

Vermont Dam Removal Questions & Answers

PURPOSE

Quickly develop a customized Q&A document for direct outreach to dam owners, municipal officials and other interested parties. Use this slide deck to select the most relevant questions to your specific audiences, as well as add in contact information and logos of your organization.

ACKNOWLEDGEMENTS

The Vermont Dam Removal Q&A is an effort of the Vermont Scaling up Dam Removal Initiative in partnership with the Vermont Dams Task Force, both voluntary partnerships of environmental nonprofits, local commissions, Natural Resource Conservation Districts, and state and federal agency staff.

This work is a compilation of content from existing sources, including the FAQs in the 2009 Vermont Dam Removal Guide and the Vermont Natural Resources Council's educational brochure Let Them Flow Wild and Free. Additional material was developed by the Scaling up Dam Removal Initiative.

How to Use the Q&A Slides

Personalize each slide with your organization's logo and contact information

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How to Use the Q&A Slides

Customize the list of questions

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INFORMATION ABOUT DAMS AND VT DAMS

- How many dams are there in Vermont and who owns them?
- What was the original purpose of dams in Vermont?
- Do dams help control flooding during storms?
- Why aren't more dams used to generate power?
- Are these old dams really a safety hazard?
- Have there ever been dam failures in Vermont?

DAM REMOVAL WHYs

- Why should dam owners consider removing their dams?
- <u>Will dam removal cost me, the owner or</u> <u>municipality, anything?</u>
- What would my involvement as the dam owner be like in the removal process?
- <u>What will the restored river look like after</u> dam removal?
- <u>Will there be an increase in flooding during</u> <u>the removal or after?</u>
- <u>Can the dam be used for hydropower</u> production instead of being removed?
- Is the goal to remove all dams in VT?

DAM REMOVAL HOWs

- How are dams removed?
- What if the owner just breaches the dam?
- Who will own the exposed land?
- What about property values?
- <u>Is dam history a consideration?</u>
- How much does it cost to remove a dam?
- Is there money available to help remove the dam?
- <u>Cost of dam repair or replacement vs.</u> <u>dam removal?</u>
- How long will it take the impoundment to revegetate?
- What happens to the fish and wildlife that were in the impoundment?
- What about all the sediment behind the dam?
- Will there be wetland impacts?

COMMUNITY CONCERNS

- <u>Can you remove a dam that is used for</u> <u>fire suppression?</u>
- What about the current benefits of the dam and impoundment?
- <u>Won't the river go away leaving a mud pit</u> for mosquitos?
- <u>It's been like this for decades. Why can't</u> we leave it?
- How does dam removal impact my flood insurance?



Vermont Dam Removal Q&A INFORMATION ABOUT DAMS AND VT DAMS

How many dams are there in Vermont and who owns them?

- Vermont has over 1,100 dams based on estimates from the Vermont Department of Environmental Conservation and the American Society of Civil Engineers. There are indications that many more are not accounted for in these inventories.
- Most dams are privately owned, some by commercial entities like electric companies, ski resorts, or other organizations, and many are owned by individuals.
- A smaller number of dams are publicly owned by the State of Vermont or municipalities, and a few are owned by the federal government.

Prepared by The Nature Conservancy in partnership with the VT Dam Task Force.









What was the original purpose of dams in Vermont?

- Most of Vermont's dams were built many decades to over a hundred years ago for a variety of reasons including power for mills, water supply, livestock, or recreation.
- As the water-driven mill industries and water supply systems that fueled the colonial growth across New England were abandoned for more efficient technologies, many of these legacy dams no longer serve their original purpose and have fallen into disrepair.
- These dams, or dam remnants, remain in rivers or streams, disrupting natural stream processes, creating public safety and environmental hazards, and no longer providing hydro-power or flood control.

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Do dams help control flooding during storms?

- Very few dams in Vermont were built for flood control; to store water during floods and release the water over time, after the flood peak had passed and protect our historic river-side towns.
- Most other dams in VT are "run-of-river" dams, which are designed to have a constant flow over the spillway, and essentially have "full" impoundments with very limited ability to store water during a flood.
- All dams raise flood elevations upstream relative to the predammed condition and may actually increase flooding upstream.
- By far a greater risk for public safety is the failure of a poorly maintained dam that can cause catastrophic downstream flooding.

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Why aren't more Vermont dams used to generate power?

