

US EPA ARCHIVE DOCUMENT

A photograph of the Fort Halifax Dam, a large concrete structure with a spillway on the left. Water is cascading over the spillway into a rocky riverbed. In the background, a red brick mill building is visible. The sky is clear and blue.

Fort Halifax Dam Removal

What happens when the water goes down?

Introduction

- Fort Halifax is owned by NextEra Energy Maine Operating Services LLC.
- Located on the Sebasticook River in Winslow, ME.
- The dam was 472 feet long, 29 feet high, and it impounded an area of 350 acres.
- Federal Energy Regulatory Commission and Maine DEP included as a part of the license and certification terms an agreement between the State of Maine and the Kennebec Hydro Developers group (KHDG), where KHDG agreed to provide permanent fish passage on several of their dams, including Fort Halifax.

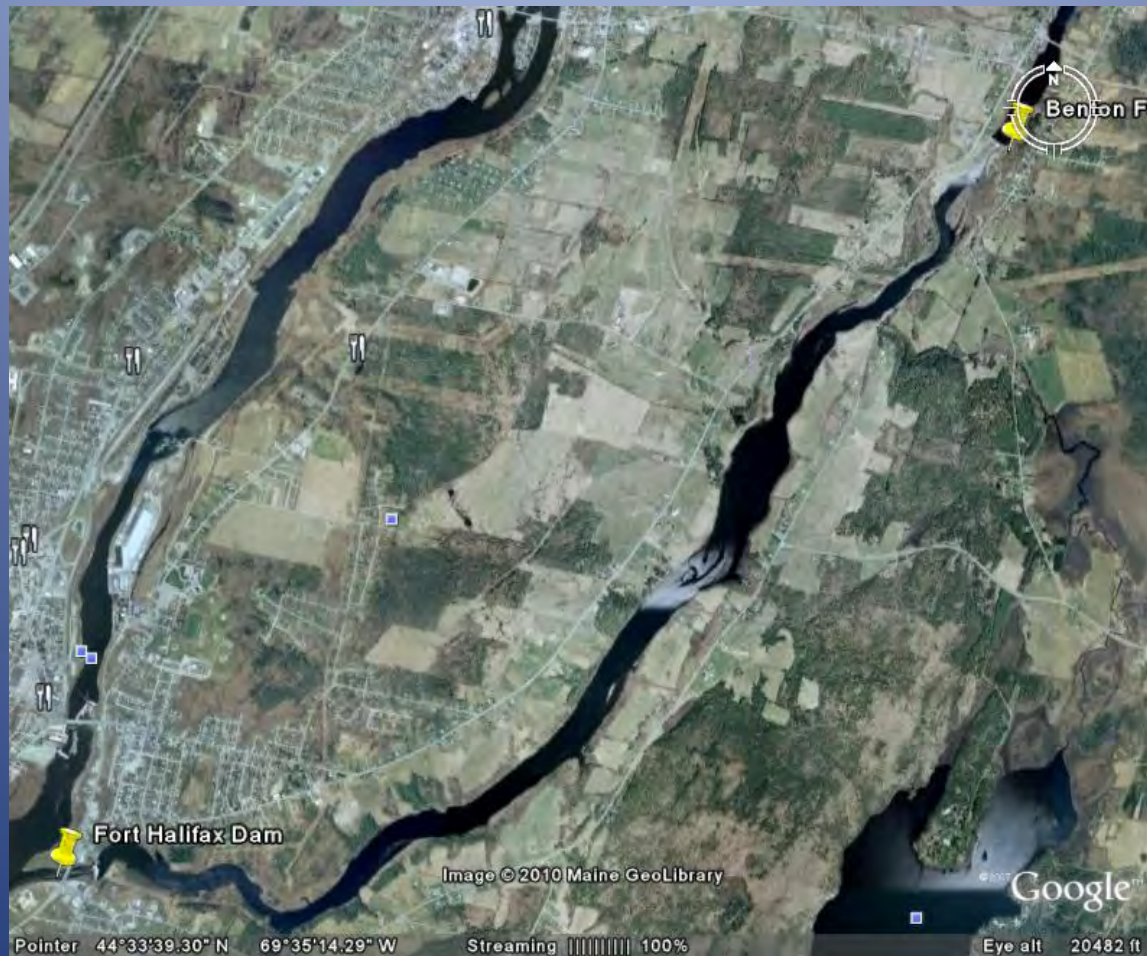
Cost of Compliance with KHDG Agreement

- NextEra Energy investigated 3 alternatives to provide fish passage
 - A fish lift at a cost of about \$4,000,000.
 - A fish pump was unacceptable to stakeholders within the KHDG agreement due to unknown effectiveness for all species of anadromous fish.
 - Dam removal (with mussel relocation) at an estimated cost of \$750,000.

Final Dam Decision

- The decision was made to remove the dam due to economics.
- The dam removal would dewater about 64% of the existing impoundment, converting it to a 5.2 mile free-flowing river.
- The dewatering created an issue with two state listed freshwater mussel species.

