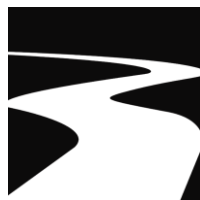


Clementsport Dam Removal and Restoration

Project Report: 2011 Season



Produced for the Clean Annapolis River Project
By Lindsey Freeman and Andy Sharpe
November 2011



Clean Annapolis River Project

P.O. Box 395,
151 Victoria Street, Annapolis Royal, Nova Scotia
902 532 7533; carp@annapolisriver.ca;
www.annapolisriver.ca

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Funded in part by the Nova Scotia Salmon Association, NSLC Adopt-A-Stream, Gulf of Maine Council-NOAA Habitat Restoration Partnership, RBC Blue Water Leadership, Atlantic Salmon Federation, Atlantic Salmon Conservation Foundation, Human Resources and Skills Development Canada, Nova Scotia Transportation and Infrastructure Renewal, Environment Canada and Nova Scotia Environment

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Acknowledgements

The removal of the Clementsport Dam would not have been possible without the dedication and efforts of a number of individuals and organizations over the past 4 years. In particular, we would especially like to thank the following:

- Eric Hutchins, National Oceanic and Atmospheric Administration and Anita Hamilton, Fisheries and Oceans Canada, for their longstanding support and contributions to the Project Advisory Group.
- Aaron Corr and the team at Parish Geomorphic for their guidance throughout the project.
- Reg Baird and Roy Barteaux for their encouragement and support.

Introduction

The Clementsport dam, located on the West Moose River, was initially constructed in 1942 by the Canadian Department of National Defense (DND) to provide a source of drinking water for the Cornwallis Naval Station (PARISH Geomorphic Ltd, 2010). The dam structure and property were sold to the Municipality of the County of Annapolis in the 1960s, who later leased it to the Royal Canadian Legion (Clementsport Branch). The Royal Canadian Legion reconstructed the dam in the 1980s to provide a swimming area for the community, and subsequently added a fish ladder to the structure in 1991 (Clean Annapolis River Project, 2009). A lack of maintenance over the past 10 years coupled with high river flows and ice damage, undermined the structural integrity of the dam, and it fell into disrepair. The fish ladder became impassable and the dam created an obstruction to fish migration and was considered to be becoming an increasing safety hazard.

In September 2011, after 4 years of planning and preparation, the Clementsport Dam was removed. It is estimated that this removal has provided 19.1 kms of accessible upstream habitat for fish access and migration. Figure 1 illustrates the layout of the project site prior to the dam's removal and the restoration of the Moose River floodplain. The status of the removal, restoration and ecological monitoring of the site as of November 2011 is outlined in this report.

