



# Final Report

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## Removing Dams in Vermont's Lake Champlain Basin

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## Executive Summary

Dam removals are a phased process and require collaborative input from many sources along the path to removal. When this grant was awarded in 2020, it picked up on work that had already begun, bringing four dam removals through the finish line, and pushing one more forward. This grant has successfully reconnected approximately 76 miles of rivers across the Lake Champlain Basin by removing Pelletier Dam, Dunklee Pond Dam, and Camp Wihakowi Dam.

Each dam brought its unique location in the Lake Champlain Basin watershed: Johnsons Mill Dam on the Bogue Branch in Bakersfield, Dunklee Pond Dam on the Tenney Brook in Rutland, Pelletier Dam on North Breton Brook in Castleton, Camp Wihakowi Dam on the Bull Run in Northfield, and Cross Brothers Dam on the Dog River in Northfield.

Similarly, each dam had a somewhat different timeline and actions associated with the project depending on the characteristics of the river, the history of the dam, the natural communities around it, and the human development affected by the dam. Removing Dunklee Pond Dam addressed a significant flood risk that had caused evacuations for the community around it, while removing Johnsons Mill Dam focused on restoring a historically rich brook trout stream. Each dam removal was tailored to its specific goals through strong partnerships with local and regional stakeholders. Local Conservation Districts, watershed groups, landowners, and towns were crucial in completing these projects.

Removing these dams spread the benefits of dam removals throughout the Vermont portion of the Lake Champlain Basin. The ecosystem accomplishments are clear: fish returning to reaches that had been closed to them; sediment transport reestablished; water flow returned to its natural state; cold water preserved through the draining of impoundments; river channels returning to equilibrium, floodplains reconnected; natural habitat restored; vegetation regrowth occurred; and the safety and wellbeing of humans was restored from the threat of flooding.

The remaining dam in this grant, Cross Brothers in Northfield, has reached partial design for removal, and is supported by the town. It has not moved forward due to the waiting period for funding through the Federal Emergency Management Agency (FEMA). Cross Brothers is positioned so that once the funding is secured, final design will be underway.

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## 1. Project Synopsis

The Vermont Dam Removal Initiative prioritized five dams for removal and/or advanced engineering for future removal: Johnsons Mill Dam in Bakersfield, Camp Wihakowi and Cross Brothers dams in Northfield, Dunklee Pond Dam in Rutland, and Pelletier Dam in Castleton. The Camp Wihakowi Dam, Pelletier Dam, and Dunklee Pond Dam were all removed and the rivers and floodplain were restored.

The goals of the project were multi-faceted:

- Raise awareness of the impact of dams on river connectivity, aquatic organism passage water quality, public safety, flood resilience and economics;
- Prioritize dams within the LCB for removal based on their ecological impact;
- Collaborate with dam owners, watershed groups and local communities to remove dams and restore river and stream function.

Removing dams takes a multi-year, collaborative approach that brings together different funding sources, partners, construction professionals, and engineers. All three of the dams that were removed with this grant received additional funding in other stages of the project from LCBP and other funders. Cross Brothers in Northfield is still in the process of potentially receiving funding from FEMA.

The need for removing derelict dams is paramount both as an infrastructure liability (they pose a risk to human life if they fail), and as an ecological benefit (they are an artificial physical barrier across rivers). Removing deteriorating dams is a better option than repairing them, as it is typically less costly and the restored natural functions are immediate. Dam removal restores a river's flow dynamics, improving water quality and aquatic habitat by increasing dissolved oxygen, reducing water temperatures, and providing passage for migrating fish.

Vermont Natural Resources Council (VNRC) partnered with the U.S. Fish and Wildlife Service, The Friends of the Winooski, The Franklin County Natural Resources Conservation District, Poultney Mettowee Natural Resources Conservation District, Trout Unlimited, The Town of Northfield, The Town of Rutland, The Town of Castleton, The Vermont River Conservancy, The Vermont Fish and Wildlife Service, The Vermont Department of Environmental Conservation and others for the five projects.

## 2. Tasks Completed

**Task 1.1 Pelletier Construction** - The Pelletier Dam was removed in September of 2022. The dam was deconstructed and sediment was removed from the former impoundment. A portion of this LCBP grant was used to cover the cost of construction and oversight with our engineers for the project including regulatory approvals for any design changes, as-built plans and any required post-project regulatory filings. Select pieces of the historic marble that made that dam were placed in the project area to serve as seating. A historic documentation plaque will be created and placed in 2023.



Pelletier Dam removal site post construction.

