

Foreword:

The Massachusetts Department of Dam Safety has designated the Bartlett Pond Dam, located off of Route 117 in the town of Lancaster, in critical need of repair, replacement or removal. The effects of bank erosion on the eastern abutment of the main spillway and general decay of the emergency spillway have increased significantly over the last few years. If the dam were to breach during a storm event the culvert under Rt. 117 would be damaged and there would be substantial downstream flooding and erosion.



Pare Engineering of Foxboro, Ma. submitted a Phase II Inspection/Evaluation report to the Town that confirms the structural problems with the dam. They also have identified significant seepage beneath the actual dam structure. Pare has prepared cost estimates, accrued over twenty five years, of three options available to keep the dam in compliance with dam safety standards. Simple repair, though cheaper in the short term is cost prohibitive over time. (1)

The two remaining options, replacement or removal would require significant portions of the existing structure be demolished to the foundations. The pond would have to be drained and the existing dam removed in either case. This is necessary because of the extensive degradation of existing structures and current dam building standards. The essential question therefore is “should the dam be replaced?” (1,2)

Framing the Debate

It is easy to view Bartlett Pond and the dam as a single entity. The area is overseen by the Lancaster Conservation Commission and has been dedicated as a memorial to Bob Frommer, a founder and past Chairman of the Commission. At the western gateway to the town it is a popular spot to picnic or get a hotdog and a bit of wisdom from “Murph”. Historically there was a furniture factory on site and the water driven turbine is still in place. It has existed as a pond in the recollections of everyone alive today.

In a broader ecological sense Bartlett Pond is part of the Wekepeke Brook Watershed. What ever occurs upstream of the dam, both on land and in the water, directly impact the pond. Likewise what happens in the pond directly affects conditions below the dam. Everything within a watershed is



interrelated and constantly changing. When considering the fate of the Bartlett Pond Dam it is more appropriate and necessary to consider the welfare of the entire watershed rather than just the pond.

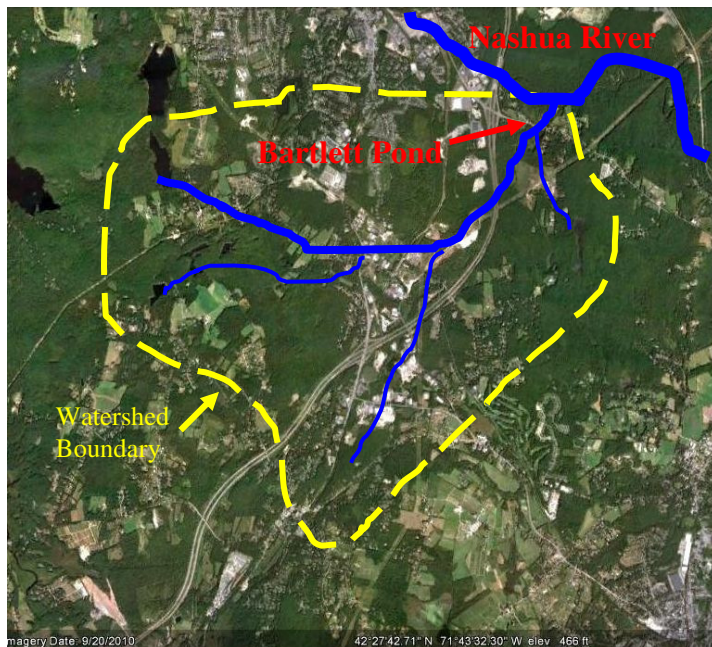
The Role of the Conservation Commission

The primary function of the Conservation Commission is to approve plans, assure that safeguards are in place, issue permits and provide project oversight in accordance with the Massachusetts Wetlands Protection Act and the Department of Environmental Protection (DEP) performance standards. The Commission is also charged with applying local wetland protection by-laws and promote and protect the interests of the Open Space and Recreation Committee.

Two of the three parcels impacted by decisions pertaining to dam removal are under the custodianship of the Conservation Commission (the third being a town owned parcel). The Town of Lancaster is the actual owner/applicant for all three. The Board of Selectmen has requested the Conservation Commission makes a recommendation regarding which option, removal or replacement is appropriate under the Commission's mandate. Applicants often discuss proposals with the Commission before applications are filed, and the Selectmen's request is not unusual. Final decisions, warrants and filings will be the Select Board's decision and the voters of Lancaster will vote on removal or replacement. The Conservation Commission will act accordingly on the filings submitted.

