

Dam Safety and Dam Removal in Rhode Island, Analysis and Recommendations

Save The Bay
March, 2010

Introduction

Safety, liability and environmental hazards of aging dams are issues for every community in Rhode Island. Most of the dams in Rhode Island were constructed before 1900 for water supply, industrial mill use, power supply and recreation. This aging infrastructure has costs for cities, towns, the state, and private landowners. Most of these structures do not fulfill their original purpose, but have become a permanent fixture in the landscape. Recreation is an important incidental benefit that communities receive from impoundments while many rely on private dam owners to maintain structures for public use. Dams are also getting a second look as potential hydropower resources. There are many compelling reasons to seek the removal of outdated and unwanted dams, but these must be weighed against the benefits that a dam provides to a community.

While every dam creates a unique situation, there are several factors that make dams harmful to rivers. Dams prevent the migration of fish and other wildlife within a stream system. Anadromous fish, those that migrate from the ocean into rivers to spawn, such as shad, rainbow smelt and river herring, require free and open rivers for the completion of their life cycle and for a nursery for their young. Stagnant river flows disorient migrating fish and can prevent them from reaching ideal spawning habitats, putting their population at risk.

Dams alter flow in the stream and increase water temperatures. They also cause flow alteration by either blocking flow to downstream habitats or by creating powerful surges that erode soil and vegetation and alter natural channel shape. This is often due to manipulation of the dam for power generation or water supply.

Dams alter the flow of nutrients in the stream. Sediment trapped behind dams accumulates toxins such as heavy metals, PCB's and dioxins. Nutrients such as phosphorus and nitrogen accumulate in large quantities in the sediments and cause algae blooms or excessive vegetation growth. Large woody habitat (large branches, logs and other organic matter) is prevented from continuing downstream where it becomes an important source of food and shelter.

Across the state, communities, conservation groups and policy makers are struggling with decisions to repair or remove aging structures. Mill ponds and other impoundments stand as an important reminder of our early colonial history, and provide a strong sense of place and identity to the community. While dams largely serve a



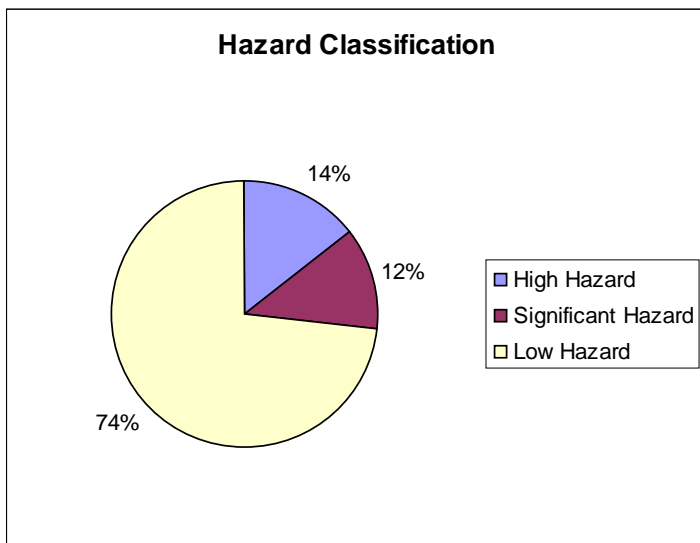
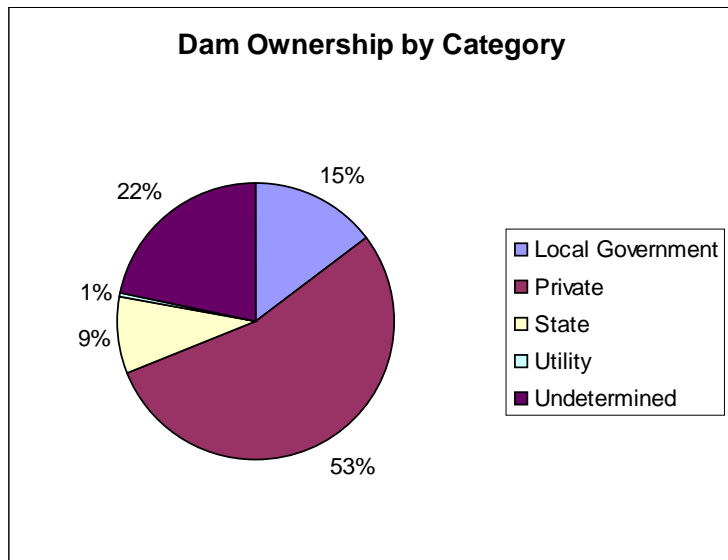
private interest, it is often in conflict with public trust values such as navigation and fish passage. The removal of a dam represents a significant change for a community, and is seen by many as the loss of a resource - a skating pond, a swimming hole and to others as a gain – for the fish which can now migrate freely up the river, and for paddlers who gain unobstructed access.