- Most of the economically viable sites for hydroelectric power have already been developed. Hydroelectric dams are regulated by the federal government and require extensive permitting to ensure they meet federal energy and Clean Water Act requirements.
- While hydropower is often discussed as a green solution to energy and climate issues, the economic and ecological costs of altering river flows and severing fish and aquatic species migration routes should be considered in these discussions. Fish, reptiles, and amphibians depend on rivers as critical pathways throughout their life cycle and also need to move within river systems to find refuge during droughts or floods.
- Dams fundamentally limit the ability of a river to provide critical ecosystem services to both human and natural communities that depend on them. Removing unnecessary dams is part of the climate solution for these species.

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Are these old dams really a safety hazard?

- Yes, they often are. A 2021 report by the Vermont Section of the American Society of Civil Engineers noted that 31 percent of the dams inspected by the State of Vermont were in poor condition – meaning they have a high probability of failure. Many of these dams are also classified as having high or significant hazard potential, meaning that if they were to fail, economic losses and losses of life could be expected.
- It's important to note that only the larger dams are required to be inspected regularly. Many of the smaller dams across Vermont landscape have never had a condition or hazard assessment, and the failure risk is unknown. As dam condition only degrades over time and storm events are increasing, many of the obsolete dams built decades to over a hundred years ago warrant consideration for removal or repair.

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Have there ever been dam failures in Vermont?

- Yes. There have been about 16 known dam failures in Vermont in the past 50 years, and likely many more unknown failures in the more distant past.
- A notable example is the 1947 east Pittsford dam failure on East Creek in Chittenden that caused extensive damage all the way downstream to Rutland. About 300 homes and businesses were damaged; roads and rail lines were closed for several days; and 500 families were displaced during the event. Estimated damages were in the millions in 1947 dollars and the U.S. Army had to be deployed to help with the recovery.
- As more of the Vermont dams age without proper maintenance and extreme rainfall events become more frequent, the likelihood of more failures increases.

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DAM REMOVAL WHYs

Why should dam owners consider removing their dams?

- Dam maintenance is the responsibility of the owner and dams impact river health and public safety. Due to Vermont's Dam Safety Act (State Statute 10 V.S.A. Chapter 43), dam owners can be held responsible for any loss of life or property damage resulting from dam failure or improper operation.
- Removal of the dam is often less expensive than repair and relieves an owner of any legal and financial liability around the dam or the need to maintain and inspect the site.
- In addition to eliminating a safety hazard for the public, dam removal improves water quality, restores river habitat for fish and wildlife, and reduces water temperatures in the face of a warming climate.
- As these benefits and the impacts of dams have become better understood, many dam owners are choosing to remove their dam.

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DAM REMOVAL WHYs

Will dam removal cost me, the owner or municipality, anything?

- Dam removal is a one-time cost that will vary by project. The dam and impoundment size and condition, and potential impacts to surrounding infrastructure play into the complexity of the project, which can affect costs to complete a removal.
- Projects can often be completed using grant funds at limited costs to the owner. The ecological and social benefits of these projects mean that many federal and state grants can be combined and leveraged.
- A typical dam removal is a highly collaborative effort among engineering firms, non-profit conservation groups, and state and federal agencies who will raise the funds necessary to complete the project from design through construction.

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DAM REMOVAL WHYs

What would my involvement as the dam owner be like in the removal process?

- Dam owners ultimately decide whether a project should proceed and can be involved to varying degrees throughout to ensure the project meets their expectations. Each project can be different in how it is managed and coordinated to meet dam owner needs.
- Often the engineering and construction processes are managed by an NGO or state agency and owners do not need to be directly involved in the contracting. Dam owners may need to sign permits or access agreements acknowledging permission to complete the work.
- Liability during the construction process is addressed and paid through the contractor's insurance which names the owner as additionally insured.
- Long-term maintenance of the site is typically minimal and following a set period with partners to monitor the site there are no additional requirements from the landowner.

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DAM REMOVAL WHYs

What will the restored river look like after dam removal?

- The river channel that re-forms or is actively restored after a dam is removed will be a similar size and shape as the river upstream and downstream of the former impoundment. Often the original river channel still exists under the impoundment and project designers take great care to ensure the restored section is contiguous with the existing river channel.
- Many dams were built on natural ledges or swifter flowing sections, which will be exposed after removal restoring the sound of the water. Removal of dams that were built to increase the water level in a natural lake or pond will have less effect on the surface area or volume of the water body. And project sites will revegetate and establish a natural river channel.
- Changes to the landscape will depend on the size of the dam, its purpose and the size and shape of the impoundment. Renderings showing what the restored river channel will look like under different removal scenarios can be developed to help the community understand the outcomes and make decisions about removal options.

