man-made dams
 - Increases dam safety risks/chances of a dam safety issue that could impact public safety



Wolcott Pond Dam, Wolcott



Lake Winona Dam/Bristol Pond Dam, Bristol



Rood Pond Dam, Williamstown

Dam Safety Alternatives to Beaver Challenges

- Install and maintain beaver flow devices
 - Inadequate hydraulic capacity for storm events, limited effectiveness at man-made dams.
- Install and maintain debris screens
 - Screens sized large enough to pass small debris and exclude large debris that can clog spillways.
- Constant maintenance/debris/dam removal
 - Allocate manpower and funds to regular to daily debris removal/site management

Avoid These Water Level Control Devices at Dams

Because these devices require partial obstruction of spillways or outlet pipes, their use at a dam should be strictly prohibited. Obstruction of spillways or outlets can cause reservoir levels to rise resulting in overtopping of the dam, erosion of earthen spillways and other detrimental impacts.

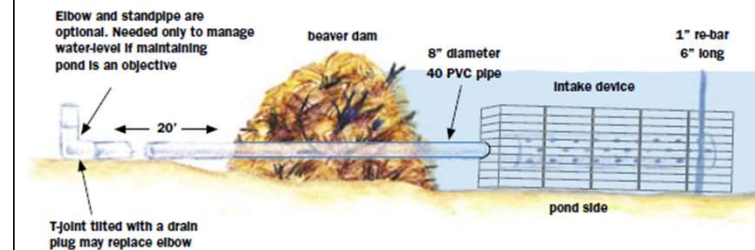


Figure 5-9. The Clemson Beaver Pond Leveler is a passive but effective means to control water levels through a beaver dam.

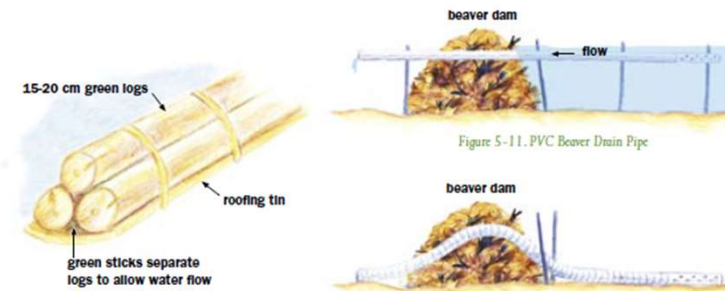


Figure 5-11. PVC Beaver Drain Pipe

Figure 5-10. A 3-log drain manipulates water levels through a beaver dam.

Figure 5-12. Massachusetts Beaver Pond Leveler

FEMA P-473 – Technical Manual for Dam Owners
– Impacts of Animals on Earthen Dams

Dam Safety Alternatives to Beaver Challenges (continued)

- Beaver Removal
 - Work with local game warden and licensed trapper to remove beaver.
- Modify existing dam to accommodate beaver activity
 - Fund, design, permit, and perform dam rehabilitation to new configuration not susceptible to negative impacts from beaver activity.
- Remove man-made dam
 - Fund, design, permit, and perform man-made dam removal, making dam/site management no longer necessary.

Thank you!

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Wrightsville Reservoir