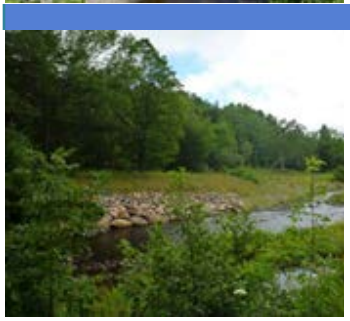
Ecological Monitoring of the Clementsport Dam Removal Project

Results of pre and post-restoration monitoring undertaken at the Clementsport Dam Removal Site on the Moose River, Clementsport NS







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Funded 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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Table of Contents

List of Figures

List of Tables

List of Acronyms

CABIN: Canadian Aquatic Biomonitoring Network

CARP: Clean Annapolis River Project

CCME: Canadian Council of Ministers of the Environment

COGS: Centre of Geographic Sciences

DND: Candian Department of National Defence

D.O.: Dissolved Oxygen

EPT: Ephemeroptera, Plecoptera, Trichoptera

pH: Power of Hydrogen

GOMC: Gulf of Maine Council on the Maine Environment

NOAA: National Oceanic and Atmospheric Administration

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Executive Summary

The removal of the Clementsport Dam on the Moose River in Clementsport, Nova Scotia in September of 2011 was the culmination of four years of planning and preparation by Clean Annapolis River Project and its partners. A strong component of the project was the development and execution of a pre-restoration and post-restoration regimen that would allow an evaluation of the ecological effects of the dam removal and related restoration activities.

Monitoring began in 2009 to establish pre-restoration conditions of the waterway. Post-restoration monitoring began at the project site in September 2011 immediately after the dam removal and channel work was completed, and continued to the fall of 2012 with photo point monitoring continuing to the summer of 2013. Ecological parameters monitored included water quality (dissolved oxygen, pH, temperature, and conductivity), elevation surveys, benthic invertebrate community sampling, grain size analyses, fish passage surveys (e.g. electrofishing), and establishment of photo stations. The selection of monitoring parameters and methods were in large part guided by the Stream Barrier Removal Monitoring Guide (Gulf of Maine Council 2007) with input from the project advisors.

Elevation surveys included the use of cross-sectional profiles as well as longitudinal profiles of the area in which restoration work occurred. Changes were observed in areas that had received re-grading work, as well as the impoundment area directly above and below the dam, where sediments that had accumulated behind the dam were removed, and the pool below the dam filled in naturally with materials deposited from upstream.

Photo point monitoring over the life of the project documents significant change within the restoration area, especially in relation to changes in vegetation and with the channel characteristics and direction. Contrary to the restoration design, the channel within the impoundment seems to be establishing to the left by the Clementsport Road where weirs were constructed to divert flows instead of on the right where a main channel was graded and riffles were constructed..

Water quality sampling across all sites indicated that prior to the dam's removal, average temperatures were higher than post removal temperatures. The pH data collected at the four monitoring sites did not display a significant change between pre-restoration and post-restoration average values. However, a difference was observed between sites: the sites downstream (Above and Below Dam) displayed a higher pH average than further upstream (Above and Below the Reservoir). There was no significant change observed in the DO levels between sites or from the pre-restoration and post-restoration data sets. All DO levels were well above the acceptable limit of 6.5 mg/L for cold water species.

The average conductivity values that were measured prior to the dam's removal were higher both above and below the dam, as compared to the post removal averages, but not significantly different. Comparatively, relatively little change was observed upstream in the conductivity values recorded above and below the reservoir

Aquatic invertebrate samples were collected pre and post dam removal across three sites: an upstream control, the impoundment area, and downstream of the dam removal site. Overall, it was observed that the diversity and abundance of invertebrate populations changed over time at the upstream and impoundment sites, but remained relatively unchanged downstream. The former impoundment shows a dramatic increase approximately one month post-restoration when aquatic invertebrate samples were collected. In comparison, the upstream control site exhibits a decline over the same period.

Fyke net surveys conducted in 2009 and 2010, prior to the removal of the dam, indicate the presence of Atlantic salmon (Salmo salar) parr both downstream and upstream of the dam. This suggests that Atlantic salmon were able to migrate upstream despite the dam and the fact that the fish ladder was derelict. Other species observed were brook trout (Salvelinus fontinalis) above and below the dam, and white sucker (Catostomus commersonii), above the dam.

There is little difference in the electrofishing capture data pre and post-restoration with the exception of the site at Guinea Road bridge, downstream of the former dam, which was shifted slightly downstream post-restoration, affecting the comparability of catch data. Longer term monitoring of the fish communities at these sites is necessary in order to draw any conclusions regarding the impact of the project on fish populations.

Vegetation transects were surveyed post restoration in 2011 and 2012 to measure regeneration success on site. The percentage of bare soil found within the restoration area decreased from 39.8% to 0.4% while the percentage of rocks in the surveyed area increased from 23.8% to 58.3%. Vegetative cover increased noticeably, from 1.2% to 12.7%, predominantly in the form of herbaceous vegetation

From the grain size surveys conducted prior to and after the dam's removal, it was determined that removal of the dam had very little effect on the substrate size present in any of the sites assessed upstream or downstream of the impoundment area. The only change observed occurred within the former impoundment area, where a decrease in the proportion of finer particle size classes was observed post-restoration. Prior to removal of the dam, accumulated sediments were removed from the impoundment. In addition, much of the remaining finer material was liberated after the dam was removed. This likely explains the significant decrease in the proportion of grain grain sizes in all categories under 11.3mm post-restoration.

1.0 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 next 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 kilometers 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.

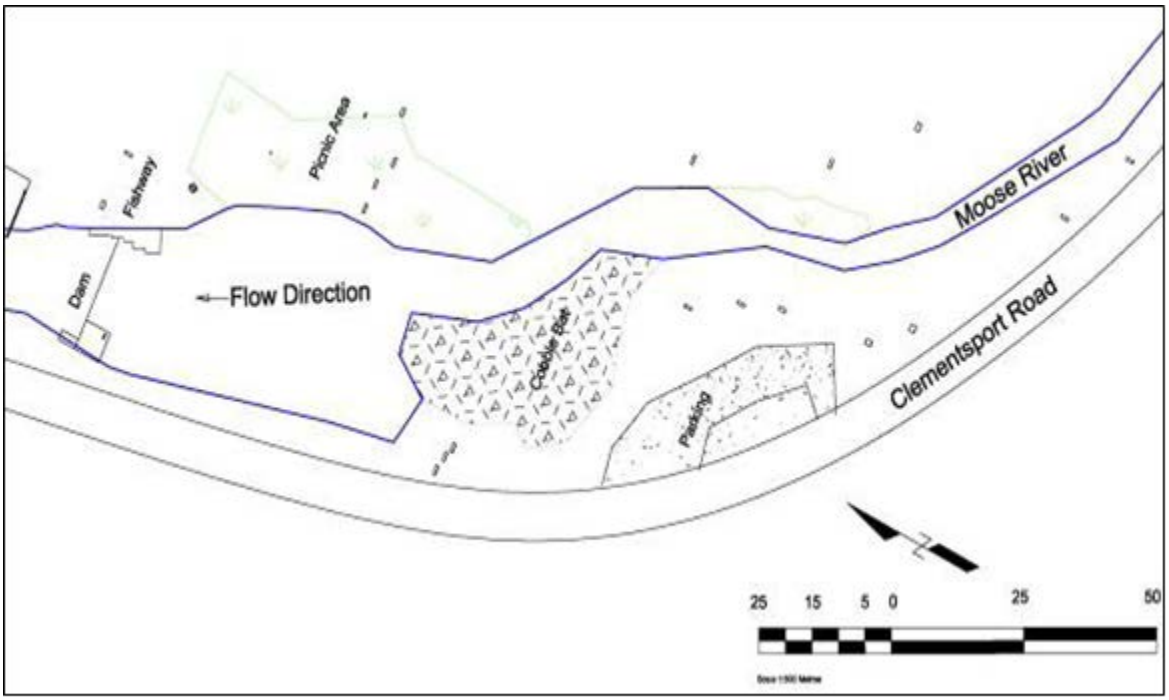

Figure 1: Clementsport Dam Site Layout Prior to Dam Removal and Floodplain Restoration.

A strong component of the Clementsport Dam removal project was the development and execution of a pre-restoration and post-restoration monitoring regimen that would allow an evaluation of the ecological effects of the dam removal and related restoration activities. This report outlines and discusses results of the pre and post-restoration monitoring activities.

1.1 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.

1.2 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 2. 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.