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DAM REMOVAL WHYs

Will there be an increase in flooding during the removal or after?

- Dam removal is a carefully managed process that will not result in a sudden release of water or flooding to downstream land.
 Flooding after the removal is also unlikely as a result of a removal.
- Only a small percentage of dams provide flood control benefits, and those dams were expressly built for that purpose. Most dams do not significantly affect or control downstream flooding and therefore their removal will not cause a significant change in flooding downstream.
- In some cases, dam removal will actually decrease flooding upstream of the dam because it lowers the water level and can eliminate a hazard by removing the potential for a catastrophic breach of the structure.

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DAM REMOVAL WHYs

Can the dam be used for hydropower production instead of being removed?

- Retrofitting existing small dams to generate electricity is usually not economical. The vast majority of good sites for hydropower development in the state were developed decades ago, and the sites that remain are hampered by limited generating capacity and the cost of development, operation, and maintenance.
- Even with the available incentives to develop renewable energy sources, the economics of many dam sites remain marginal. The cost of repairs to an existing dam, upgrades to meet current environmental and safety standards, installation of new generation infrastructure, and funding operations & maintenance overhead make hydro-power development on existing dams cost prohibitive.
- In most cases, the community, public safety, economic and ecological improvements of removing the dam outweigh the societal benefits provided by the relatively small amount of renewable energy.

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DAM REMOVAL WHYs

Is the goal to remove all dams in VT?

- No. Many dams in Vermont serve an active public purpose and are being managed and maintained to state dam safety standards.
- Dams that produce hydropower are regulated by the Federal Energy Regulatory Commission (FERC), and many active water supply and recreational dams are well maintained.
- Dam removal advocates largely focus on the hundreds of dams in Vermont that no longer serve a useful purpose. Most of these dams are well past their service life, in deteriorating condition and are no longer maintained. These derelict dams continue to disrupt natural stream processes, block aquatic organism passage and movement of gravel and cobble and create liability and safety hazards.
- Dam owners decide how to manage their property, and advocates work with dam owners who are interested in removal.

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DAM REMOVAL HOWs

How are dams removed?

- Dam removals are carefully engineered and managed to limit impacts to the river and surrounding area.
- Engineers consider the surrounding context of the river and human community, including the amount of water and sediment behind the dam, the adjacent roads, homes, and other infrastructure, and how the species and ecology of the river could be impacted.
- Heavy construction equipment is typically used to take the dam apart in sections to allow the water behind the dam to drain slowly and minimize erosion and sedimentation impacts in the adject areas.
- Dam removals require multiple state or federal permits. Sites are typically monitored for a time following removal to ensure the design meets the project standards and goals.

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What if the owner just breaches the dam?

- Removing part of the dam without carefully managing the impacts could create a safety hazard with negative consequences to adjacent infrastructure and the ecosystem. Rapidly removing the pressure from impounded water on the dam structure without appropriate planning and mitigation actions can result in catastrophic failure. Even a partially breached dam can be a liability. Open gates can clog with debris and water can re-impound behind the structure creating an unstable habitat and safety concerns. Breached structures can also continue to be passage barriers to fish, especially at low flows, and do not allow for full river restoration above the dam.
- A dam owner may be required by the Dam Safety Program to reduce the water height for safety reasons. The option to fully remove the vertical extent of the structure and restore the channel and its banks to a natural system is the best solution to ensure public safety and remove owner liability. Citizens should encourage dam owners to proactively deal with their dams before emergency situations arise so that the community has a chance to participate in the design process and ensure the project meets necessary permit requirements.

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DAM REMOVAL HOWs

Who will own the exposed land?

- Land ownership following dam removal will vary at each site typically based on the deed and title of the property. In some cases, land is owned to the centerline of the river.
- Sorting out property ownership for older former mill properties, however, can be a complex task. Deeds and titles for the specific dam and/or legislative acts that provide for creating reservoirs will often show who owns the impoundment and the land under the water.
- Ownership and access rights to the newly exposed land will be determined for each case and communicated with landowners well before any demolition commences.

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What about property values?