Rhode Island Dam Safety Program

In Rhode Island, dam owners are responsible for safe operation of their dam, and are liable for any consequences of dam failure, but the Department of Environmental Management has the responsibility to inspect or “cause to be inspected” dams and determine their condition. The director can require an owner to perform a dam inspection using a qualified engineer. DEM must also review and approve plans for construction or substantial alteration of a dam and order an owner to make repairs or take other necessary actions to make a dam safe.

The Rhode Island dam safety database includes 671 regulated dams. All 39 cities and towns have dams in the system. While about half of the dams in the state are known to be privately owned, 22% have undetermined ownership. The total number represents only dams that are under state jurisdiction, many more small dams exist and are not counted or regulated.

Dams under state jurisdiction include low hazard dams that are six feet or more in height or have fifteen acre-feet or more of storage capacity and high hazard and significant hazard dams. An acre foot is a unit of volume equal to 43,560 cubic feet or 325,830 gallons (a measure that would cover one acre to a depth of one foot).



Dam Classification and Inspections

Dams in Rhode Island have the following classifications:

High Hazard Dam: A dam where failure or misoperation will result in a probable loss of human life.

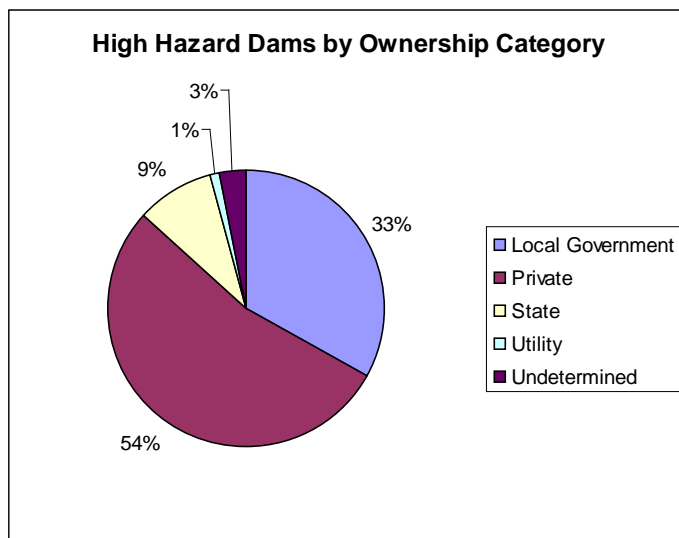
Significant Hazard Dam: A dam where failure or misoperation results in no probable loss of human life but can cause major economic loss, disruption of lifeline facilities or impact other concerns detrimental to the public’s health, safety or welfare. Examples of major economic loss

include but are not limited to washout of a state or federal highway, washout of two or more

municipal roads, loss of vehicular access to residences, (e.g. a dead end road whereby emergency personnel could no longer access residences beyond the washout area) or damage to a few structures.

Low Hazard Dam: A dam where failure or misoperation results in no probable loss of human life and low economic losses.

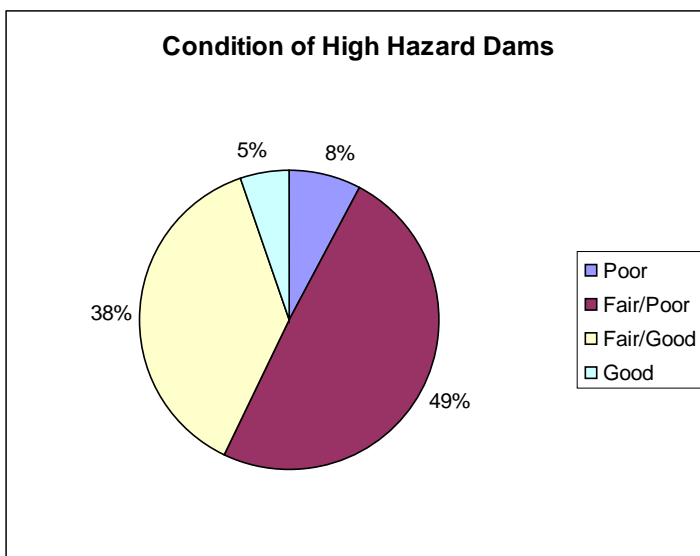
Visual dam inspections are required every two years for high hazard dams and every five for significant hazard dams. Low hazard dams are inspected by DEM every five years to determine whether downstream conditions have changed enough to warrant raising the hazard classification.