The Wekepeke Watershed

The Wekepeke Brook Watershed is a sub basin of the Nashua River Watershed. Its headwaters lay in the Towns of Leominster and Sterling. It flows north for a distance of approximately six miles into the Town of Lancaster and discharges into the Nashua River about ¼ mile downstream of the Bartlett Pond Dam.



Of its 11.5 square miles of area, about 20% are permanently protected, 67% is forested and about 8% are residential. Interstate 190 bisects the watershed from around Exit 5 in Sterling to Exit 7 (Route 117) in Lancaster. There are over 18 miles of stream frontage in the main stem and major tributaries. (6)

A former water supply for the Town of Clinton is located in the upper (southwestern) areas of the watershed. Although these reservoirs are in the towns of Sterling and Leominster the lands are still owned by the Town of Clinton. Included within the water supply area are four impoundments (ponds and dams) on tributaries that feed the mainstem Wekepeke Brook. Associated channels, pipes and pump houses in disrepair remain throughout the system.

Since Clinton has received its water from the Wachusett Reservoir since the 1960's, its structures in the Wekepeke supply system have been abandoned and are in poor condition.

One obvious aspect of the Watershed, particularly when viewed from Route 190 is the abundance of sand and gravel operations. These materials are remnants of Glacial Lake Wekepeke that covered the area about 15,000 years ago. Because of these deposits in Sterling and Lancaster a significant amount of the water that flows out of the upper basins enter the underground aquifer rather than flowing on the surface. Nestle Corp recently commissioned the Rushing Rivers Institute to investigate the potential of bottling this water from wells in a way that wouldn't adversely impact the Wekepeke watershed. Although Nestle has decided not to go ahead with commercial operations at this time, the study offers important and credible insight into the ecology and hydrology (water flow) of the Wekepeke Brook watershed. (5)

Surface waters in the middle reaches of the Wekepeke flow unimpeded through primarily forested lands. The water is kept cool and clean by the seepage of ground water back into the brook. About 0.5 miles from where the Wekepeke enters the Nashua River, the mainstem flows into Bartlett Pond. A tributary out of the Blood Town forest also enters the pond here as well. This tributary has historically carried a high contaminant and silt load because it flows directly through agricultural land near the inflow of Wekepeke Brook into the pond.



Sediment sampling done by Pare Engineering did not detect heavy metals or other hazardous substances stored in the sediments of the pond other than a small amount of naturally occurring arsenic. (1)

The biggest ecological threat to Bartlett Pond is the seasonally consistent high levels of Coliform bacteria; low levels of dissolved oxygen (DO) and elevated water temperatures. The Lancaster "Stream Team" of the Nashua River Watershed Association has been sampling the Wekepeke Brook below the dam for over 20 years and maintains a comprehensive data base of water quality indicators. (7)



The high levels of Coliform bacteria and low levels of dissolved oxygen (DO) indicate that animal fecal waste (manure) is getting into the pond. The coliform samples indicate the source to be warm-blooded animals. The low DO's mean organic waste is entering the pond and good microorganisms that break it down are

using up all of the available oxygen (Biological Oxygen Demand, BOD). The elevated water temperatures both speed up the rate at which the oxygen is used and reduces the actual amount of oxygen that the water can hold.

These three factors working together result in conditions that severely degrade the water quality in and below the pond. As a result, only stress tolerant organisms such as mosquito larvae, caddis flies and creek chubs can survive. Oxygen poor environments are notorious for producing noxious gasses such as sulfur and methane. Microorganisms would be much more capable of breaking down the waste in a cooler flowing environment, reducing offensive odors in a manner similar to how wastewater treatment plants operate.

Bartlett Pond covers nearly 5 acres and has an average depth of about 3.5 feet with the deepest channel being around 6 feet. Base flows through the pond are about 15 cubic feet per



second (cfs), exceeding 100 cfs after storms. (2) Retention time of water entering the pond averages slightly over 24 hours under low flow conditions and a matter of hours at flood stages. In comparison, other ponds in Town such as Spectacle or Fort Ponds would have a complete water change in 5 to 8 years.

Considering Bartlett Ponds' flow rate, flushing rate, depth and surface area it can be concluded that:

- Most sediment entering the pond will have sufficient time to settle out. Sediment depths exceed 4 feet in many places. The pond is rapidly filling in. Flowing water with the sediment removed is much more likely to erode banks downstream.
- Due to the shallow depth, the water can warm up significantly in the summer time. (7)
- Oxygen poor conditions (low DO's) in the pond prevent the breakdown of organic waste and promote the production of noxious gasses.
- Conditions for invasive aquatic plants to take hold are ideal and are currently evident at Bartlett Pond.
- Since the pond flushes out so quickly there is very little chance that it could experience algae blooms.
- Bartlett Pond serves no flood control function due to its shallow depth and water levels can't be regulated. Flooding of the parking area and Route 117 is increasingly common as the pond fills in and its level rises.

