

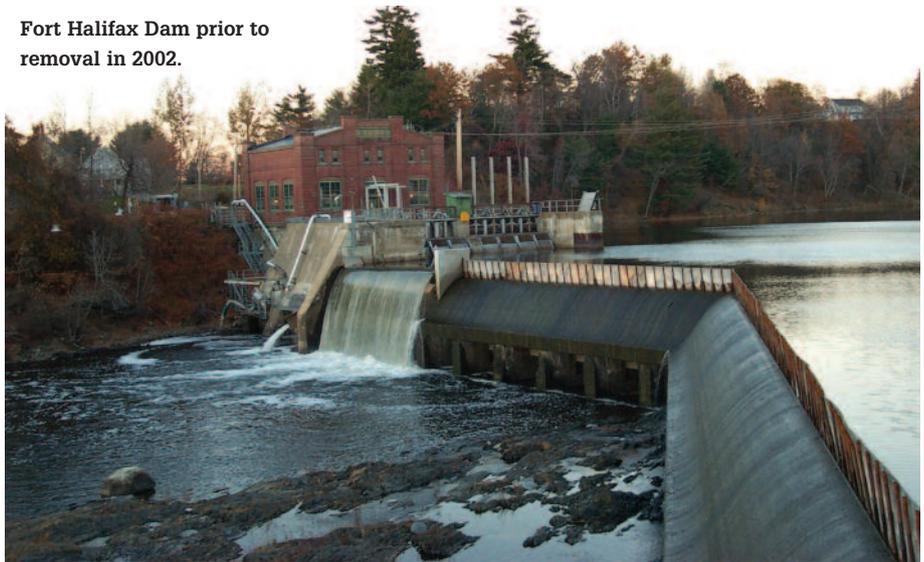
Anatomy of a dam removal

Peter Foote details the removal of Fort Halifax Dam in the US state of Maine

Dam removal has been an increasingly common activity in the US and North America over the past 15 to 20 years as dams initially constructed in the late 1800's and early 1900's have aged or outlived their original functions. Increased environmental awareness and interest in river restoration have also placed more focus on dam removal, instead of repair or rehabilitation of older dams. American Rivers, a major river-advocacy organization in the US has as one of its primary missions to assist in the removal of dams that are outdated or "dangerous" from an engineering (dam safety) or environmental perspective. American Rivers reports that it has assisted in the removal of more than 150 dams.

Many of the dams that have been removed are low-head, non-hydro, or have not produced hydropower for many years, or have essentially been abandoned. There are, however, several high-profile hydropower dams that have been removed or are in the process of being removed, including: Edwards Dam, Kennebec River, Maine; Condit Dam, White Salmon River, Washington; Elwha and Glines Canyon Dams, Elwha River, Washington; and the Great Works and Veazie Dams, Penobscot River, Maine. Many of these high-profile projects have had extended regulatory processes to accomplish their removal, and although the Fort Halifax Dam was not considered one of the higher-profile projects for removal, the regulatory process still required six

Fort Halifax Dam prior to removal in 2002.



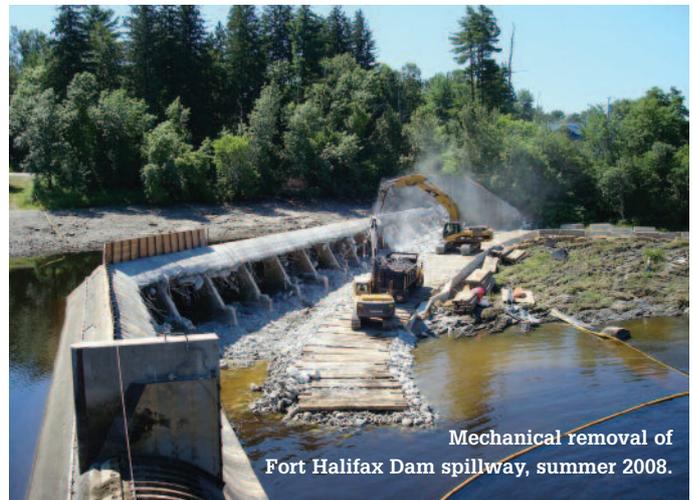
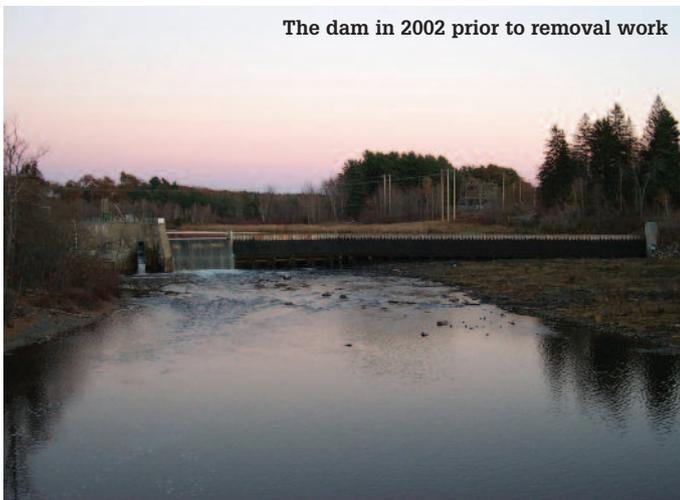
years to complete, in part because of local opposition to its removal. This article describes the regulatory process involved with this removal, and the post-removal environmental setting.