Original Impoundment



Impact of Dam Removal on Freshwater Mussels

- Two species of state listed freshwater mussels: yellow lampmussel (*Lampsilis cariosa*) and tidewater mucket (*Leptodea ochracea*).
- Enhancing some mussel habitat.
- Eliminating some mussel habitat.

Dam Removal Logistics

- The project took place in late July when river flows were low and after migration of anadromous fish.
- The impoundment was initially drained through the hydro units dropping the headpond 9 feet.



- The dam was breached by mechanical means.
- Flows were controlled, and the headpond was lowered 2 feet per day.



- After the initial breach, the remaining bays were removed.
- All debris was removed by September 1st in order to minimize impacts to anadromous fish.



Biological Concerns During Dam Removal

- Possible fish stranding
- State listed freshwater mussel stranding (required an Incidental Take Permit (ITP))
 - ITP requirements included relocation of state listed mussels: yellow lampmussel and tidewater mucket.
 - Survival study of both species of relocated mussels.
 - The ITP did not address common species of mussels.

Fish Stranding Prevention

- Each day during drawdown, three boat teams would cruise designated sections of the impoundment to locate standing pools of water.
- The teams would check for fish, if present, net fish and return them to the river channel.

The choice of dam demolition was key, very few fish were found due to the slow drawdown of the impoundment.



Mussel Relocation

- The target mussel species were identified.
- All field technicians were trained to identify the target species.



- Teams were given buckets, gloves, walkie talkies, and mussel identification cards.
- Two man teams were deployed by boat staff.



Each team was responsible for a one mile stretch of river bank upstream of the dam.



- A team would collect a buckets of mussels.
- The boat team would come to transport them.
- The expert would check accuracy and the mussels would be stored in floating holding boxes.





- Suitable relocation areas were found in the deepest portions of the river channel.
- The best survivability for the mussels indicated hand placing them in the substrate with their siphons exposed.
- Biologists snorkeled to hand place over 10,000 mussels.

Incidental Take Permit Requirements

- Pit tag study to measure the effectiveness of relocation efforts.
- Radio telemetry study to measure the movement of mussel post relocation and give insight into relocation by high flow events in a riverine condition.

Incidental Take Permit Requirements

- 240 individuals were tagged using passive integrated transponder (PIT) tags.
- 120 each of yellow lampmussels (*Lampsilis cariosa*) and tidewater mucketts (*Leptodea ochracea*) were tagged, 60 control and 60 test subjects.
- A total of 12 mussels were tagged with radio tags.



Tagging Methods

- Pit tags and radio tags were attached with dental cement.
- In addition, all mussels had a unique number attached in case the tag was damaged or lost.



Methods for Pit Tagged Mussels

- 20 of each species were placed in six separate transects (40 per transect).
- 3 transects were test subjects and 3 were control subjects.
- Surveys were conducted in the fall of 2008, and August 2009.
- A third survey will be held in August 2011.