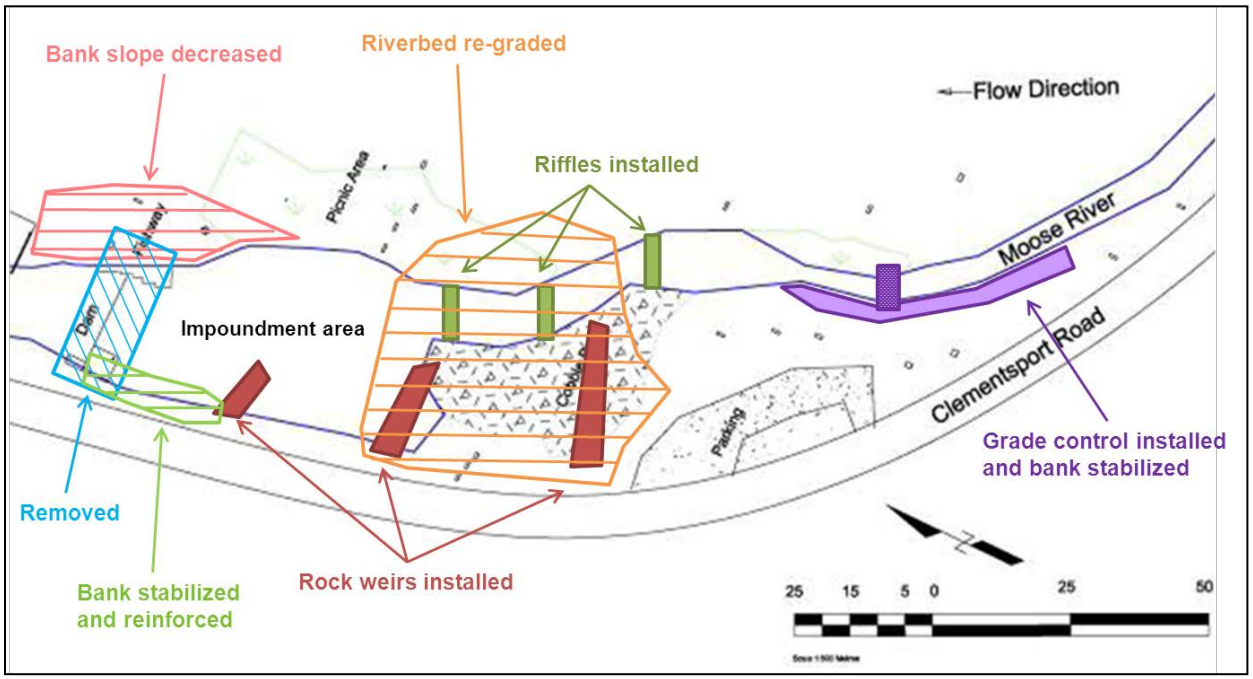

Figure 2: Overview of Floodplain Restoration Work Completed at the Clementsport Dam Site.

In addition to floodplain restoration activities, re-vegetation of exposed soils in the former impoundment area was undertaken. Disturbed soils on re-graded banks were covered in hay mulch and planted with grass seed. Native trees and shrubs were also planted throughout the restoration area beginning immediately post removal, with help from a group of 10 volunteers from the Nova Scotia Community College's Environmental Technology program. The students donated their time and effort in planting 45 white spruce seedlings and 120 willow stakes. In the spring of 2012, a total of 620 native willow and 100 native red-osier dogwood stakes were planted to facilitate re-vegetation of the former impoundment area. Nursery-grown native trees and shrubs (15 yellow birch, 5 red oak, and 15 American elder and 5 highbush cranberry) were also planted in the spring on the banks and in the floodplain of the river by the Middleton Girl Guides. An additional 170 red spruce and 30 white pine seedlings donated by Clean Nova Scotia were planted in the fall of 2012 along the upper floodplain of the impoundment by students from Annapolis West Education Center.

Table 1: Summary of Species Used in Riparian Restoration Activities.

Species Planted	Number Planted
White spruce	45
Willow sp.	740
Red-osier dogwood	100
Red oak	5
Yellow birch	15
Canadian elderberry	15
Highbush cranberry	5
Red spruce	170
White pine	30
Total	**1125**

1.3 Ecological Monitoring

1.3.1 Pre-Restoration

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

1.3.2 Post-Restoration

Post-restoration monitoring began at the project site in September 2011 immediately after the dam removal and channel work was completed, and continued to fall 2012 with photo point monitoring continuing to summer 2013. Monitoring activities included water quality measurements, photo point surveys, vegetation monitoring, transect elevation surveys, electrofishing surveys, post-restoration grain size analysis and aquatic macroinvertebrate sampling.

2.0 Methodology

Table 2: Summary of Parameters Monitored Pre and Post Restoration of the Moose River.

Parameter	#of sample stations	Location of sample stations	Sampling duration and frequency
1. Monumented Cross Sections	15	Along the monitoring reach, including downriver, impoundment and upriver areas.	Centre of Geographic Sciences (COGS) students established the cross sections. Cross sectional elevation profiles were measured in August 2009, pre-restoration, and in November-December 2012, post-restoration.
2. Photo Stations	6	1.View down river towards the impoundment and dam 2.View across the dam to the west bank 3.View across the dam to the east bank 4.Upriver view towards the impoundment and dam 5.Longitudinal profile view upriver 6.View across the impoundment area to the east bank	Permanent photo stations were established and photos taken throughout project from pre-restoration phase in 2009 until the summer of 2013.
3. Water Quality	4	1. Above dam 2. Below dam 3. Above reservoir 4. Below Reservoir	Sampling period began in May 2010 and continued until October 2012.
4. Aquatic invertebrates	3	1.Upriver 2.Impoundment 3.Downriver	Each site was sampled annually in the early fall from 2009-2012.
5. Pre Restoration Fish Habitat Utilization Survey (Fyke Net)	2	1. Below the dam 400m above salt water. 2. Upstream of impoundment 50m.	1. Fyke net set September 7 to October 4, 2009 2. Fyke net set June 3 to June 30, 2010
6. Fish Habitat Utilization Survey (Electrofisher)	4	1.Upstream of dam (reference) 2. Directly upstream of old impoundment 3. From confluence of east and west Moose River branches directly up to the downstream side of the dam 4. Guinea Road bridge	Each site was sampled annually in late August-early September in 2011 and 2012.
7. Vegetation Transects	8	Along the impoundment area, from the dam upstream to the parking lot.	Sampling occurred in the fall of 2011, and was repeated in the late summer of 2012.
8. Grain Size Surveys	6	1. Below confluence of East and West branch 2. Below the dam 3. Directly upstream of dam 4. Within the impoundment 5. Directly upstream of impoundment	Surveys occurred in August and early September prior to the dam removal. Post-removal surveys took place in November 2011, and May and October 2012.

		6. Upstream (control)	

2.1 Measured Parameters

A variety of methodologies were employed in order to collect data on the various parameters that were monitored over the course of this project. The selection of monitoring parameters and methods were in large part guided by the document Stream Barrier Removal Monitoring Guide (Gulf of Maine Council 2007) with input from the project advisory team.

2.1.1 Monumented Cross-Sections

A total of 15 monumented cross-sections were established along the Moose River, by students of the Centre of Geographic Sciences (COGS) (Figure 3). The cross-sections are spread along the river and encompass areas below the dam, across the impoundment as well as upstream of the impoundment. The purpose of these cross-sections is to monitor the horizontal and vertical changes in the river's channel. The cross-sections provide data on the elevations and distances of selected areas of the river (Gulf of Maine Council, 2007).

2.1.1.1 Cross-sectional Profiles

Cross-sectional profiles of the river channel were measured along each of the monumented cross-sections using an automatic survey level and seven meter surveyor's rod. Elevation measurements were taken at 1 meter intervals in the dry portion of the cross-sections, and at 0.5 meter intervals in the wetted channel. Additional measurements were taken at the water's edge.

2.1.1.2 Longitudinal Profile

The longitudinal profile of the channel beginning downstream of the dam at the first transect location and terminating at the farthest transect upstream was derived using the lowest elevation recorded from the cross-sectional profile surveys. This was used to represent the elevation of the stream bottom within the thalweg.

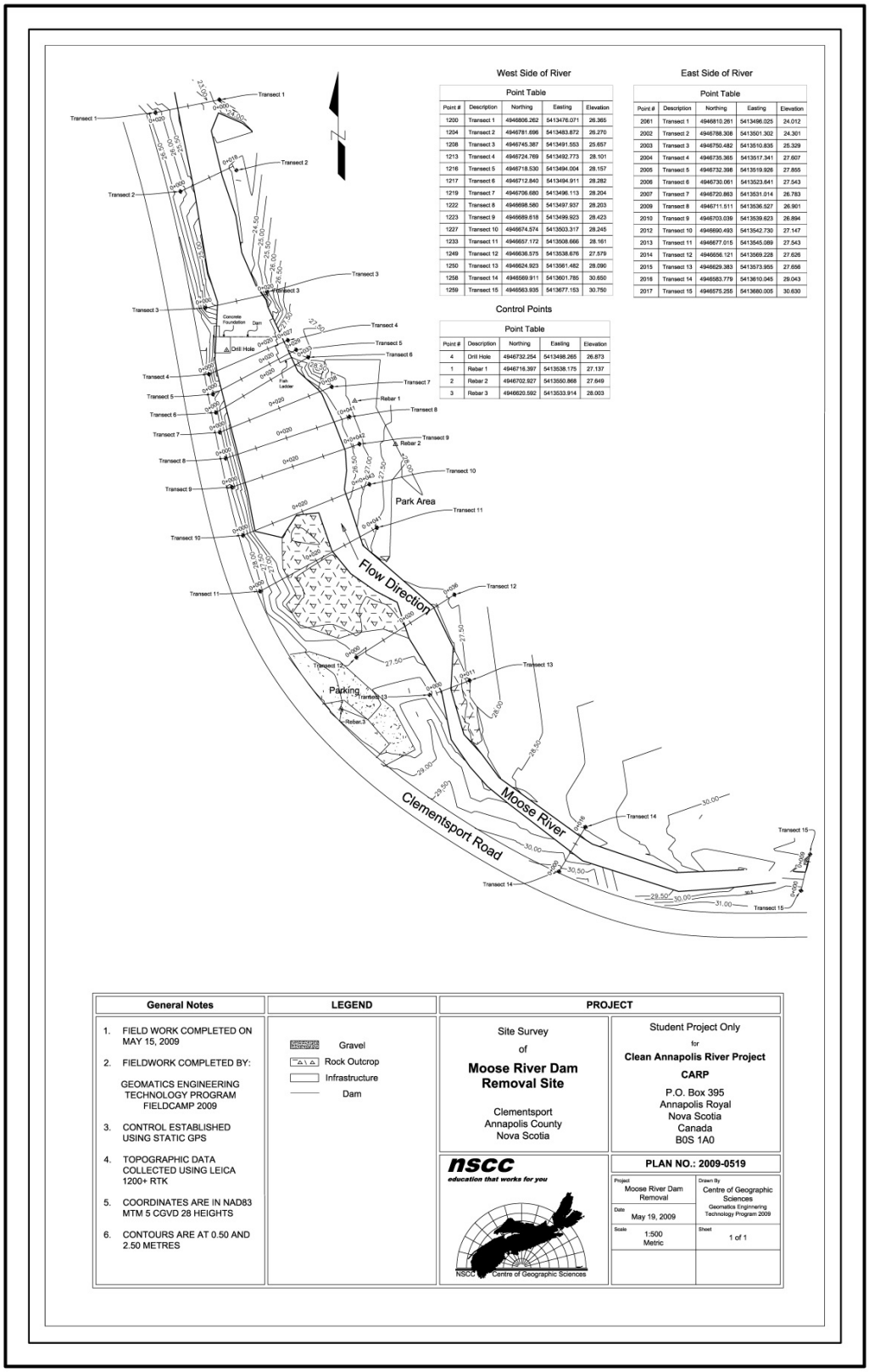

Figure 3: Location of Monumented Cross-Sections at the Restoration Site.