Description of Fort Halifax Dam

The Fort Halifax Dam, located on the Sebasticook River, a tributary of the Kennebec River (Maine), was constructed in 1907-1908 with an installed generating capacity of 1500kW. The concrete gravity dam was 29ft (8.8m) high and 553ft (169m) long, and formed a 417-acre reservoir that extended 5.2 miles upstream from the dam. The hydroelectric project was first licensed by the Federal Power Commission (now called the Federal Energy Regulatory Commission [FERC]) in

1968, and that license was renewed in 1997. The dam was located about 1600ft (488m) upstream from the mouth of the Sebasticook River, which joins the Kennebec River in Winslow, Maine, and was the first obstruction to upstream fish migration on the Sebasticook River. The mouth of the Sebasticook River is located about 18 river miles upstream of Augusta, the site of the former Edwards Dam that was removed in 1999. The Kennebec River is no longer dammed between the tidewaters of Merrymeeting Bay and the mouth of the Sebasticook River. Because of an ongoing diadromous fish restoration program¹ in the Kennebec River Basin, the FERC license for the Fort Halifax Dam had a requirement for safe and effective upstream and downstream fish passage

The dam in 2002 prior to removal work



Mechanical removal of Fort Halifax Dam spillway, summer 2008.

at the dam. Prior to removal of the dam, upstream fish passage was provided by means of a fish pump and trucking, while downstream fish passage was accomplished by intake screening and a fish bypass sluice.

Diadromous Fish Restoration and 2002 proposal to remove the dam

The Kennebec River Basin diadromous fish restoration program is being conducted under the auspices of the Kennebec Hydro-Developers Group (KHDG) Settlement Agreement of 1998, which was signed by the major hydroelectric project owners within the basin, the state and Federal fisheries agencies, and certain NGO groups. This agreement provided funding for restoration activities and for the removal of Edwards Dam, and set a specific schedule for construction of fish passage facilities at seven dams within the basin. Fort Halifax Dam was one of those dams, and the agreement called for installation of a new fish lift at the dam (retirement of the fish pump) by May 1, 2003, or decommissioning of the project to allow for fish passage. FERC incorporated the KHDG agreement fish passage requirements into the project license in 1998. As a result, in anticipation of having to construct a fish lift, FPL Energy (the project owner) designed a state-of-the-art fish lift. This design had an estimated cost of \$4.1M, compared to the typical annual power revenues at the project of about \$320,000. Therefore, FPL Energy concluded that the project would no longer be economical, with the construction and operation of a new fish lift, and on June 20, 2002, filed an application with FERC to surrender the license, retire the project, and breach the dam to allow for upstream and downstream fish passage.

FERC process

Under the FERC regulatory process, any major action to be taken by FERC (such as a license issuance or surrender) must be publically noticed and must be analyzed pursuant to the National Environmental Policy Act (NEPA) using either an Environmental Assessment (EA) or an

Environmental Impact Statement (EIS), prior to the agency taking final action. In response to the public notice of FPL Energy’s proposal, several parties filed notices of opposition to the proposal with FERC, including “Save Our Sebasticook” (SOS),² the Town of Winslow, Maine, and other local landowners. The SOS and landowner opposition was primarily related to the loss of waterfront property on the project reservoir, the potential reduction in property values if the reservoir was drained, the loss of recreational activities (boating and fishing) on the reservoir, and adverse effects on aesthetics by draining the reservoir and exposing mudflats. The Town of Winslow was concerned about the loss of an operating hydroelectric facility and the associated tax revenue, and the effect on sewer lines that crossed the reservoir bottom just upstream of the dam. Federal and state fisheries agencies and the NGO groups that signed the KHDG Settlement Agreement, however, fully supported the removal of Fort Halifax Dam because it would remove an obstruction to fish migration and enhance the potential for fisheries restoration in the Sebasticook River.