- Removing a dam will lower the water levels upstream, which can be challenging to conceptualize when we are used to an impoundment. While the loss of one type of recreational and scenic resource may decrease value to some, to others this change is balanced by the restored river, improved water quality, and added open space that increases the value of the site.
- Several studies of sites before and after dam removal suggest that property values may actually increase in the long-term following dam removal. Removal of a dam structure may also decrease tax liability for a dam owner.
- Perceptions around the value of the pond may no longer be accurate, if the impoundment has filled with sediment or has water quality problems.

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DAM REMOVAL HOWs

Is dam history a consideration?

- Some of the over 1,100 dams in Vermont are associated with early colonial and industrial mills that were abundant across New England. Though the legacy of indigenous people's use of the river predates all dams, community members often feel an attachment to dams for their colonial historic and cultural significance.
- Impacts to the full history of sites are considered during the design and permitting phase. When appropriate, dam history can be acknowledged through interpretive signage and preservation of associated mill buildings or a leaving a component of the dam.

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DAM REMOVAL HOWs

How much does it cost to remove a dam?

- Costs vary significantly depending on the size and location of the dam and managing impacts to adjacent infrastructure and the impounded sediment.
- For most small dam removals, the project cost is in the range of \$100,000 to \$500,000. Dam removal projects with more complex issues, such as road and bridge impacts or large volumes of sediment that need to be managed, will cost more to remove.
- Balancing these costs against the repair and upkeep budget required to maintain a dam to modern safety standards usually weighs in favor of removal for a typical site.

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DAM REMOVAL HOWs

Is there money available to help remove the dam?

- Yes! There are many grants available for dam removal.
 Depending on the issues and benefits at each site, grants are available to improve safety, water quality, river habitat, and specific fish and wildlife.
- Most projects will leverage several grants targeted at site-specific benefits of removal. For example, a failing dam directly upstream of a village center might target funding for flood resilience and improved safety, whereas a dam on a high-quality brook trout stream would focus on fish habitat and water quality grants.
- Many of the grants are federal or state funds, although private foundations sometimes fund removal and restoration.
- Free flowing rivers provide many benefits to public health and safety, so there are many parties interested in funding projects that restore the myriad functions and services that rivers provide to human and natural communities.

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DAM REMOVAL HOWs

Cost of dam repair or replacement vs. dam removal?

- In most cases the cost to remove a dam is often less expensive than repair or replacement. Dam removal is a one-time cost with lasting benefits and can often be funded through government grants to benefit fish and wildlife, improve water quality and climate resilience.
- Repair is a capital cost that must be budgeted for over time, and the initial repair bills can be extremely expensive. Many dams that were built under different building codes would need significant upgrades to the dam and adjacent structures in order to meet modern safety standards.
- Even after repair, a dam must be maintained in perpetuity. Check with the Vermont Dam Safety program for more information about maintenance and inspection requirements.

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DAM REMOVAL HOWs

How long will it take for the impoundment to revegetate?

- Land exposed after a dam removal in New England typically revegetates quickly. Depending on the time of year, revegetation of the sediment behind a dam begins within weeks of dewatering. The newly exposed sediment is usually high in plant nutrients and often has a dormant seed bank that quickly sprouts when exposed to sunlight.
- Depending on project goals the exposed land behind a dam can also be seeded with desirable species to improve the rate of vegetation regrowth and ensure better habitat for particular species, such as birds, butterflies, or pollinating insects.

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Vermont Dam Removal Q&A DAM REMOVAL HOWs

What happens to the fish and wildlife that were in the impoundment?

- Dams create artificial habitat by impounding water and altering river function. Impoundments trap sediment and create stagnant conditions with warmer water than the rest of the river system. While the habitat will certainly change when a dam is removed, rivers typically provide more habitat variety for a greater number of species and impacts to fish and wildlife can be managed during the removal process.
- Dam removal is timed during the year to limit impacts to species. And dam impoundment can be lowered slowly, allowing animals to move to appropriate habitat. When necessary, threatened species can also be individually captured and relocated to a safe area of the river. When the area is restored to a flowing river and the habitat changes, species will move to find suitable habitat.
- Generally, much of the wildlife that uses an impoundment such as birds and turtles will quickly adapt to restored river conditions. Fish will be able to move upstream and make use of the full river for their life cycle. The restored river may also help bring back cold-water fisheries such as trout and will allow anadromous fish such as Atlantic salmon to use the river for spawning.

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DAM REMOVAL HOWs

What about all the sediment behind the dam?