**Task 1.2 Pelletier Site Restoration** - An initial tree planting was completed in October of 2022. Eleven volunteers were recruited to plant native trees and shrubs to the river banks. VNRC partnered with the Poultney Mettowee Conservation District to source local trees for the planting. Beaver Dam analogs were added to a new channel cutting through a bend in the river to mitigate erosion and head cutting. The Japanese Knotweed population was managed through reseeding and planting of the disturbed areas to stop the population from spreading.

A media event was held with the Vermont Agency of Natural Resources Secretary to highlight the Pelletier removal.



Volunteers help plant trees and shrubs at the Pelletier Dam removal site.

**Task 2.1 Camp Wihakowi Construction** - A portion of this LCBP grant was used to cover the cost of construction and oversight with our engineers for the project including regulatory approvals for any design changes, as-built plans and any required post-project regulatory filings.



Camp Wihakowi Dam removal during construction

**Task 2.2 Camp Wihakowi Restoration** - Trees and shrubs were planted along the banks and in the floodplain in accordance with the revegetation plans. The area was replanted and regrown while maintaining access across the river for the landowner.

**Task 3.1 Cross Brothers Design and Permitting** - Cross Brother Dam has reached 30% of design finalization. VNRC is currently securing funding to bring the design to completion, submit permits, remove the dam and restore the river. VNRC has secured \$150,000 of match for the project. Concurrently, the Cross Brothers project continues to move through the FEMA consideration for funding.

**Task 4.1 Johnsons Mill Design and Permitting** - The Johnsons Mill dam reached 100% design for removal, and met requirements for SHIPO documents and permitting. Johnsons Mill Dam was removed in August 2021 through a separate funding source.



Johnsons Mill Dam post construction.

**Task 5.1 Dunklee Pond Construction** - A portion of this LCBP grant was used to cover the cost of construction and oversight with our engineers for the project including regulatory approvals for any design changes, as-built plans and any required post-project regulatory filings. Two historic documentation plaques were created and placed, one along the sidewalk where the stream runs under the road, and the other in the pocket park. Restoration of the banks and floodplain in the former impoundment was completed through a separate funding source. A pocket park was created that overlooks the site.

A media event was held with the Vermont Agency of Natural Resources Secretary to highlight the Dunklee removal. The reduction in flood risk to the surrounding community, who had been evacuated several times due to the poor condition of the dam, was highlighted along with the public education and access, and ecological restoration benefits.



Volunteers plant trees at the Dunklee Pond restoration.



Historic documentation of the Dunklee Dam overlooks the former dam site.

**Task 6.1 Reporting** - This document serves as the Final Report. Quarterly reports have been submitted at the end of each calendar quarter.

### 3. Methodology

While each dam removal project has its own unique aspects, the project methodology is consistent beginning with selecting dams for removal using the VT Dam screening tool, followed by landowner education, obtaining landowner/stakeholder engagement and support, engineering feasibility and design including assessment of watershed change and ecosystem benefits, dam removal permitting, and finally dam deconstruction and removal, and follow-up monitoring. This tried-and-true framework has been used for most of the successful dam removal projects that have been completed in Vermont in the last 23 years.

### 4. Quality Assurance Tasks Completed

Not applicable.

### 5. Deliverables Completed

**Deliverable 1.1 Pelletier Dam Removed** - Pelletier Dam was fully removed in September of 2022 and as built designs were completed. The historic documentation sign is currently in production.

**Deliverable 1.2 Pelletier Dam Restoration** - An initial planting was completed in October of 2022. The site will continue to be monitored throughout the new year as the channel adjusts. A spring planting is expected to account for changes in the channel and tree mortality. The invasive population of Japanese Knotweed continues to be monitored and plantings are placed to contain it.

**Deliverable 2.1 Camp Wihakowi Dam Removed** - Camp Wihakowi Dam was removed, as built plans were completed and historic documentation was completed in October of 2020. The project started in 2018.

**Deliverable 2.2 Camp Wihakowi Dam Restoration** - Plantings at the Camp Wihakowi site were completed in June of 2021.

**Deliverable 3.1 Cross Brothers Design, Documents, Permits** - Cross Brothers Dam concept design is complete. Once funding is secured the project will move forward.

**Deliverable 4.1 Johnsons Mill Design, Documents, Permits** - Design plans and report, SHPO documents, and permits were all completed for the Johnsons Mill Dam removal in November of 2020. The project successfully completed with the removal of the dam in 2021 through a separate grant.

**Deliverable 5.1 Dunklee Pond Dam Removal** - Dunklee Dam removal, as built plans and historic documentation was completed in October 2021.