Warm water varieties of fish, such as White Suckers and Dace are common in the pond though they average less than a few inches in length. A few hatchery reared "pan sized" Rainbow Trout are occasionally stocked in the spring but will not survive beyond mid-June because of excessively high water temperatures and low oxygen levels.

In October of 2011, the stretch below the dam was surveyed by fisheries biologists from Mass Fish and Wildlife and only warm water varieties of fish were found. This is in sharp contrast to

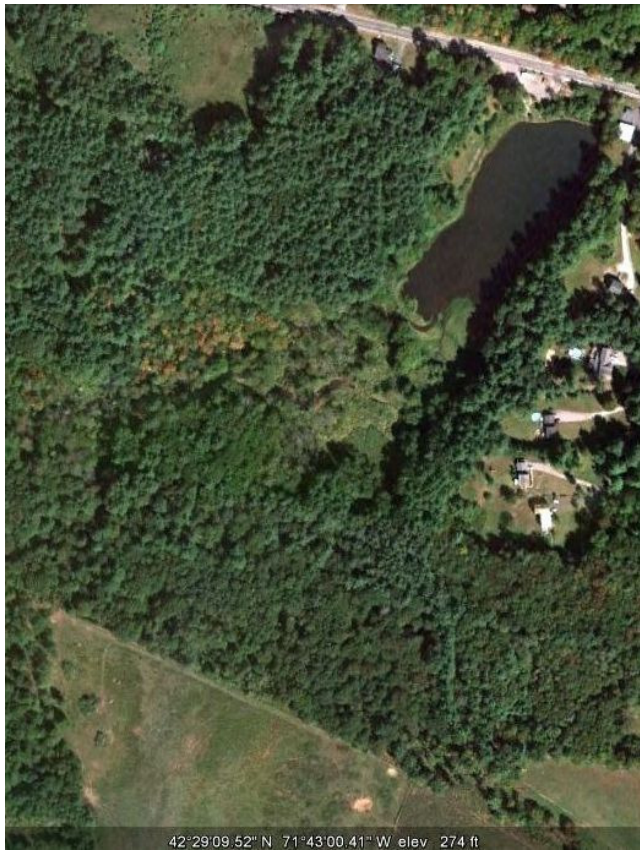
nearly 20 years of data by Fish and Wildlife, augmented by the Rushing Rivers Institute report that show a significant native population of Brook Trout and reproducing stocks of Brown Trout upstream from Bartlett Pond. (2, 3) Trout are indicators of high water quality but can't survive under degraded conditions. Warmer temperatures in Bartlett Pond result in less oxygen and more problems with disease. Suckers, Chubs and Daces are quite tolerant of living and breeding in these conditions. Trout are a highly sought after game fish while these warm water fish are generally of little interest to sportsmen.

Recommendations

Sufficient information has been provided to recommend restoration of the Wekepeke Brook through the Bob Frommer Conservation Area and Bartlett Pond to comply with the Order from the Department of Dam Safety. Although the area as we know it now, will change with the dam removed, several benefits to the ecology, recreation, public safety and the town's financial condition would be realized. These benefits would include the following:

- **Improved Water Quality.** Flowing streams carry more oxygen partly because they stay cooler (cold water holds more oxygen than warm water) and also because they mix more oxygen with moving current. As a result streams cleanse themselves of organic waste because the good microorganisms that assimilate organic and other waste have a healthy environment to thrive in.
- **Fragmented Ecosystems Would be Reconnected.** When populations become isolated as the result of barriers such as dams they become much less able to adapt to changes in the environment. This limits genetic possibilities as gene pools become less diverse.
- **Barriers Restrict Access to Favorable Habitat.** It was observed by the fisheries biologists from Mass Fish and Wildlife that gravel in the streambed below the dam is ideal for trout reproduction but trout would have difficulty surviving due to elevated water temperatures from the outfall of the dam. Also, trout seek out springs and deep pools in the summer time when water temperatures rise. Removing the dam would improve and develop these areas as trout populations move around more as seasonal conditions dictate.
- **Improved Water Quality Favor More Desirable Species.** It is highly probable that a self sustaining cold water trout fishery would become established and expand in the lower Wekepeke Brook.
- **Less Bank Erosion** – Water going over a dam releases a tremendous amount of energy. Since most of the silt settles out in the impoundment above the dam the river scours the banks below to regain its silt load with a lot of energy to do so. A flow through system is much more stable and experiences much less erosion.
- **Reduced Flooding of the Highway and the Parking Area.** Removing the dam would lower the water level at the current location by approximately 6 feet. The volume of the flood plain, where the pond currently exists, would increase significantly and river levels would rise and fall much more slowly. With less flooding, fewer contaminants from the road and parking area would be released back into the river.