2.1.2 Photo Stations

Six permanent photo stations were established in 2009 to show various views of the monitoring reach;

1. A view down river towards the impoundment and dam
2. A view across the dam to the west bank
3. A view across the dam to the east bank
4. An upriver view towards the impoundment and dam
5. A longitudinal profile view upriver
6. A view across the impoundment area to the east bank

Recording photos at these stations was meant to track visual changes that may occur over time, such as changes to riparian vegetation and channel morphology. Pre-restoration photos were taken in the late summer of 2009. Post-restoration photos were taken beginning immediately after the dam removal and channel work in September of 2011, and were continued through to July of 2013.

2.1.3 Water Quality

The slowing of water movement by dams, as well as the increase in water depth particularly in the impoundment causes stratification of the water temperature as well as oxygen levels (American Rivers, 2002). In low head dams such as the one in Clementsport, the impoundment area can trap heat and when waters flow downstream, it shifts the community towards favouring warm water fish (Walks et al., 2000).

The following water quality parameters were measured monthly from spring to late summer/early fall from 2010-2012.

- Dissolved oxygen (mg/L and percent saturation)
- Water temperature (degrees C)
- Conductivity (mS/cm)
- pH

Four sites were monitored regularly for water quality. One site was upstream of the impoundment area, another just below the confluence of the East and West branches of the Moose River downstream of the dam, another upstream of the County of Annapolis owned reservoir in Clementsvale, and one below it. The coordinates of the sampling sites are given below in Table 3. All coordinates were taken using the NAD83 datum, in UTM Zone 20T.

Table 3: Locations of Water Quality Monitoring Sites on the Moose River

SITES MONITORED	ABOVE DAM	BELOW DAM	Above Reservoir	Below Reservoir
Easting	294668	294598	297760	297317
Northing	4947832	4947992	4942163	4942647
Descriptor	Near north end of parking area, where bank protection stone was installed.	Just below the confluence of the East and West Moose River branches.	Upstream of County of Annapolis water supply reservoir in Clementsvale.	Downstream of County of Annapolis water supply reservoir in Clementsvale.

2.1.4 Aquatic Invertebrates

River systems are host to many different forms of life, and many of them can help indicate the river's water quality. Of particular interest are benthic invertebrates, which are small, relatively long-lived, sedentary aquatic organisms that live in the sediments, on woody debris, or rocks present on streambeds (Bouchard Jr, 2004). These include insects (e.g. mayflies), molluscs (e.g. clams) and other organisms that spend part or all of their life cycle on the bottom of watercourses. Some aquatic invertebrates are very sensitive to pollution, while others are pollution tolerant and can thrive in a contaminated environment. Measuring the relative abundance and diversity of both sensitive and tolerant invertebrates at a site can provide information on the water quality. Monitoring of aquatic invertebrates is therefore an important feature in pre-restoration and post-restoration monitoring efforts after stream barrier removal as the change in community structure of the aquatic invertebrates at a site can provide significant information about changes in water quality and benthic habitat from barriers removal (Kanehl et al., 1997; Stanley et al., 2002).

Three benthic invertebrate sample locations were established in 2009 and sampled in the fall of 2009-2012 (see Table 4). Collection of the aquatic invertebrates followed the Canadian Aquatic Biomonitoring Network protocol (CABIN, 2012). Habitat data, water and invertebrate samples were collected from each site. Invertebrates preserved in-field and later sorted from the samples by CARP staff. These were then sent to a qualified taxonomist for identification. Data were entered into Environment Canada's CABIN database, and analytical tools available on the CABIN database website were used to calculate population metrics to compare pre and post-restoration assemblages of aquatic invertebrates at each site.

Table 4: Aquatic Invertebrate Sample Locations on the Moose River.

SITES MONITORED	ANN27	ANN28	ANN29
Easting	294772	294603	294580
Northing	4947768	4947916	4948015
Descriptor	Approximately 200m above former dam. Sampled as control site.	Within former impoundment.	Downstream of dam below confluence of East and West branches of Moose River

2.1.5 Fish Habitat Utilization Survey

2.1.5.1 Pre-Restoration Fyke Net Surveys

Surveys consisted of placing a fyke net below the Clementsport dam approximately 400 meters from salt water (the Annapolis Basin) between September 7 and October 4, 2009, and 50 meters above the impoundment from June 3 to June 30, 2010. The fyke net was placed such that it captured fish travelling upstream, and was checked every 24 hours. Fish were measured, identified to the species level and returned to the river.

2.1.5.2 Electrofishing Surveys

Electrofishing was undertaken at four sites pre-removal in 2011 and post-removal in 2012. Three passes were conducted using a Smith-Root POW backpack electrofisher in reaches barricaded using barrier nets. The site coordinates and descriptors are given below.

Table 5: Electrofishing Locations on the Moose River

SITES ELECTROFISHED	MR4	MR3	MR2	MR1
Easting	295025	294667	294602	294564
Northing	4947001	4947813	4947953	4948049
Descriptor	Upstream of dam	Directly upstream of old impoundment, adjacent to parking lot	From confluence of East and West Moose River branches directly up to the downstream side of the dam	From Guinea Road bridge to the confluence of the East and West branches in2011. Shifted downstream of bridge in 2012 due to excessive depth.

2.1.6 Vegetation Transect Surveys

The presence of low head dams, such as the Clementsport Dam, can alter the natural riparian plant communities in an area so that they are transformed from forest or shrub dominated structures to those that are more characteristic of wetland or organic-rich habitats (Nilsson and Berggren, 2000). The type of plant community present in a riparian area can have significant effects upon the river or stream it surrounds, by providing thermal refugia, instream habitat and/or cover, erosion control and a detrital food source for aquatic species (Haberstock et al., 2000; CABIN 2012). Removal of a low head dam can expose sediments in the impoundment from resulting drawdown, whose re-colonization is a primary concern for restoration of a site. Of particular concern is the potential invasion of non-native species that may out-compete native individuals (Collins et al., 2007).

The impoundment area of the Clementsport dam site was surveyed over a two year period post-removal to monitor the re-colonization success of the affected area. Transects 4 through 11 (see Figure 3) were surveyed immediately following the dam's removal, and then again a year later. Three randomly selected $1m^2$ plots were sampled along each transect, and were surveyed for the percent cover of various categories of species and substrate. Any vascular species found within the plots were reported.

2.1.7 Grain Size Surveys

Size classes and composition of the riverine sediments at the Clementsport Dam removal site were measured along 6 of the pre-established monumented cross-sections. Two transects were monitored below the dam (Transects 2 and 3), one at the site where the dam was located (Transect 4), one within the impoundment area (Transect 9), and two upstream of the impoundment area (Transects 13 and 14). Grain sizes were measured along each of these transects using the Wolman 100 pebble count. Substrate was randomly selected and measured along the intermediate axis length. Grain sizes were then classified under various size classes. Refer to Figure 3 for transect locations and coordinates.

3.0 Results

The monitoring results from the pre and post-restoration surveys described in the preceding section were analyzed and are presented and discussed in this section.

3.1 Monumented Cross-Sections

3.1.1 Cross-Sectional Profiles

Elevations recorded from the elevation surveys along the monumented cross-sections were plotted against the horizontal distance between elevation points. This gives a graphical representation of the cross-sectional profile of the river channel pre and post-restoration. Both pre and post-restoration profiles were plotted on the same graph for each transect location to allow for easy visual comparison.

Four cross-sections are presented and discussed in this section. Please refer to Appendix B.1for the remaining transect charts, and appendix A.6 for the cross-sectional elevation data.

3.1.1.1 Transect 4

Transect 4 is located immediately upstream of the former dam, and traverses the site of the fish ladder that existed in conjunction with the dam. The location of the fish ladder can be seen in the extreme fluctuations in elevation between 20 and 25 meters across the pre restoration transect. The change in grade between 25 and 30 meters is due to the regrading of the eastern bank. The decrease in bottom elevation between 10 and approximately 22 meters post restoration is likely due to the removal of accumulated sediments from behind the dam prior to removal, and the development of a new channel can be seen by the pre and post restoration elevation changes from10 to 25 meters across the transect.