Of the 97 high hazard dams in Rhode Island, 52 are privately owned, 32 are municipally owned and only 3 do not have an ownership classification.

Visual inspections are also conducted at dams that are believed to be unsafe, or where requested by members of the community. Inspections may be performed by DEM or by a dam owner’s engineer. While DEM may require an owner to inspect his or her dam, the state’s dam safety engineer or contractor generally conducts visual inspections and verifications of hazard classification. DEM has one dam

safety engineer for all the dams in the state. Between 2004 and 2007, only 6 high hazard dam inspections were completed. In 2007, 12 dams were inspected by request of concerned citizens. Seven high hazard dams were inspected in 2008, and 21 in 2009/2010. If all high hazard dams were inspected according to schedule, there would be 48 dams inspected yearly.



Inspections are conducted of the embankment, spillway and low-level outlet. These components are rated *Good*, *Fair* and *Poor*. *Good* is defined as a component that is meeting minimum guidelines and is properly maintained. *Fair* is defined as needing maintenance and *Poor* is defined as a component that has deteriorated beyond maintenance and needs repair or is non-functioning. A majority of high hazard dams in Rhode Island have components that are either in poor or fair condition.

While RI DEM does assess “hazard creep” by doing an inspection of low hazard dams to see if they warrant a change in

classification, few if any low hazard dams are visually inspected in the field on a regular basis. Of the 491 low hazard dams, 11 are listed as breached, and 71 have no condition listed.

Regulation and Statute

The primary dam inspection law in Rhode Island was first adopted in 1896. Crucial pieces, such as the definition of a dam and engineering guidelines were missing from this statute. The dam inspection and inventory program had its inception in 1883, and was under the authority of the Commissioner of Dams and Reservoirs which at that time recorded 86 dams. In 2008, the dam safety inventory contained 671 dams.

In May of 2000, Governor Lincoln Almond established a Dam Safety and Maintenance Task Force to review and make recommendations for improvements to the State's Dam Safety Program. The task force was made up of representatives from lake associations, dam owners, public works directors, the RI Clean Water Finance Agency, the RI Emergency Management Agency, the Natural Resources Conservation Service, the Department of Environmental Management and members of the General Assembly. Before the task force was convened, the Rhode Island dam safety statute had not been updated since 1956.

A major issue addressed by the task force was the need for a financial mechanism for assisting dam owners with dam repair and maintenance costs as well as removal of their unwanted structures. The failure of California Jim's dam in South Kingstown in 1998 and the Mill Pond dam in North Kingstown had brought the lack of dam maintenance into the spotlight. Little emergency planning had been implemented by dam owners or by municipalities up to that point.

According to the task force, financial constraints and wetlands permitting issues were frequently cited by dam owners as reasons that prevented them from making needed repairs or performing routine maintenance. Financial constraints had also prevented DEM from meeting its inspection requirements - a full time dam safety inspector was hired in 1999 after a three year vacancy in that position. The task force also pointed out the lack of a requirement for dams to have up to date Emergency Action Plans (EAPs) which include inundation maps of areas likely to be flooded.

Updates to the Dam Safety Statute and Regulation

Section 46-12.2-2 of the RI General Laws was amended in 2001 authorizing the Clean Water Finance Agency to issue loans for projects associated with dam safety. In 2005, Chapter 45-62 (Dam Management Districts) was added, authorizing municipalities to create dam management districts to collect funds for dam repairs, maintenance, management and/or removal.

An amendment to Chapter 46-19 was enacted in 2006 that authorizes DEM to take necessary actions in an emergency to mitigate unsafe dams and assess the costs to the dam owner. EAPs were also required to be completed by 2008 for municipalities with a high or significant hazard dam and for state agencies that own such structures. The Rhode Island Emergency Management Agency is responsible for coordinating EAPs and for giving final approval.

New dam safety regulations were promulgated in December 2007. These regulations include the following:

- Definitions of important terms including dam, hazard classification, maintenance, repair and unsafe dam;

- Assignment of a hazard classification to each dam in the state inventory;
- Requirement that owners register their dams and notify DEM when ownership is transferred;
- A schedule for visual inspections of high and significant hazard dams;
- Procedure to streamline repair of high and significant hazard dams; and
- A procedure for dam owners to take emergency actions at high and significant hazards dams.