- **18 Acres of Town Owned Land Would Become Accessible.** Currently, Bartlett Pond cuts



off access to these parcels without trespassing through private lands. If the Wekepeke Brook were restored a simple bridge would open up 18 additional acres to public use. These lands would be ideal for stream fishing and passive recreation. (see fig.1)

- **There are NO ecological, scientific or financial reasons why the dam should not be removed.** In some cases it is best to leave dams in place so that toxins and nutrients in the sediments are not mobilized or that unwanted species do not gain access upstream of the dam. Information from Pare and the DFW indicate that neither of these conditions exists. Abutter ownership, historical, or other emotional issues often influence the decision of whether to remove a dam or not, but the Town of Lancaster is the owner of the dam and all lands involved in this decision. Since the site would actually be improved in many ways, real

estate values would not be adversely affected on adjoining properties.

- **Low Cost Option.** Although cost estimates made by Pare Engineers and Michael R. Chelminski, P.E. vary substantially, dam removal would cost much less (30% or greater) than replacement. Dam replacement would also incur substantial annual operation and maintenance costs over the life of the dam, usually 50 years.

Conditions favoring dam removal by State and Federal agencies will significantly reduce permitting costs. Pare Engineers estimate that currently permitting alone would cost about \$200,000, about 2/3 of the entire cost of dam removal! With much more simplified procedures soon to take effect, these costs would be reduced to a fraction of this amount. Massachusetts DCR estimates that permitting costs should be no more than \$30,000 and could be done by local employees or volunteers with the help of the DCR staff. Rather than filing seven permits, as is the case now, only one comprehensive permit would need to be filed with the DEP. (4)

In many cases around the country, government agencies such as the National Guard have been mobilized to do actual removals. Considering the presence of the Guard units here in Lancaster it is quite probable that they would become involved if asked.

Many grant sources are available to restore watersheds and dam removal initiatives have become well established. Years ago it was almost unheard of to remove a dam but now stakeholders have realized that it is best for the environment and the most cost effective means of dealing with dam structures that have exceeded their design life. By being one of the first towns to do so in Massachusetts, we would receive priority in obtaining these grants.

Conclusion

Restoring the Wekepeke Brook through the Bob Frommer Conservation Area offers a unique opportunity for enhancing this 28-acre tract of land. It's high visibility and familiarity at the entrance to Town of Lancaster makes it imperative that its public appeal be maintained. The recreational and esthetic values will be enhanced by streambed improvements, increased trout habitat and expanded trails and clearings to improve fishing access and passive recreation.