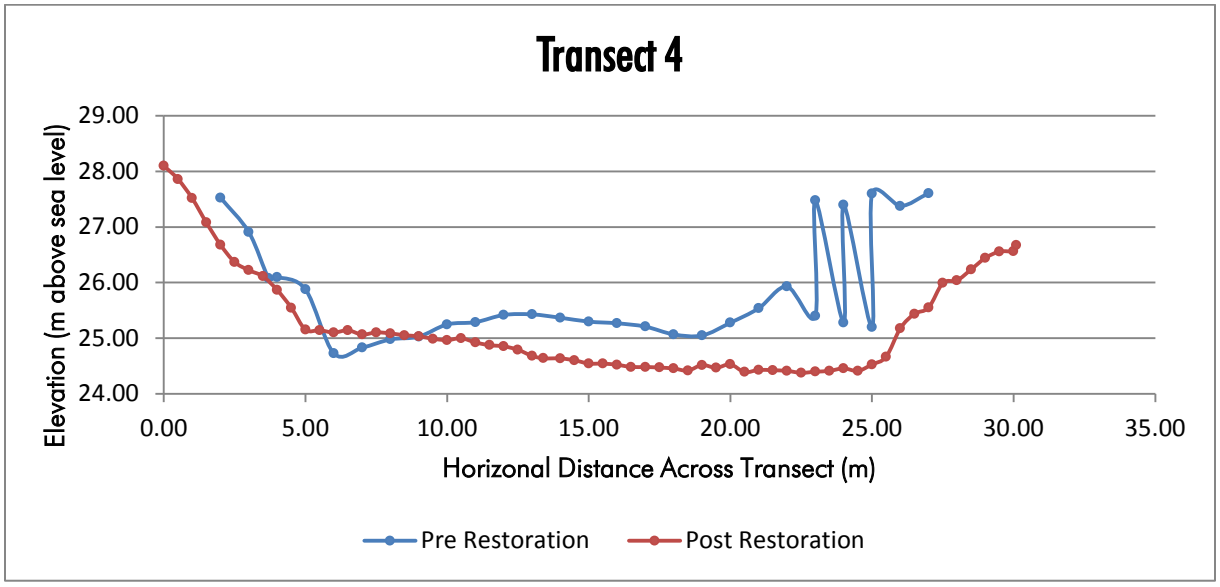

Figure 4: Cross-Sectional Profile at Transect 4

3.1.1.2 Transect 7

Transect 7 is located 25 meters upstream of the former dam, within the impoundment area. Some change in profile can be observed across this transect. Most notably, the bottom elevation seems to have flattened out between 7.5 and 30 meters. This may change in time as the

channel through the former impoundment continues to establish itself, but at the moment may have implications for fish passage, as the channel is wide and shallow, and may not prove passable in summer water level conditions.

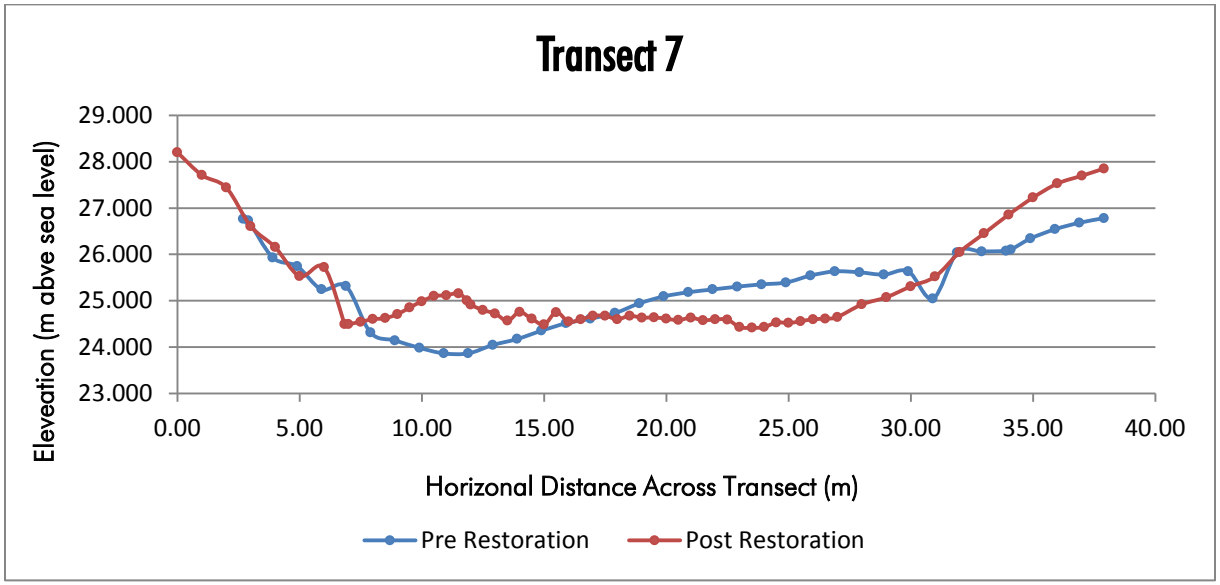

Figure 5: Cross-Sectional Profile at Transect 7

3.1.1.3 Transect 10

Transect 10 is located 55 meters upstream of the former dam, within the section of channel that underwent re-grading (see figure 2). The overall change in elevation observed post-restoration is likely attributable to the re-grading work. It should be noted that the thalweg elevation seen between 5 and 10 meters demonstrates little change post-restoration.

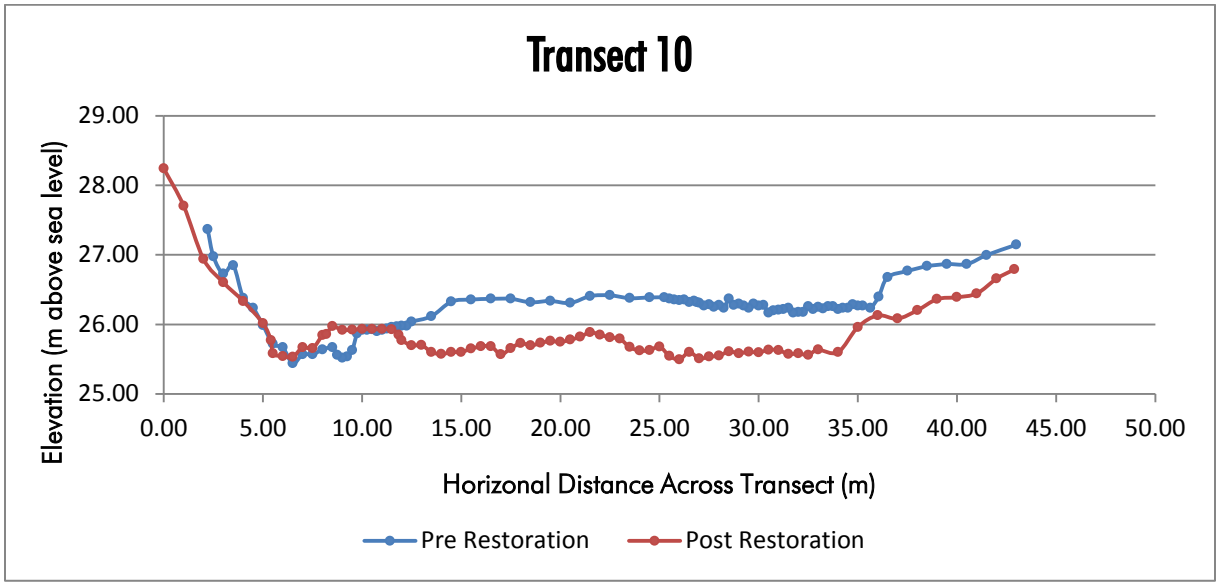

Figure 6: Cross-Sectional Profile at Transect 10

3.1.1.4 Transect 13

Transect 13 is located 120 meters upstream of the former dam, outside of the restoration area. Little change is seen in the cross-sectional profile at this site.

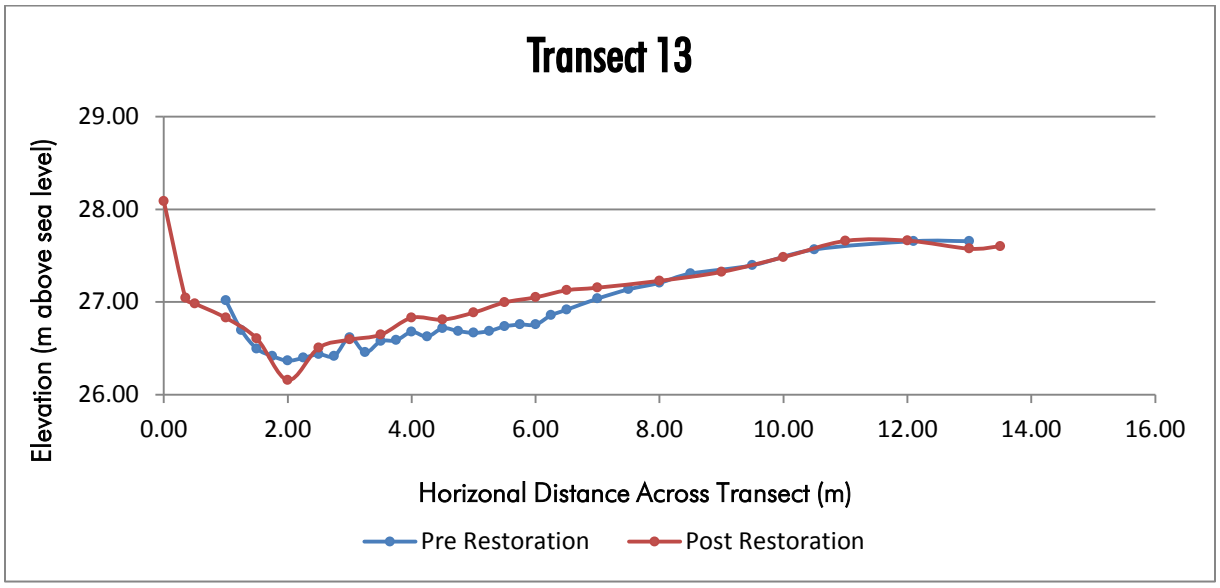

Figure 7: Cross-Sectional Profile at Transect 4

3.1.2 Longitudinal Profile

The longitudinal profiles were derived using the lowest elevation recorded across the monumented cross-sections when surveying the cross-sectional profiles as a proxy for the thalweg depth. The longitudinal distances between measurements were determined by plotting the center of each transect and measuring the distance between them. The center of each transect was used instead of the actual location of the elevation measurement along the transect because of the significant change in the channel profile that occurred over the life of the project. The shift in the location of the thalweg along the transect caused a change in the longitudinal relationship between sites, making the plotted longitudinal profiles less comparable. Using the transect centers to define the longitudinal relationship between elevation measurements allows comparison of the longitudinal profiles pre and post-restoration. It should be noted that the monuments for Transects 1, 3 and 4 were lost post-restoration; therefore they are excluded from both the pre and post-restoration longitudinal profiles to maintain consistency.