Updates Related to Freshwater Wetlands

One of the statutory and regulatory recommendations from the task force was to establish a streamlined approval process for dam repairs, maintenance and removal. The recommendation was for DEM to internally coordinate wetlands review based upon information provided through the Dam Safety Program. Changes were adopted in new regulations promulgated in 2007. Amendments to the Freshwater Wetlands Regulations were also adopted to include the repair or maintenance of high and significant hazard dams under exempt activities.

The regulations state that maintenance, repair and emergency repair of high and significant hazard dams is permissible as an exempt activity as long as projects adhere to the Regulations for Dam Safety, and as long as the project will not result in the substantial alteration of a dam. Substantial alteration is any modification that results in a permanent change in the water elevation of the impoundment or in downstream flow. Dam removal and drawdown are still considered a substantial alteration and require a full permit submission. Maintenance of a low hazard dam requires that either a cofferdam be used to maintain water elevations or that water elevations should only be lowered to the extent needed to complete inspection, maintenance or repair. In the case of the Blue Pond Dam failure in Hopkinton, RI, in March 2010, the owners had filed a wetland permit to permanently draw down the impoundment. The permit was still at DEM and not finalized for two years before the dam collapsed.

Dam Removal in Rhode Island

Dams are a public issue even while most are privately owned. Management and permitting decisions about the use of dams are made on an individual basis, while the consequences of those decisions may have a cumulative impact on the entire watershed. Dams need to be looked at in the context of their effect on the broader landscape, and their long-term costs must be evaluated. Public safety and liability issues are as much an impetus for dam removal as are environmental concerns. Dam removal projects that include a federal trust species, such as anadromous fish, are often more likely to be funded through federal agencies and other river restoration programs, but there are plenty of dams that are either abandoned or in poor and failing condition where dam removal could be facilitated for economic, public safety and liability reasons.

If given enough time, water will find its way through a dam's structure and it will deteriorate and fail. Many of the state's dams that have stood for centuries are now safety hazards. Experience in Wisconsin has shown that repairing dams typically costs 3 to 5 times the one-time cost of removal. Many private owners and municipalities no longer want the burden of increased maintenance costs and liability associated with keeping a dam.

Removal of a dam is one of the best tools for river restoration. Rivers quickly return to their former channel and habitat function when a dam is removed. While wetland types will change in type and extent within the formerly impounded area, there is a benefit to restoring the riparian corridor,

wetlands and floodplain. Within one growing season, the banks are re-vegetated and river specific species have returned to the former impoundment. River restoration can also benefit the community by increased recreational and habitat potential, restoration of high quality fisheries and the return of wildlife.

For these reasons, it is important that the rules that govern river and wetland resources for the public good recognize the ability of dam removal projects to restore the “functions and values” of riparian wetlands. There is an inherent conflict within the rules governing wetlands when the state goal is to “preserve, protect and restore the purity and integrity” of the state’s wetlands, if “preserve” means to prevent change. Dams have created artificial situations on our rivers which we now must preserve as a consequence. Dams should also not be used as containment for contaminated sediment that we do not know how to handle.

Several dam removal projects are currently in the permitting phase in Rhode Island, and it has become clear that the regulatory environment has not been set up to easily handle these projects. While it is true that these types of restoration projects are new to permitting staff and that precedents have not been set, there are several issues that have come up that have specifically made dam removals hard to permit in Rhode Island. There may be ways to make specific changes to both regulation and statute to simplify and streamline restoration project permitting, and several other states have guidance that Rhode Island can follow. There also needs to be a fundamental understanding that these projects have a compelling public purpose and are designed to restore the functions and values of riparian ecosystems.

Issues for Consideration in Rhode Island

Sediment Quality

Every dam in Rhode Island has impounded sediment that has built up over decades, much of which contains elevated levels of at least one contaminant. Eleven dams in the dam safety database are listed as breached or drained. It is unclear whether those dams were intentionally or unintentionally breached, and how much of the sediment behind those dams moved downstream in an uncontrolled manner. Small dams, many unregulated, will continue to fail and breach on their own without assistance, and without DEM permits.