## 6. Conclusions

Human development in the form of impervious surface, artificial barriers, and stormwater runoff are perhaps the biggest root causes of degradation along Vermont's waterways. The removal of these dams has so far reconnected approximately 76 miles of rivers to a free-flowing stream and helps mitigate water quality impacts associated with stormwater runoff, and septic overflow. The removal of the dam allows the natural sediment supply chain to contribute to improved channel evolution, increased dissolved oxygen, and cooler temperatures for native Brook Trout and other aquatic habitat populations.

Four of the dams highlighted in this grant have now been removed, Johnsons Mill Dam on the Bogue Branch in Bakersfield, Camp Wihakowi in Northfield, Dunklee Pond Dam in Rutland, and Pelletier Dam in Castleton. Cross Brothers is actively, if slowly, moving forward. The direct ecosystem service benefit of derelict dam removal at the Camp Wihakowi dam site is apparent as fish and other aquatic species are now observed moving up and down the new reconnected river segments. The removal has restored aquatic habitat, river and stream connectivity, and natural riverine processes. The removal of Dunklee Dam has lowered flood threats to the community built around the dam, increasing people's safety and protecting their property. Removing the Pelletier Dam alone reconnected 37 miles of river and restored two acres of floodplain, opening renewed passages for fish and other aquatic species, improving the flood resiliency of the area, and recreating a well vegetated riparian area for wildlife.

As project development, all of the dams progressed local watershed groups including Friends of the Winooski River, Winooski Natural Resources Conservation District, Franklin County Natural Resources Conservation District, the Poultney Mettowee Natural Resources Conservation District, Vermont River Conservancy, and The Nature Conservancy were involved with every



step of the process. VNRC's partnership with these organizations have allowed the projects to progress with the needed support, technical oversight, collaborative work ethic and capacity to get the job done.

All of these projects were identified and targeted due to the dilapidated dam infrastructure and the direct hazard that infrastructure presents to people and downstream communities. The removal of these dams mitigates the risk of dam failure, flooding, and general public safety as well as directly improves public access for recreation and fishing opportunities. In the case of Camp Wihakowi Dam, a public access easement was formalized and the State-owned Pelletier Dam removal now has improved public parking and an easy recreational access for this public resource.

### **Lessons learned**

Removing dams is a dynamic process and each project provides a multitude of learning opportunities for practitioners. Through the implementation of these projects, the biggest lesson we learned was that being physically present in the active removal work makes a big impact. The more you are engaged in the project and can physically visit the site to communicate with contractors and coordinate work efforts with engineers, landowners, public passers-by and regulators, the stronger the project is going to be and the more confident you are in addressing and modifying plans as changes arise.

### **Future work is ongoing**

Future dam removal work by VNRC is ongoing, as a convening organization for dam removal in Vermont we continue to engage with dam owners and the public regarding the ecological benefits of river reconnection and dam removal, thereby identifying future potential projects within the Basin and managing others from start to finish. We look forward to continuing our work on dam removal for the years ahead.

## **7. References**

Not Applicable.

## **8. Appendices**

A1: Camp Wihakowi dam removal final plans

A2: MOA between Friends of Winooski River and Camp Wihakowi dam owners

A3: Camp Wihakowi dam removal archeological resources assessment report

A4: Camp Wihakowi dam removal media alert

B1: Cross Brothers dam Historic resource review and archeological resources assessment

B2: Cross Brothers dam dam safety approval

B3: Cross Brothers dam preliminary engineering report

C1: Dunklee dam Rutland City Conditional Use Approval

C2: Dunklee dam Army Corps Compliance Certification Form

C3: Dunklee dam Army Corps Compliance Certification Form signed

C4: Dunklee dam floodway no-rise/no impact certification

C5: MOA between army corps of engineers, state historic office, and VNRC

C6: Dunklee dam Army Corps permit

C7: Dunklee stream alteration permit  
C8: Dunklee Dam removal press release  
C9: Dunklee Dam construction begins press release  
C10: Dunklee Dam removal media advisory  
C11: Dunklee tree planting volunteer outreach  
D1: Johnsons Mill Dam final dam removal plans  
D2: Johnsons Mill Dam ANR approval to alter a dam  
E1: Pelletier Dam stream alteration permit  
E2: Pelletier Dam ANR approval to alter a dam  
E3: Pelletier Dam removal dam safety approval  
E4: Pelletier dam removal historic documentation package  
E5: Pelletier dam highway department notice of approval  
E6: Pelletier dam army corps permit  
E7: Pelletier dam ANR authorization to discharge, notice of authorization, and notice of addition of co-permittee  
E8: Pelletier dam notice and instructions to bidders  
E9: Pelletier dam ANR Authorization under the Flood Hazard Area & River Corridor General Permit  
E10: Pelletier dam construction begins press release  
E11: Pelletier dam removal press release  
F1: Dam removal photos