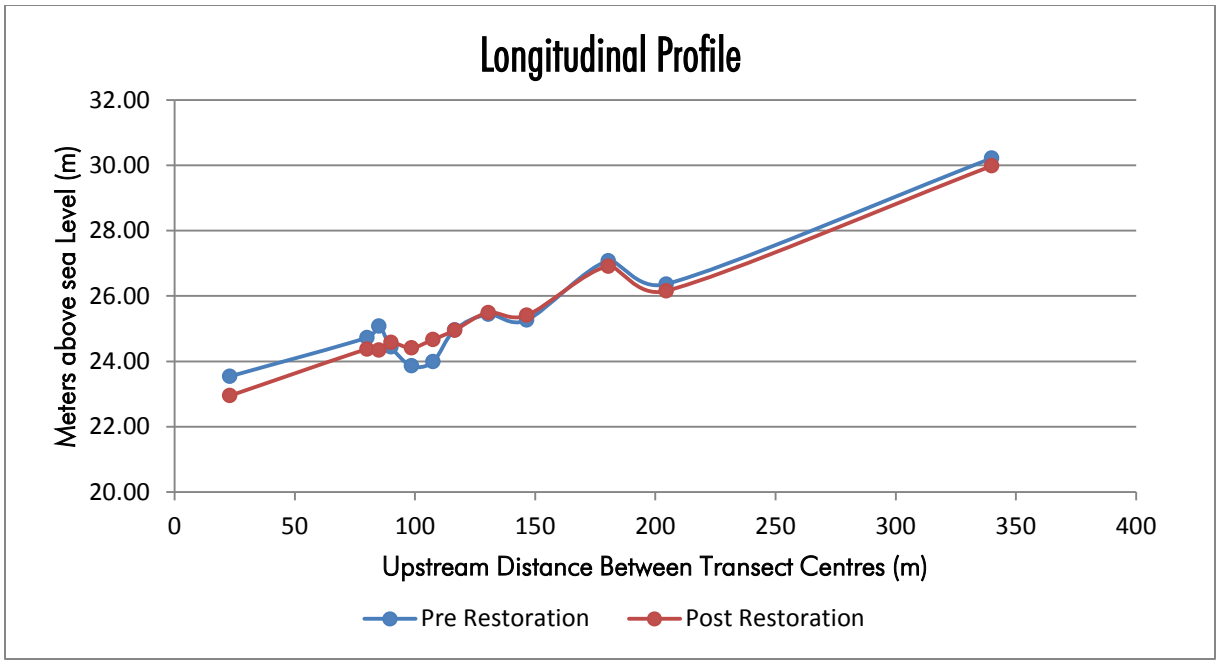

Figure 8: Longitudinal Profile

The longitudinal profiles pre and post restoration are relatively consistent, indicating little overall change in the channel slope due to the restoration work undertaken. A slight decrease at the third point upstream (transect 4) is in the portion of the channel immediately upstream of the former dam, and likely represents the removal of the accumulated sediments behind the dam. The increase in elevation upstream of that point is likely due to the former impoundment filling in with material transported from upstream.

3.2 Photo Point Monitoring Stations

3.2.1 Station 1: Downstream towards the impoundment and dam

The series of photos at Station 1 depict the changes in the impoundment area and surrounding riparian zone throughout the life of the project. Of note are the shift in the channel characteristics in the former impoundment area and the changes in vegetative cover in the surrounding riparian zone.

The presence and extent of the headpond prior to the dam removal are seen in Figure 9. A shift to lotic conditions and the establishment of a channel are observable in Figures 10 through 12. It should be noted that in Figure 10, which shows the channel immediately after the dam removal and channel work, the wetted channel is prominently to the right within the former impoundment, flowing through a series of constructed riffles as intended in the restoration design (refer to section 1.2). Weirs installed along the left side of the former impoundment were intended to direct flow to the right and trap and build sediment to further establish the channel. It can be observed in Figures 11 and 12 that the wetted channel has shifted to the left of the former impoundment, and is flowing over the weirs. A small proportion of the flow through the site still runs through the constructed riffles, but it appears that the primary channel is being established along the left side of the former impoundment.

Changes in riparian vegetation are quite apparent in this series of photos. The presence of scattered shrubs and herbaceous vegetation can be seen in Figure 9 prior to the disturbance caused by the dam removal and channel work. Little change is noted between Figures 10 and 11. Figure 12 shows a dramatic change in vegetative cover. Shrubs and herbaceous vegetation appear to be colonizing the exposed soils in the former impoundment quite aggressively.

Figure 9: Station 1 Pre-Restoration August 9, 2009

Figure 10: Station 1 Post-Restoration October 18, 2011

Figure 11: Station 1 Post-Restoration July 6, 2012

Figure 12: Station 1 Post-Restoration I July 29, 2013

3.2.2 Station 2: Across the dam to the west bank

The series of photos at Station 2 depict the changes at the site of the former dam, looking across the channel to the west bank. Of note are the removal of the dam and the changes in channel characteristics at the site.

Figure 13 shows the dam and accumulated sediments in the headpond at low flow. Figure 14 shows the site immediately after the dam and the majority of the accumulated sediments were removed. The prevalence of fine substrate material behind the former dam is apparent in Figure 14, as is the presence of a pool at the former tailwater. Figure 15 shows the establishment of the channel at station 2, and a shift in substrate to a cobble/boulder composition that is more consistent with the substrate found in reaches outside of the former impoundment. Figure 15 also shows that the plunge pool below the dam has been filled in.

Figure 13: Station 2 Pre-Restoration September 11, 2009

Figure 14: Station 2 Post-Restoration September 14, 2011

Figure 15: Station 2 Post-Restoration October 2, 2012

3.2.3 Station 3: Across the dam to the east bank

The series of photos at Station 3, similarly to Station 2, depict the changes at the site of the former dam, but looking across the channel to the east bank. Of note are the removal of the dam, the changes in channel characteristics at the site, and the changes in riparian vegetation at the site.

Figure 16 shows the dam and the presence of the headpond. Figure 17 shows the site immediately after the dam was removed and the prevalence of fine substrate material behind the former dam, as well as the presence of a pool at the former tailwater. Figure 18 shows the establishment of the channel at Station 2, and a shift in substrate to a cobble/boulder composition that is more consistent with the substrate found in reaches outside of the former impoundment.

The presence of hay mulch and planted white spruce along the re-graded eastern bank can be seen in Figure 17. Figure 18 shows grasses colonizing the eastern bank, and sprouting willow and dogwood stakes immediately behind the location of the former dam on the west bank. Figure 19 shows further colonization of exposed soil by vegetation.

Figure 16: Station 3 Pre-Restoration August 6, 2009

Figure 17: Station 3 Post-Restoration September 14, 2011

Figure 18: Station 3 Post-Restoration July 6, 2012

Figure 19: Station 3 Post-Restoration July 29, 2013

3.2.4 Station 4: Upriver view towards the impoundment and dam

The series of photos at Station 4 depict the changes at the site of the former dam, looking upstream. The same observations can be made as for Stations 2 and 3 from an alternate perspective.

Figure 20: Station 4 Pre-Restoration Aug. 6, 2009

Figure 21: Station 4 Post-Restoration September 14, 2011

Figure 22: Station 4 Post-Restoration July 6, 2012

Figure 23: Station 4 Post-Restoration July 29, 2013

3.2.5 Station 5: Longitudinal profile view upriver

The series of photos at Station 5 depict an upstream view of the channel between Guinea Road bridge and the former dam. The dam is visible in Figure 24, and absent in Figures 25 through 27. The channel characteristics appear consistent throughout the life of the project at this site, indicating little change in the downstream channel due to the removal of the dam.

Figure 24: Station 5 Pre-Restoration August 6, 2009

Figure 25: Station 5 Post-Restoration September 14, 2011

Figure 26: Station 5 Post-Restoration July 6, 2012

Figure 27: Station 5 Post-Restoration July 29, 2013

3.2.6 Station 6: Across the impoundment area to the east bank

The series of photos at Station 6 represent a diagonal view across the upstream portion of the former impoundment into the upstream channel facing toward the eastern bank and upstream. Of note are the changes in the channel characteristics and riparian vegetation within the same reach as Station 1, from an alternate perspective.

As is observed at Station 1, the channel is establishing itself along the left side (facing downstream) of the former impoundment over the constructed weirs, resulting in a pool/riffle sequence.

As with Station 1, little change is noted in riparian vegetation until 2013 (Figure 31) whereupon extensive colonization of exposed soils is observed.

Figure 28: Station 6 Pre-Restoration September 8, 2009

Figure 29: Station 6 Post-Restoration September 14, 2011

Figure 30: Station 6 Post-Restoration June 1, 2012

Figure 31: Station 6 Post-Restoration July 29, 2013

3.3 Water Quality

The water quality results obtained from the pre and post-restoration monitoring were averaged and plotted for each of the monitored parameters, and are plotted below. The additional monitoring sites above and below the reservoir have also been included for comparative purposes. Refer to Appendix A.2 for detailed water quality data.