Because Rhode Island lacks sediment quality standards for impounded sediment, recent dam removal projects have been held to a residential soil standard. This has raised the question of the need to apply Brownfields rules which require the identification of a responsible party. Massachusetts has a sediment standard that includes threshold concentrations for both human health risk and aquatic life risk, each with their own requirements for disposal or reuse. Much of the cost of a dam removal project depends on the threshold levels of contaminants and amount of potentially mobile sediment in the impoundment. Sampling requirements in Massachusetts are for one sample per 1,000 cubic yards of potentially mobile sediment, up to 10,000 cubic yards. If there are more than 10,000 cubic yards, a sampling plan is generally agreed upon with the permitting agency. Rhode Island currently has no sediment sampling policy, making it very difficult for project proponents to develop a sampling plan and negotiate with DEM on a project by project basis.

Downstream Sediment Mobility during Construction

Dam removal in Rhode Island has also been made more difficult and expensive due to onerous requirements for construction work to be done in a dewatered section of the stream. This requires

huge expense for flow diversion, coffer damming, and hydraulic pumps to keep a construction area dry. Most states do much of their dam removal work “in the wet” because it is less damaging to the stream, and requires a shorter time of disturbance. Extensive water control can double the time of construction and dry out organisms in the streambed.



In these cases, construction is completed by drawing down the impoundment by opening the dam’s gates or creating a breach in the structure. Construction equipment enters the area along the dry stream margins or by creating an access road. Experience has shown that while there may be a temporary increase in turbidity or nutrients going down stream, these levels rarely exceed background levels or storm induced flows.

Permit Streamlining

Recently DEM created a Watershed Quality and Wetland Restoration Task Force that serves as an aid to property owners who wish to remove, repair, or construct dams in Rhode Island. The goal of the task force is to attempt to coordinate the many agencies that are involved in the process of removing a dam. Another objective is to aid dam owners in determining the permits that are necessary to for a proposed project. In preliminary meetings with the task force, there has not been much clarification of policies, and more questions than answers. Adding restoration practitioners to the task force to help guide policy may be a way to further the goals of restoration in Rhode Island. The development of a separate permitting track for restoration projects, similar to that of New Hampshire, could help to clarify the process and develop clear policies.

Making Dam Owners Accountable

Dam owners should be held accountable for the safety of their structures. Ownership information should be obtained and recorded with the property deed. Owners should be responsible for completing their own inspections according to the hazard classification schedule, and reporting that information to DEM. In Massachusetts, this requirement has led to many more dams being inspected and found to be in poor condition. Owners are being confronted with the information and are seeking removal of their structures. While restoration partners are often willing to work with a dam owner in situations where habitat is ideal, owners may also benefit from low interest loans through the Clean Water Finance Agency for other situations where safety is of primary concern. Clear incentives for dam owners are critical if we are to see restoration on a meaningful scale.

Recommendations:

- Rivers in Rhode Island need to be looked at as complete systems, and the cumulative effects of decisions about hydropower, fish ladders and dam removal need to be identified and prioritized on a multi-decade time horizon, taking into account predicted changes to the local climate.
- There should be a statement of policy from the General Assembly, state agencies or through an Executive Order stating that aquatic habitat restoration is a goal of the State of Rhode Island.

- Rhode Island should establish an aquatic habitat restoration task force to evaluate needs and opportunities for the future with particular focus on climate change adaptation.
- More dams in Rhode Island should be inspected. In order to do this, a requirement should be developed through statute or regulation for dam owners to inspect their own dams according to the schedule for hazard classification. Low hazard dams should be inspected every ten years.
- Any dam shown to be in unsafe condition should be monitored at frequencies that assure the safety of the public with updates provided by a registered engineer until the dam is made safe.
- The Rules and Regulations should include a definition of “Abandoned” as a dam that has no identifiable owner or a dam whose owner fails to respond to the owner’s obligations, provided this definition does not allow dam owners to abandon their dams with no repercussions or liabilities.
- If a dam owner wants to remove a dam, “incidental beneficiaries” should be given a fixed amount of time to assume financial and legal responsibility for the dam, should they want the dam to remain in place.
- Dam removal projects should qualify for funding through the Clean Water Finance Agency.
- Any dams repaired using public funds or loans should include measures to mitigate resource damages that occur as a result of the dam’s operation. This would include opportunities for enhancing fish passage and providing safe portage.
- Ownership information for all regulated dams in Rhode Island should be obtained and should be recorded with property deeds.
- A separate streamlined process should be developed to handle permitting of dam removal projects within the Freshwater Wetlands Regulations.
- Rhode Island should develop sediment standards similar to those in Massachusetts that identify levels of risk tolerance related to ecological life risk and human health risk.