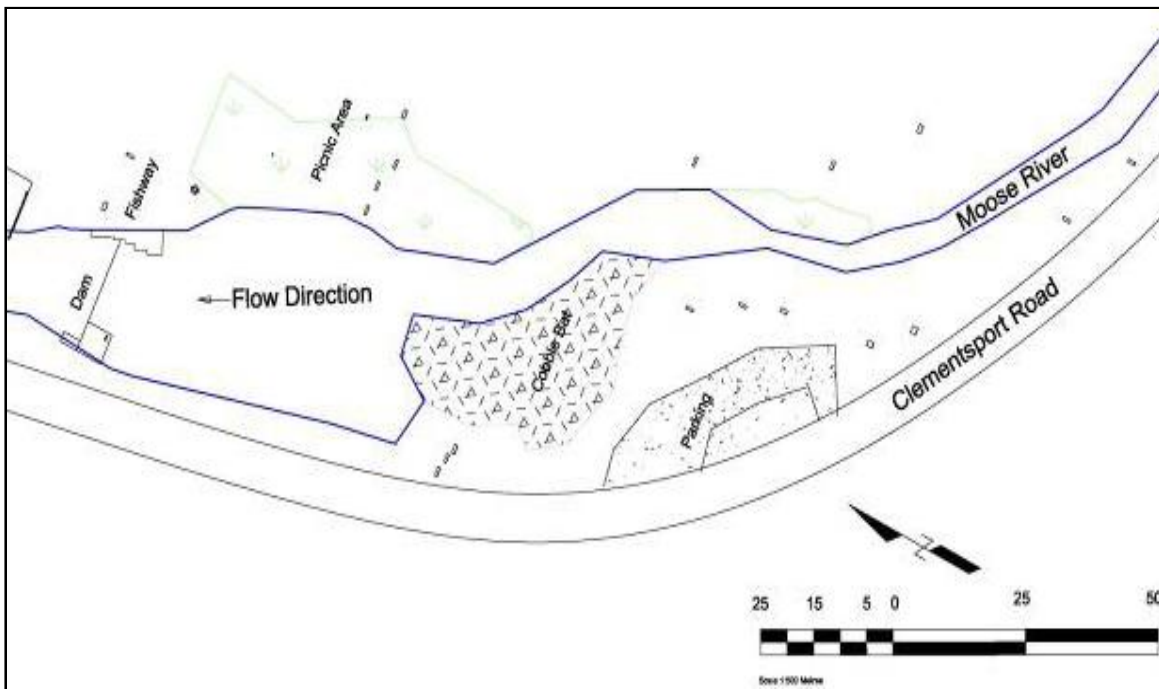


Figure 1 | Clementsport Dam site layout prior to dam removal and floodplain restoration.

Site Preparation and Pre-Removal Monitoring

Monitoring began in 2009 to establish pre-removal conditions of the waterway. Ecological parameters monitored included water quality (dissolved oxygen, pH, temperature, conductivity, total dissolved solids, and turbidity), discharge, elevation surveys, benthic invertebrate community sampling, grain size analysis, fish passage surveys (e.g. electrofishing), and establishment of photo stations.

To expedite the removal process and minimize impacts to the Moose River, construction equipment and materials were amassed at the site prior to removal. Sedimentation and erosion were minimized using approved control measures around the construction site such as silt fences, cofferdams, pumps, erosion control blankets, stone and filter gravel, and hay (see Figure 2). Diversion channels were also created to redirect the river during construction activities to minimize disturbance to fish (see Figure 3). Fish rescue was also undertaken as required throughout the project's completion.



Figure 2 | Silt and erosion control measures established at the dam removal site. Silt fences are denoted by a) and b) shows some bank protection measures put in place.



Figure 3 | Diversion channel during dam removal.

Dam Removal and Demolition

The removal of the Clementsport dam was conducted in a series of steps between September 5 and 13th, 2011. The dam itself consisted of several parts, namely a fish ladder adjacent to the eastern shore, a wooden crib serving as the core structure of the dam, and a concrete abutment on the western shore that housed water withdrawal equipment. Prior to the dam removal, the earthen embankment on the eastern shore was cut back to create a 3:1 slope, and erosion control measures were put in place. After site preparation was complete, the fish ladder was removed, followed by the wooden crib structure. The concrete abutment was demolished later, after a majority of the floodplain restoration work had been completed. All debris was trucked off site, and disposed of in accordance with provincial regulations. Figures 4 through 6 illustrate the steps of the dam removal, beginning with the removal of the fish ladder (Figure 4), the wooden crib (Figure 5), and the demolition of the concrete abutment (Figure 6).



Figure 4 | Removal of fish ladder.



Figure 5 | Removal of wooden crib structure.



Figure 6 | Demolition of concrete abutment.

Floodplain Restoration and Re-vegetation

The restoration of the Moose River floodplain consisted of both reconstruction and re-vegetation efforts. A diagram outlining the primary activities is presented in Figure 7. Firstly, the riverbed upstream of the former impoundment area was lowered and re-graded to widen the floodplain and remove some of the accumulated cobble debris. Three riffles were constructed in the same general area to slow the velocity of the river. In the former impoundment area, three rock weirs were built to trap sediments over time and allow the accretion of sediments alongside the Clementsport Road. Bank stabilization work was completed adjacent to Clementsport Road to cover soils exposed from the concrete abutment removal and to reinforce the existing bank structure. The fine sediments that had accumulated by the dam in the former impoundment area were also removed in order to restore the substrate to a coarser arrangement common to the Moose River system. Upstream of the riffles, a grade control structure was installed and an eroding bank was stabilized with stone and filter gravel. Figure 8 illustrates the dewatering and excavation that was completed prior to the addition of stone and filter gravel for bank protection.