3.3.1 Temperature

Water temperature, like dissolved oxygen, serves as a broad indicator of water quality. The temperature of water has a direct bearing on the aquatic species present and their abundance. For example, trout and salmon species experience stress at water temperatures in excess of 20ºC, with lethality occurring after prolonged exposures to temperatures over 24ºC (MacMillan et al., 2005).

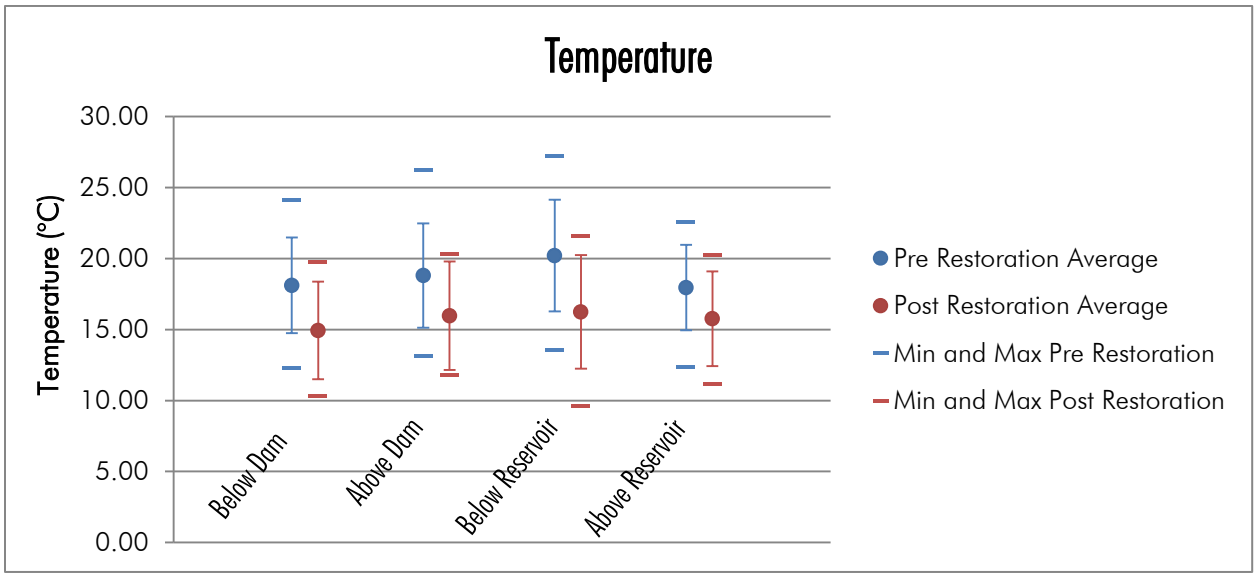

Figure 32: Temperature Data Collected at the Clementsport Dam Removal Site Pre and Post-Restoration.

The water samples taken prior to the dam's removal in 2011 showed overall higher average temperatures across all sites, as compared to the post-restoration samples, which had lower average temperatures. The sites monitored above and below the reservoir showed the same temperature decrease, and these were well removed from the site of the dam's removal. Therefore, it is likely that the observable overall decrease in average temperatures post-restoration is more likely a result of climactic fluctuations between monitoring years. There is a consistent temperature increase from the Above Reservoir and Below Reservoir sites. This is most likely attributable to the design of the reservoir, which draws upon the warmer surface waters and transfers them downstream.

3.3.2 pH

pH is a measure of the acidic/basic nature of water and is determined by measuring the concentration of the hydrogen ion (H^+). It is expressed on a logarithmic scale from 0 to 14, with zero being the most acidic and 14 the most basic. As pH is an inverse logarithmic scale, every unit decrease in the pH scale represents a tenfold increase in acidity. To ensure the health of freshwater aquatic life, pH levels should not fall outside the range of 6.5-9.0 (CCME, 2002). Levels below 5.0 are known to adversely affect many species of fish, including salmon and trout. pH varies naturally depending on a river system's underlying bedrock and soil composition, as well as by the amount of

aquatic plants and organic material present, but can also be influenced by anthropogenic means such as acid precipitation and increased atmospheric CO_2 concentrations (Dodds and Whiles, 2010).

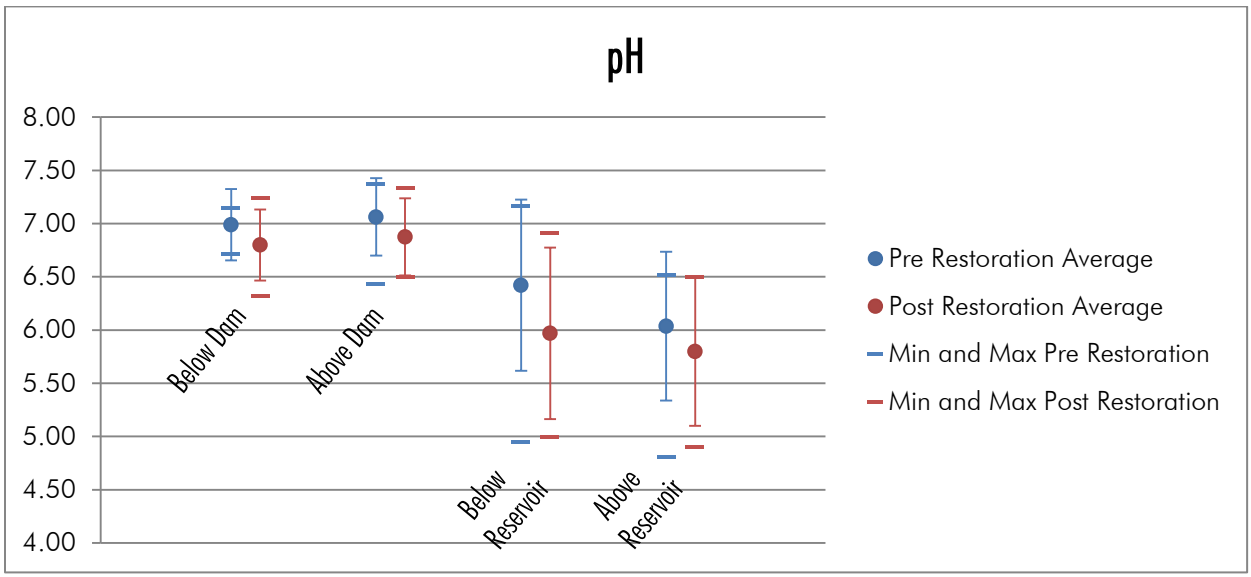

Figure 33: pH Data Collected from Sites Monitored on a Monthly Basis Pre and Post-Restoration.

Figure 33 shows the average, as well and minimum and maximum pH values recorded from the water quality monitoring at the Clementsport Dam and Reservoir sites. The pH data collected at the four monitoring sites did not display a significant change between pre-restoration and post-restoration average values. However, the sites downstream (Above and Below Dam) displayed a higher pH average than further upstream. The pH ranges upstream near the reservoir displayed a much higher range of values than those near the dam.

3.3.3 Dissolved Oxygen

Dissolved oxygen (DO) is a widely used and important general indicator of the health of a river system (Addy and Green, 1997). Aquatic organisms require oxygen in solution for internal respiration. Oxygen in the atmosphere, which is readily available to terrestrial organisms, must be dissolved into the water and is present at much lower concentrations in the aquatic environment. Wind, wave action, rainfall, and photosynthesis help aerate waterways and increase dissolved oxygen levels. Sewage, lower rates of photosynthesis, eutrophication and limited diffusion from the atmosphere due to ice cover can all lead to decreased oxygen levels.

As the temperature of water decreases, a greater concentration of oxygen is able to dissolve in the water. DO levels are also dependent to a lesser degree on atmospheric pressure and water salinity. The amount of oxygen in water can be reported in two ways, either as a concentration measurement (mg/L) or as percent saturation. Percent saturation represents the actual amount of dissolved oxygen in an amount of water compared to the maximum amount that can be dissolved. This value is given as a percentage. Water reaches its saturation point when it can no longer dissolve any additional oxygen for a given temperature. High levels of photosynthesis or turbulent conditions can "supersaturate" the water, resulting in saturation levels greater than 100%. Dissolved oxygen levels below 60% saturation are known to cause stress to aquatic life, particularly cold-water fish species (Mackie, 2004). Comparatively, CCME guidelines for concentrations of dissolved oxygen (mg/L) for the protection of freshwater warm-water species is 5.5 mg/L, while that for cold water species is 6.5 mg/L (CCME, 2002).