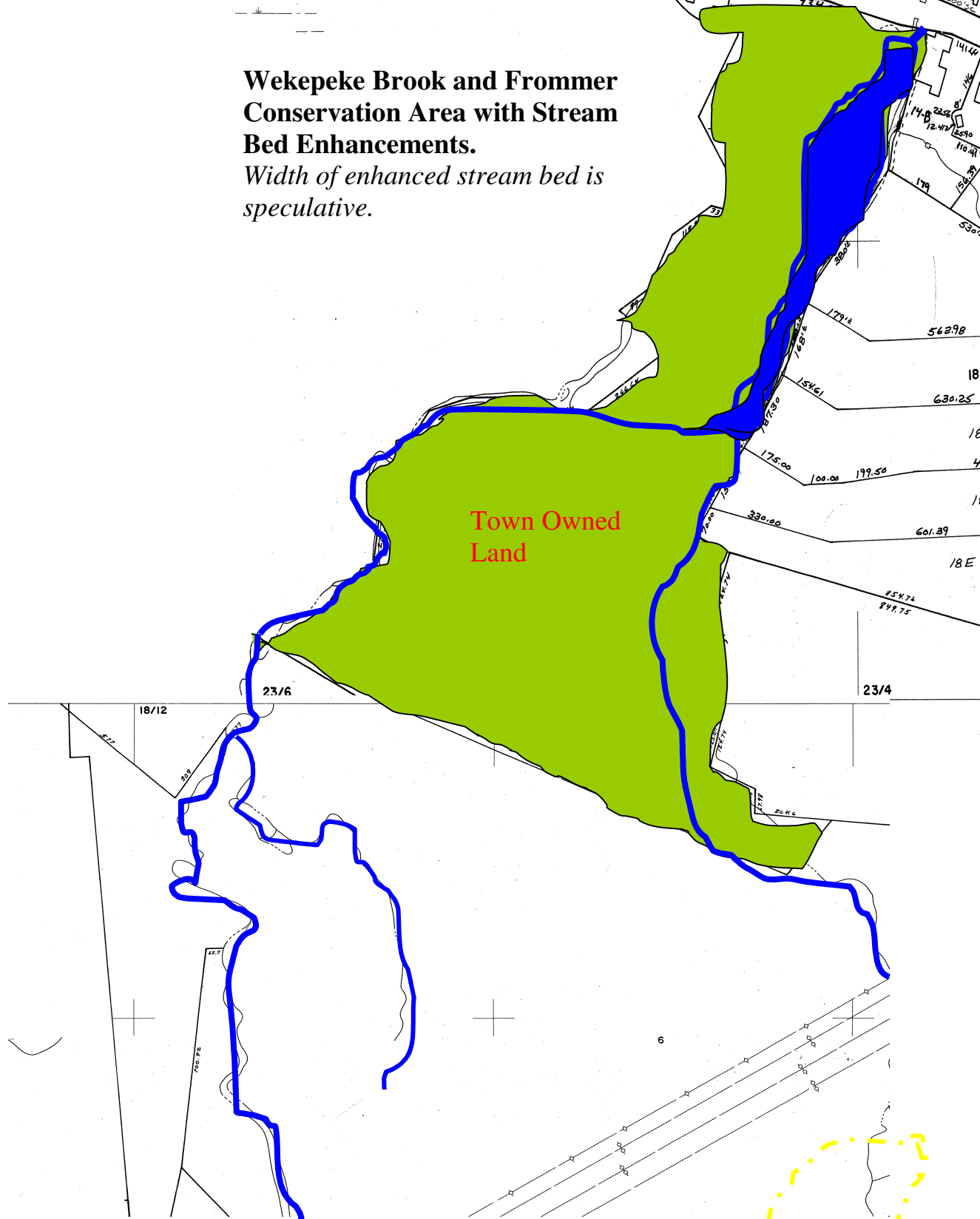
Representatives of Trout Unlimited have expressed interest in submitting applications to their national organization for grants of \$20,000 as well as supplying manpower to enhance sport fishing. Multiple governmental agencies, private organizations and foundations are also available to supply labor, assistance and funds to restore and redevelop this area.

Ultimately, the Wekepeke Watershed would be much healthier with the dam removed and the brook restored.

References:

- 1) March 2011. Phase II Inspection/Evaluation Report. Bartlett Pond Dam, Lancaster, MA. Pare Corporation. Foxboro, MA Pare Project #10177.00.
- 2) June 2011. Draft Site Reconnaissance, Preliminary Evaluation and Option of Probable Cost for Dam Removal. Bartlett Pond Dam, Lancaster, MA. Michael Chelminski, PE. Stantec Consulting Services, Inc. Topsham, ME. Prepared for MA Division of Ecological Restoration. Boston, MA
- 3) 1986 – Present. Wekepeke Brook Stream Surveys, Raw Data, Various Years. Robert Hartley and Mark Brideau.. Massachusetts Department of Fish and Wildlife. Westboro Reginal Office.
- 4) November 2009. Dam Removal in Massachusetts. A Basic Guide for Project Proponents. Version 2.5. American Rivers.
- 5) November 2011. Development of a Mitigation Method and Ecological Impacts for Springwater withdrawals on downstream Habitats for Fish and Invertebrates. Reconnaissance Study on the Wekepeke Brook. Rushing Rivers Institute. Amherst, Ma.
- 6) Nashua River Watershed Association, Wekepeke Brook Sub-Basin http://www.nashuariverwatershed.org/5yr_plan/subbasins/wekepeke.htm
- 7) Nashua River Watershed Association Stream Team Data <http://www.nashuariverwatershed.org/>
- 8) November 2009. Dam Removal in Massachusetts. A Basic Guide for Dam Removal Proponents, Draft Version 2.5. American Rivers Institute/ MA DER.
- 9) February 2002. The Ecology of Dam Removal. American Rivers Institute. Washington, DC.

Width of enhanced stream bed is speculative.



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Bartlett Pond Currently

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