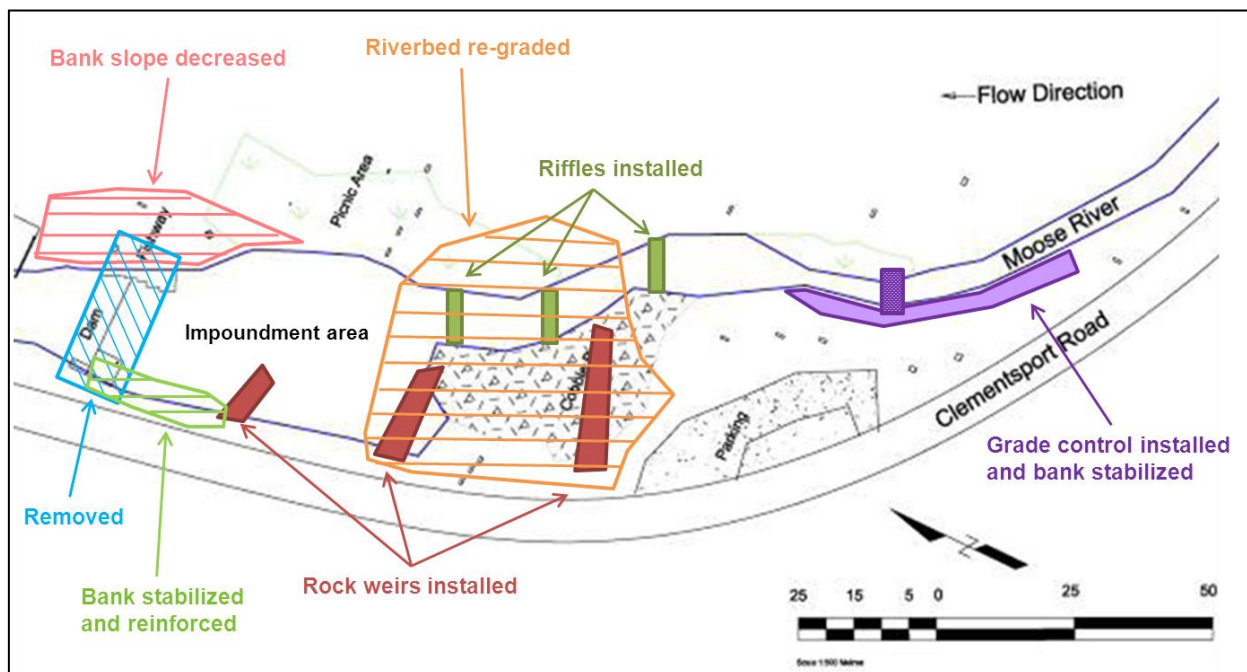


Figure 7 | Overview of floodplain restoration work completed at the Clementsport Dam site.

In addition to floodplain restoration activities, re-vegetation of exposed soils in the former impoundment area was started, and will be continued in the spring of 2012. A group of 10 volunteers donated their time and efforts to assist with the re-vegetation work (see Figure 9). One hundred and twenty willow stakes were planted to help accelerate vegetative growth. Exposed soils in the former earthen embankment area were covered with hay and 45 white spruce seedlings were also planted.



Figure 8 | Stabilizing an eroding bank upstream of the impoundment area.



Figure 9 | Volunteers assisting with re-vegetation work in September 2011.

Post-Removal Monitoring

Post-removal monitoring began at the project site in September 2011, and will continue into 2013. Water quality monitoring, discharge measurements, photo point surveys, and vegetative monitoring have been conducted to date and will continue to be sampled. Post-removal monitoring that remains includes transect elevation surveys, a longitudinal stream profile survey, fish passage monitoring, and post-removal grain size analysis.

Additional Enhancement Opportunities

- The current water supply for Cornwallis is provided by a concrete dam and reservoir on the Moose River above Clementsville. The dam is a complete barrier to fish passage, has no minimum flow requirements and makes a significant contribution to the warming of the Moose River downstream. Enhancement opportunities include establishment of fish passage, negotiation of minimum flow requirements and installation of a siphon to reduce downstream water temperatures.
- With the provision of unrestricted migratory fish access to much of the Moose River, numerous opportunities exist to implement site-specific enhancement measures, such as improvement to spawning and rearing habitat.

References

- Clean Annapolis River Project. (2009). *Summary of Pre-Restoration Monitoring Clementsport Dam, Moose River, Nova Scotia*. Annapolis Royal, Nova Scotia: Clean Annapolis River Project.
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