FERC held public meetings in the project area and issued a draft EA in January 2003, and a final EA in May 2003, after receipt of public comments on the draft EA. Alternatives considered in the EA included: (1) FPL Energy’s proposal to breach the dam; (2) FPL Energy’s proposal with a wider breach; (3) full dam removal; (4) maintaining the project in operation with an improved fish pump; and (5) maintaining the project in operation with a new fish lift. Major issues analyzed in the EA included: effects of winter ice flows after dam removal, fish passage through a partial or full dam breach versus via the existing or a new fish passage facility, the extent of impoundment sediment accumulation and contamination, the location and condition of an upstream sewer line crossing, effects on recreation, aesthetics, wetlands, and cultural resources, and the economics of the various alternatives. After issuance of the final EA in May 2003, FERC staff further investigated the potential use of an improved fish pump for fish

passage at the existing dam, but concluded following a technical conference in October 2003 that a fish pump would not be a technically feasible, long-term solution for upstream fish passage at the project. Thus, in January 2004, FERC ordered the license surrender and breaching of the dam for fish passage.

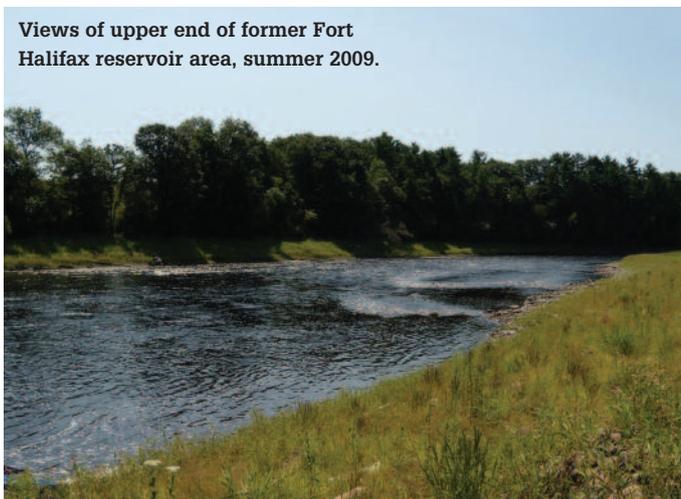
The FERC order was appealed by SOS, the Town of Winslow, and a landowner in February 2004, and FERC granted rehearing for further consideration in March 2004. However, in May 2004, FERC after further review denied the rehearing and issued its final order on the license surrender and dam breaching. In July 2004, SOS appealed this FERC order to the U.S. Court of Appeals in Washington, D.C. After a series of legal filings and proceedings, the U.S. Court of Appeals dismissed the SOS appeal in December 2005, so the FERC order of May 2004 became final.

State and local regulatory process

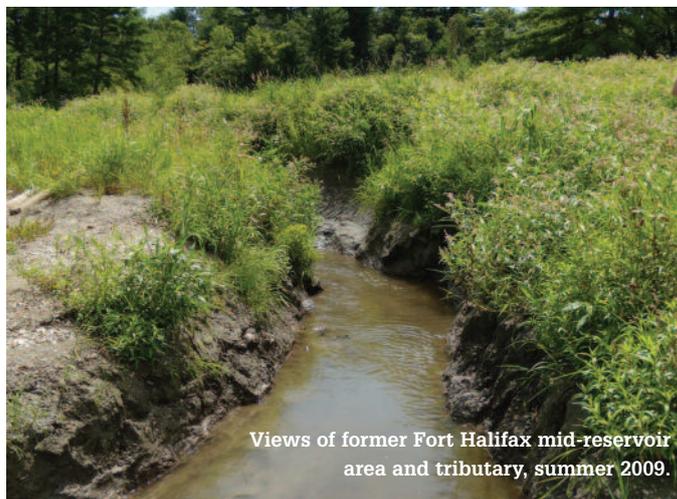
An extended state and local (Town of Winslow) regulatory process was also required before the dam could be breached or removed. The State of Maine Department of Environmental Protection (DEP) had to determine whether to issue Water Quality Certification pursuant to Section 401 of the Federal Clean Water Act, to certify that the FPL Energy’s proposal would not result in a violation of state water quality standards. In addition, Maine DEP had to issue a Waterway Development & Conservation Act Permit for breaching of the dam and for work within the Sebasticook River. During the state process, SOS remained opposed to the breaching or removal of the dam, and filed appeals at every stage of the state process. The following summarizes the major milestones of the state process and the appeals by SOS:

- 2/11/2003 - Maine DEP waived 401 Water Quality Certification, allowing the project to proceed;
- 7/16/2004 – Maine DEP issued a Waterway Development & Conservation Act Permit;
- 8/16/2004 – SOS appeal of Maine DEP permit issuance;

Views of upper end of former Fort Halifax reservoir area, summer 2009.



Views of former Fort Halifax mid-reservoir area and tributary, summer 2009.