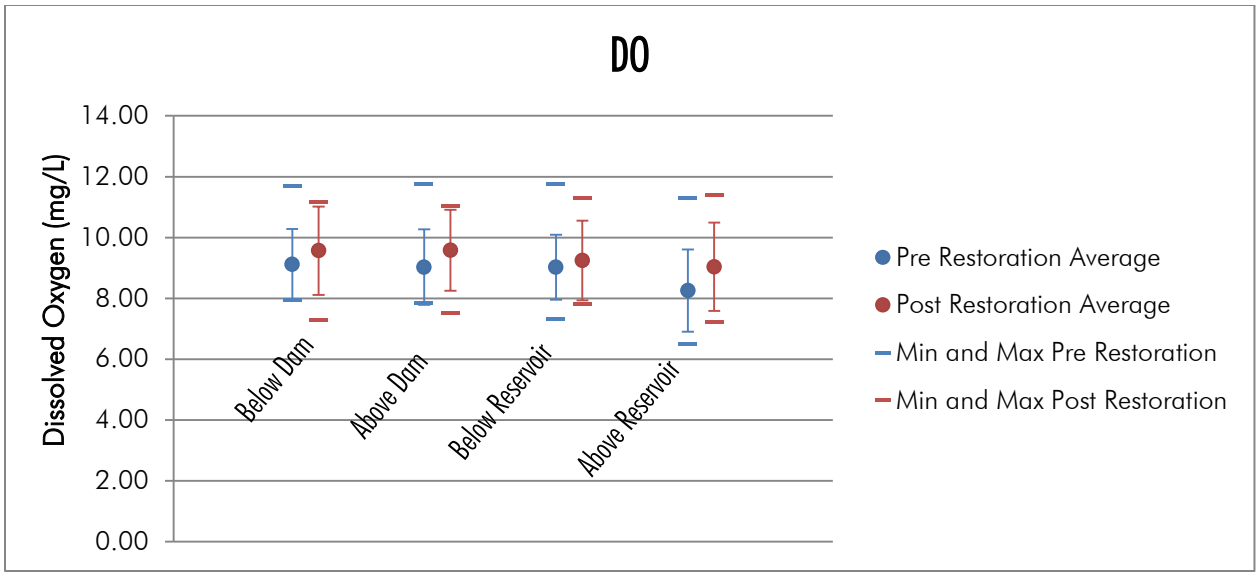

Figure 34: Dissolved Oxygen Average Values for Sites Monitored Pre and Post-Restoration.

Figure 34 shows the DO (mg/L) levels recorded as part of the water quality monitoring regime at Moose River. There was no significant observable change in the DO levels between sites or from the pre-restoration and post-restoration data sets. DO levels were well above the acceptable limit of 6.5 mg/L for cold water species. The slight observable increase between the average values recorded pre-restoration versus post-restoration are more likely attributable to the noted decreased in water temperature between years, which would have allowed a greater quantity of oxygen to dissolve into the water column.

3.3.4 Conductivity

The conductivity of a body of water is a measure of how well it can pass an electrical current, and is largely influenced by the amount of dissolved ions that are present in the water column (Said et al., 2004; Dodds and Whiles, 2010). The removal of a low head dam has the potential to affect the concentration of dissolved ions in a river by releasing impoundment sediments downstream, or exposing areas of riverine sediments to oxygen and complex biogeochemical reactions (Ahearn and Dahlgren, 2005).

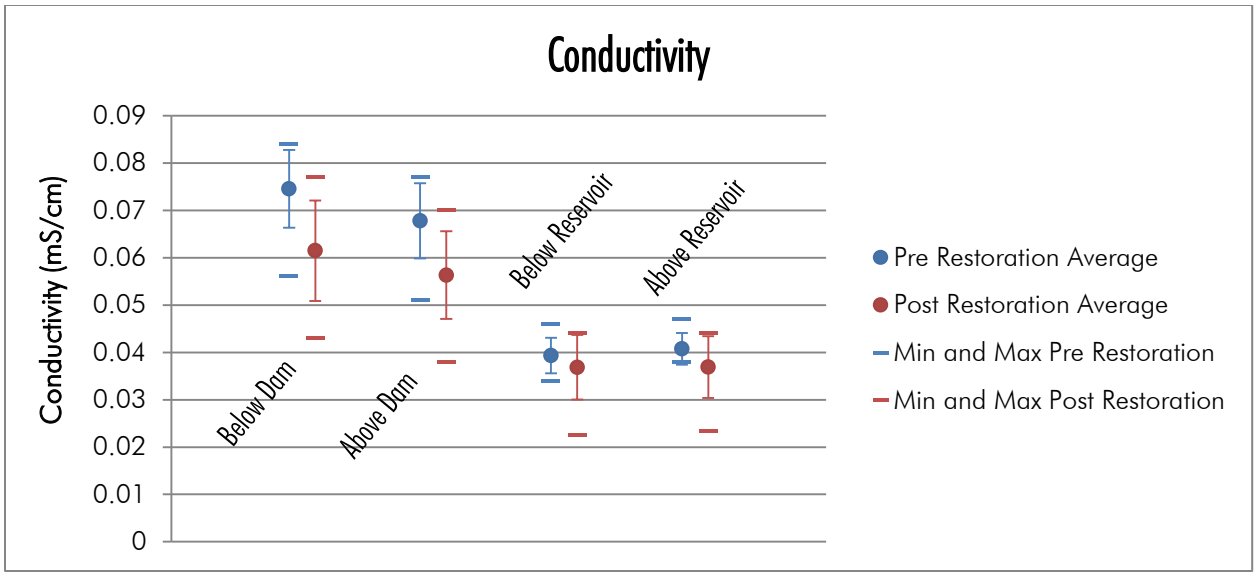

Figure 35: Average Conductivity Values for Sites Monitored Pre and Post-Restoration.

The conductivity results of pre and post-restoration monitoring at the Clementsport Dam removal site are displayed in Figure 35 in the 'Above Dam' and 'Below Dam' sets of monitoring data. The average conductivity values that were measured prior to the dam's removal were higher both above and below the dam, as compared to the post removal averages, but not significantly different. It is possible that the decrease may be attributable to the loss of fine sediments from the dam removal site. Comparatively, relatively little change was observed upstream in the conductivity values recorded above and below the reservoir.

3.4 Aquatic Invertebrates

Aquatic invertebrate data was collected from three sites on the Moose River: ANN27 (upstream control site), ANN28 (within former impoundment) and ANN29 (downstream of former dam). The data was used to calculate community metrics using the online tools available through Environment Canada's CABIN database. These metrics can be used to compare conditions at each site for two years prior to restoration (2009 and 2010), immediately post-restoration (2011), and one year post restoration (2012). Descriptions of each metric and the results for each monitoring site are presented below.

3.4.1 Percent EPT

EPT stands for three different orders of insects: Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies). These orders are particularly sensitive to pollution and undesirable water quality. They only choose to live in clean, flowing, and well oxygenated water. Their presence means that the water is generally good quality (Watershed Science Institute). Using the percent abundance of these organisms, it is possible to get a good idea of the water quality and monitor its restoration. The more EPT individuals, the more likely the water is of good quality.

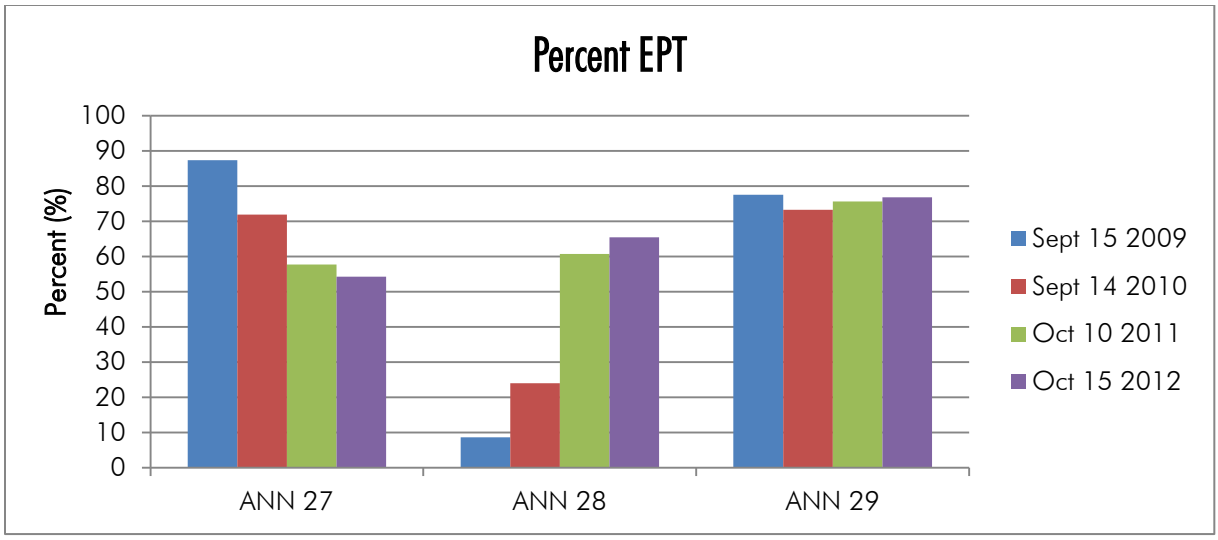

Figure 36: Percent EPT Values for Each Invertebrate Monitoring Site 2010-2012

The percent EPT value at ANN28 (within the former impoundment) shows a dramatic increase approximately one month post-restoration when aquatic invertebrate samples were collected. In comparison, ANN27 (upstream control site) exhibits a decline in percent EPT over the same period. ANN29 (downstream of former dam) exhibits little change over the monitoring period. Additionally, percent EPT values at ANN28 appear to have increased to levels more consistent with those found at ANN27, the upstream control site. The shift in EPT values potentially indicates that the habitat characteristics and water quality within the former impoundment improved, becoming more consistent with adjacent reaches upon removal of the dam and related restoration work.

3.4.2 EPT/Chironomids+EPT

The number of EPT individuals divided by the sum of Chironomid individuals and EPT individuals is used as a diversity indicator as well as a general water quality indicator. Chironomids are a family of midges that are used because they are quite common and are mostly tolerant to pollution (J. Reese Voshell, Jr., 2002). In general EPT/Chironomids+EPT serves as a ratio between tolerant families and intolerant families. The higher the value is, the higher the proportion of intolerant individuals present and the more likely the water is of good quality.