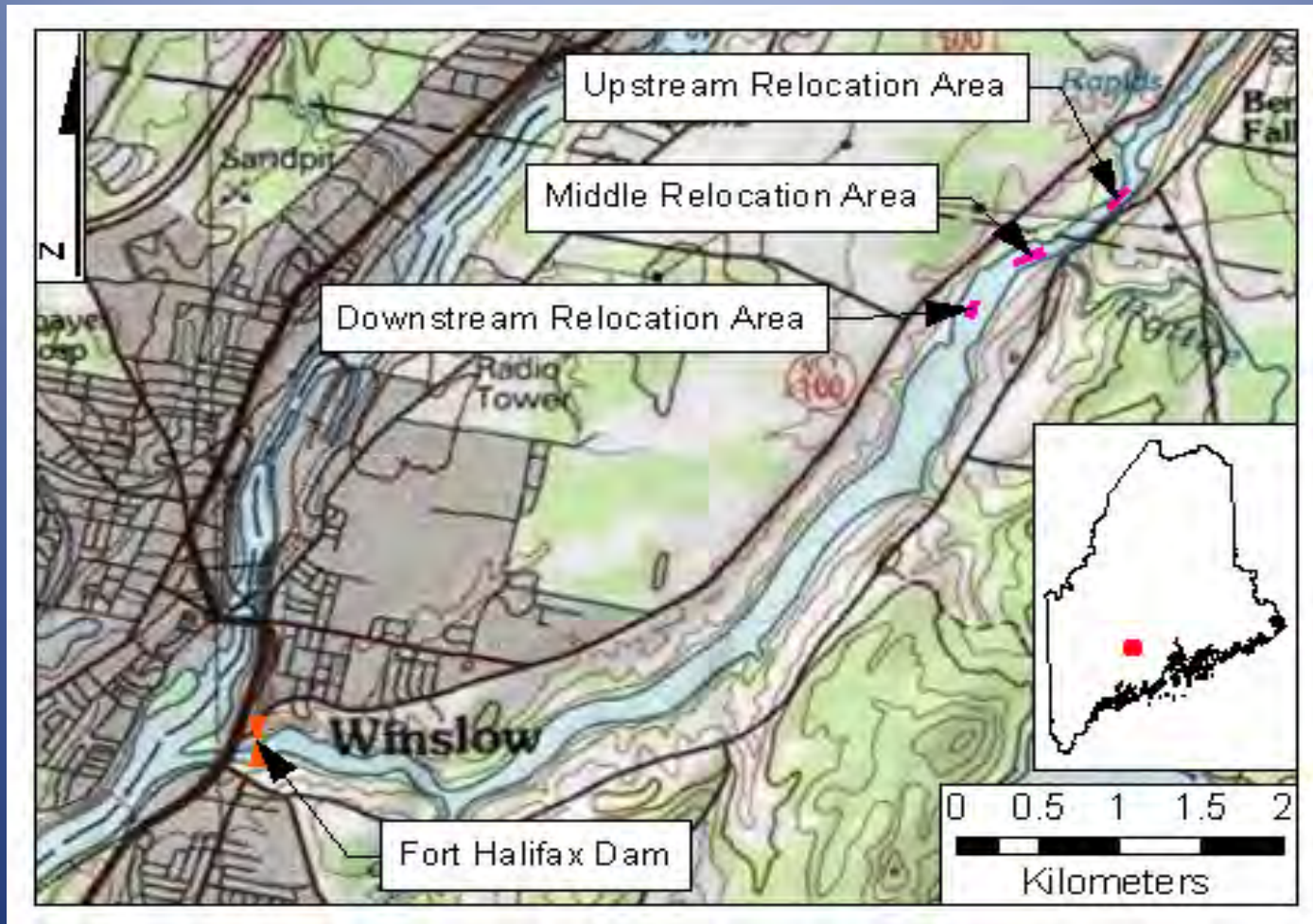
Results are pending the final survey in 2011.

Methods for Radio Tagged Mussels

- Six each of yellow Lampmussels (*Lampsilis cariosa*) and tidewater muckets (*Leptodea ochracea*) were radio tagged.
- They were placed in one transect.
- The mussels were checked monthly for movement and mortality.

Results are pending the final survey in 2011.

Project Map with Mussel Plot Locations



Erosion and Sedimentation Requirements

- NextEra requirements for restoration were limited to using riprap to stabilize two storm water outfalls and an area below Dallaire Street.
- Winter rye grass was used to seed areas where erosion occurred.
- Most areas were allowed to vegetate naturally.

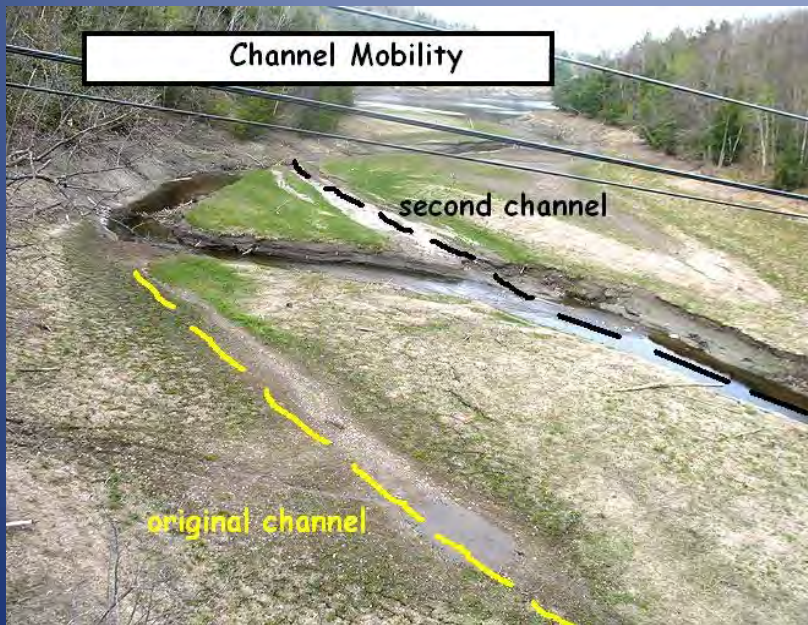
Habitat Recovery

Before and After



China Lake Outlet Stream (a large tributary above the dam);
photo taken facing upstream from bridge.

China Lake Outlet Stream (facing downstream from bridge)



Shortly after dam removal



Spring 2009

China Lake Outlet Stream September 2009



China Lake Outlet Stream Aerial 2009



Mainstem of the Seabasticook Mudflat below farm



July 2008



September 2009

Aerial View Mudflat: 2009



Ft. Halifax September 2009



Special Thanks

- NextEra Energy LLC.
- Normandeau Associates
- All the “Hired Help” who kept it interesting!