Fish counts following dam removal

Species	2009	2010	2011
Atlantic salmon	4	0	0
American shad	8	3	27
River herring	1,327,915	1,626,872	2,731,403
American eel	17	149	7
Sea lamprey	2	0	1

Counts are from the Maine Department of Marine Resources website (<http://www.maine.gov/dmr/searunfish/index.shtml>).

- 2/17/2005 – Maine Bureau of Environmental Protection (BEP) upheld the DEP permit;
- 8/16/2004 - SOS petition to Superior Court of Kennebec County regarding the legality of 1998 KHDG agreement that was the original basis for requiring fish passage at the project;
- 3/25/2005 - Superior Court of Kennebec County dismissal of SOS petition regarding legality of 1998 KHDG agreement;
- 10/12/2005 - Maine Supreme Judicial Court upheld earlier Superior Court dismissal of SOS appeal regarding legality of 1998 KHDG agreement;
- 3/21/2005 – SOS appeal of Maine BEP decisions to Superior Court of Kennebec County;
- 7/31/2006 – Superior Court of Kennebec County upheld DEP/BEP permitting decisions;
- 8/7/2007 –Maine Supreme Judicial Court upheld DEP/BEP permitting decisions.

The Maine Supreme Judicial Court decision completed the state regulatory process, but the Town of Winslow had its own permitting process that involved at least 12 planning board meetings. However, by the end of 2007, all state and local permits were in place for final retirement of the project and dam breaching.

Later FERC/DEP/Corps actions

After gaining FERC, state, and local approvals from 2004 through 2007, FPL Energy still had to

obtain final FERC approval for amendment of their plans to remove a portion of the dam. FPL Energy's initial proposal was to only breach the spillway section of the dam, but in April 2008 FPL Energy proposed to remove the entire spillway, which was approved by Maine DEP in May 2008 and by FERC in July 2008. In June 2008, SOS made one last appeal to FERC to reconsider its license surrender order, and the SOS appeal was dismissed by FERC in its July 2008 order. Also in 2008, a private hydro developer filed a request with FERC to stay its surrender order, stating that the developer would acquire the project and continue to operate the project with the required fish passage facilities. FERC also dismissed that request in July 2008, stating that the regulatory process had already run its course and the late request had no merit.

A final Federal permit that was required for work within a navigable waterway was a U.S. Army Corps of Engineers (Corps) "dredge and fill" permit pursuant to Section 404 of the Clean Water Act. The Corps initially issued the Section 404 permit in December 2004, but because of the regulatory delay and FPL Energy's change in its removal plan, the Corps amended the Section 404 permit in May 2008.

Dam removal & current habitat

The spillway section of the Fort Halifax Dam was removed in summer/fall 2008, after the six-year regulatory process and 100 years after the initial construction of the dam.

The reservoir was first slowly drawn down, to prevent fish and mussel stranding, and efforts were also made during the drawdown to rescue fish and mussels in areas where stranding was likely.

Following reservoir drawdown, the spillway portion of the dam was mechanically removed (the powerhouse remains in place). The Sebasticook River now flows freely through the

former dam site, and the 5.2-mile reach of the former impoundment can now be characterized as riverine with several series of riffles/runs, and a long pool through the mid-section of the reach. The Fort Halifax dam site is no longer an obstruction to upstream fish migration. Fish lift counts are available from the upstream Benton Falls Project, which is located immediately upstream of the former Fort Halifax reservoir. Benton Falls' counts of diadromous species in the first three years after removal of the Fort Halifax Dam are shown in the table left.

Because of the size of the river herring run now reaching Benton Falls Dam, the state of Maine allows a commercial dip net fishery immediately below the dam, to harvest excess river herring production.

Photos taken in August 2009 show that only one year after dam removal, most of the former reservoir bottom had re-vegetated with grasses and shrubs, acting to stabilize areas where sediment had deposited over the 100 years of impoundment.

Some tributaries continue to cut through the shoreline sediment deposits, but over time these areas are expected to stabilize as woody vegetation becomes better established. Many of the landowners were concerned about extensive mudflats persisting after dam removal, and examination of the reach only one year after dam removal showed that this was not the case, although the difference in vegetation type allows identification of the former reservoir level.

The removal of the Fort Halifax Dam showed that although the project was not a "high-profile" dam, a significant regulatory process was still required, in part because of local grass-roots opposition to the loss of the project and its reservoir. ■



Views of tributary stream and lower end of former Fort Halifax reservoir area, summer 2009.

Footnotes

1. Diadromous fish include both anadromous species such as Atlantic salmon, American shad and river herring (alewife and blueback herring), and catadromous species such as the American eel. The restoration program has the objective of restoring populations of these migratory species to their historic range in the Kennebec River Basin (see <http://www.maine.gov/dmr/searunfish/kennebec/index.htm>).
2. This group was comprised primarily of landowners with properties on the reservoir shoreline.

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