- Managing sediment at a project is carefully engineered and reviewed through the state and federal permitting process that requires an assessment of the quantity and the quality of sediment behind a dam. Based on these assessments and surrounding conditions, the sediment may be treated by dredging and removal, passive release downstream, stabilization with through revegetation or a combination of all these mitigations.
- Erosion of the channel and release of sediment may occur up and downstream of the former structure, but the impacts below the dam are generally temporary and the river quickly readjusts to its new configuration.
 Release of some sediment can be beneficial to rebuilding cobble bars and spawning gravel for habitat. If necessary, bioengineering and stream channel reconstruction can help stabilize sediments.
- If the sediment is contaminated from past industrial use or spills, detailed plans will be developed with environmental agencies and the landowner for removal and disposal or capping on site. Managing sediment at a project is carefully reviewed through the state and federal permitting process.

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Will there be wetland impacts?

- The wetland habitat behind a dam will change when the dam is removed. Depending on the surrounding topography, deep water marsh may become shallow marsh or wet meadow. Habitats such as red maple swamp may return. Rivers are also wetlands, and riparian areas have important habitat functions.
- While the total wetland area may change, the function of the natural ecosystem including the wetland and river will be restored. Usually, wetlands above a dam are not self-sustaining (they are sustained by a human-made structure that must be maintained) and will gradually fill with sediment over time.
- Potential changes to wetlands will be assessed during project design and permitting, and mitigation actions may be required by the permitting agency if substantial impacts are found.

Prepared by The Nature Conservancy in partnership with the VT Dam Task Force.









DAM REMOVAL HOWs

Can you remove a dam that is used for fire suppression?

- Dams sometimes create impoundments developed to be used for fire suppression by the dam owner or local municipality. In these instances, alternative methods of fire suppression can be developed.
- Most alternatives involve the construction of a dry hydrant, which allows firefighters to pump water from the stream/river into the fire truck. Often the newly developed dry hydrant provides a better fire suppression alternative than the impoundment behind the dam.
- Dam removal should not be in conflict with public safety and designing and funding replacement of fire control systems is a common aspect of dam removal projects.

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What about the current benefits of the dam and impoundment?

- Many dams have community benefits that go beyond their original purpose, and the impoundments they create are valued community skating, swimming, and boating areas. Though the dam itself may not function as intended and cause safety concerns, the recreational value often weighs against removal.
- Engage community members early on to understand their concerns of what might be lost with removal, answer misconceptions, and look for ways to integrate solutions and new opportunities to connect with the river during the design process.
- For instance, if the dam is part of a community park, consider building new trails and seating for viewing the changing river. Integrate access for swimming, fishing, or boating into channel restoration plans. Capture the history of the site through interpretive signage and historical documentation at the site or in the local historical society.

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COMMUNITY CONCERNS

Won't the river go away, leaving a mud pit for mosquitos?

- Dams flooded the natural upstream river channel when they were built, and once water levels are returned to normal following a dam removal, the river will return to its pre dammed condition.
- To understand what the restored river will look like, it is helpful to look for a flowing section of the river up and downstream of the dam and impoundment. The water surface of the restored river will likely be smaller than the impoundment, but the river will not disappear. And the drained impoundment will likely initially appear muddy while the river finds its original channel and the banks and adjacent land revegetates. This is a temporary impact, and within a growing season or two it can be difficult to even tell that an impoundment existed.
- A flowing river provides better habitat for fish that eat biting insects than for breeding mosquitos. Standing on a restored dam site you're more likely to see brook trout surfacing for mayflies than you are to be fighting a cloud of mosquitoes or blackflies.

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COMMUNITY CONCERNS

It's been like this for decades – why can't we leave it?

- Understandably, we are used to seeing the dam and impoundment as a permanent fixture on our landscape. Ponds formed by dams are not natural or historical, however, as the river was free flowing for thousands of years prior to dam construction.
- Dams create barriers to fish and wildlife movement and impact the river ecosystem.
- Without active dredging, dam impoundments rapidly fill with sediment increasing pressure on the dam itself, creating safety concerns that are expensive to address and require long term funding to manage.
- When dams no longer serve their original purpose, and the impacts to river ecology and public safety outweigh the benefits, it is in our best interests to remove these structures to ensure public safety and to benefit the environment.

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How does dam removal impact my flood insurance?

- High-risk flood areas and the impacts of dam removal on these areas are evaluated on a case-by-case basis. Homes and businesses in high-risk flood areas with mortgages from government backed lenders are required to purchase flood insurance.
- Removal of an adjacent dam may lower the flood stage of the stream/river, thus eliminating the need for flood insurance.

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