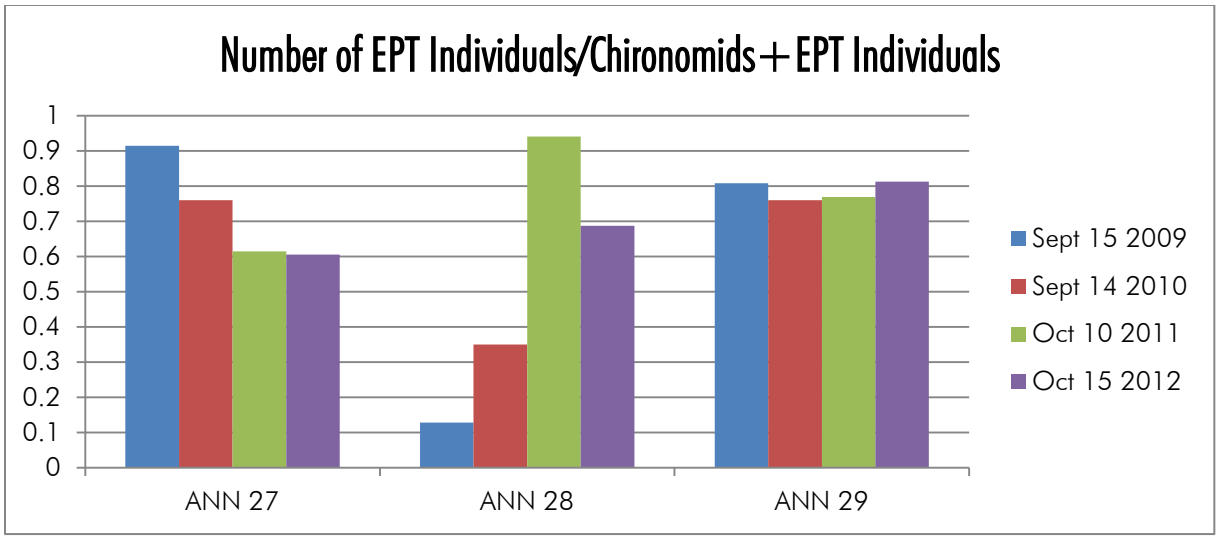

Figure 37: EPT/Chironomids+EPT for Each Invertebrate Monitoring Site 2010-2012

Similar to percent EPT, a sudden increase is noted at ANN28 for EPT/Chironomids+EPT. This is followed by a slight decrease between 2011 and 2012 to levels that fall more closely in line with those observed at ANN27 and ANN29 for both years. ANN27 exhibits a decrease in EPT/Chironomids+EPT that may suggest an increase in chironomids rather than decrease in EPT taxa present. This would also explain the decrease in percent EPT noted at the same location. ANN29 exhibits little change in EPT/Chironomids+EPT. The overall increase in EPT/Chironomids+EPT noted in the restoration area indicates a higher proportion of pollution intolerant taxa vs. pollution tolerant taxa suggesting a general improvement in water quality within the former impoundment.

3.4.3 Hilsenhoff Index

The Hilsenhoff Index is used as a broad indicator of water quality using invertebrates sampled at a location. The index can be read in terms tolerance to pollution. The scale ranges from 1 to 10 representing degrees of pollution tolerance. A value of 1 indicates that the organism is absolutely intolerant to pollution while a value of 10 indicates that the organism can live in highly polluted water. Each family is assigned a value of 1 through 10 based on their tolerance (Zimmerman, M. C. 1993). When the sample is complete, the number of organisms and their Hilsenhoff values are averaged. The result is a value between 1 and 10 indicating the quality of the water.

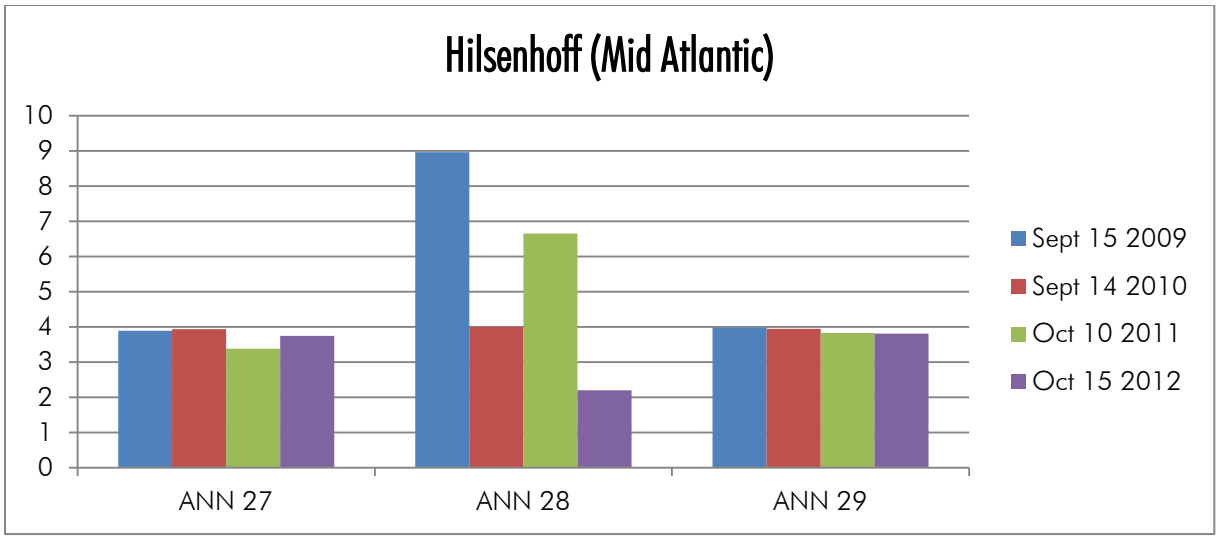

Figure 38: Hilsenhoff Index Values for Each Invertebrate Monitoring Site 2010-2012

ANN 27 and 29, respectively upstream and downstream of the restoration area, indicate little change in Hilsenhoff Index values over the monitoring period. ANN28, conversely, exhibits marked changes in Hilsenhoff Index values between each monitoring year. The improvement between 2009 and 2010 may be due to the dam becoming undercut, allowing more flow through. The higher index in 2011 may be attributable to disturbance from the dam removal and restoration activities. The general improvement in the Hilsenhoff Index at ANN28 indicates a shift in the invertebrate community toward a higher proportion of pollution intolerant taxa. This suggests a general improvement in water quality within the former impoundment.

3.5 Fish Habitat Utilization Surveys

3.5.1 Fyke Net Survey

Fyke net surveys conducted prior to the removal of the dam indicate the presence of Atlantic salmon (Salmo salar) parr both downstream and upstream of the dam. This suggests that Atlantic salmon were able to migrate upstream despite the dam and the fact that the fish ladder was derelict. It is possible that some adults were able to migrate upstream to spawn due to higher fall water levels, resulting in the presence of Atlantic salmon parr above the dam. Other species observed were brook trout (Salvelinus fontinalis) above and below the dam, and white sucker (Catostomus commersonii), above the dam. Refer to Appendix A.3 for detailed fyke net catch data

Table 6: Fyke Net Data Below Dam

Dates in-place	9/9/2009-4/10/2009
SPECIES AND NUMBERS CAUGHT	
American Eel	3
Atlantic Salmon parr	3
Brook Trout	2
White Sucker	0
TOTAL # FISH	8
Descriptor	400 m upstream of saltwater.

Table 7: Fyke Net Data Above Dam

Dates in-place	30/6/2010-7/7/2010
SPECIES AND NUMBERS CAUGHT	
American Eel	0
Atlantic Salmon parr	6
Brook Trout	2
White Sucker	3
TOTAL # FISH	11
Descriptor	50 m upstream of impoundment.

3.5.2 Electrofishing Surveys

The following tables show numbers and species captured during the electrofishing surveys conducted pre and post-restoration. Little difference is observed in capture data pre and post-restoration with the exception of MR1. This is due to the fact that the site was shifted downstream post-restoration, as the location was too deep to electrofish effectively pre-restoration, which is reflected by the exceptionally low catch success. The fact that little difference in catch data at MR2, MR3 and MR4 is observed is not surprising given the short period post-restoration in which the second post-restoration were conducted. Longer term monitoring of the fish communities at these sites is necessary in order to draw any conclusions regarding the impact of the project on fish populations. Refer to Appendix A.4 for detailed electrofishing catch data.

Table 8: Pre-Restoration Electrofishing Catch Summary

SITE(S) ELECTROFISHED	MR4	MR3	MR2	MR1 (US of Bridge)
Easting	295025	294667	294602	294583
Northing	4947001	4947813	4947953	4948025
SPECIES AND NUMBERS CAUGHT				
American Eel	31	28	23	2
Atlantic Salmon parr	0	1	0	0
Brook Trout	1	1	5	0
Creek Chub	1	4	0	0
White Sucker	0	1	1	0
TOTAL # FISH	33	35	29	2
Descriptor	Upstream of dam	Directly upstream of impoundment, adjacent to parking lot	From confluence of east and west Moose River branches directly up to the downstream side of the dam	From pool under bridge up to East & West confluence points

Table 9: Post-Restoration Electrofishing Catch Summary

SITE(S) ELECTROFISHED	MR4	MR3	MR2	MR1 (DS of Bridge)
Easting	295025	294667	294602	294564
Northing	4947001	4947813	4947953	4948049
SPECIES AND NUMBERS CAUGHT				
American Eel	25	34	27	48
Brook Trout	1	5	2	3
White Sucker	0	0	0	2
TOTAL # FISH	26	39	29	53
Descriptor	Upstream of dam	Directly upstream of old impoundment, adjacent to parking lot	From confluence of east and west Moose River branches directly up to the downstream side of the dam	From downstream of bridge up until pool under the bridge.

3.6 Vegetation Surveys

Vegetation data for all of the eight transects (total of 24 plots) were combined for each monitoring year to represent the overall change in riparian vegetation coverage and types between the year the dam was removed (2011), and the following summer (2012). Bare soil, rocks and water are also represented. The information is presented in this way due to the fact that randomized selection of vegetation plots along cross sections make the data less comparable between years for each cross-section than for the site as a whole. Detailed vegetation survey data can be found in Appendix A.5. Vegetation graphs for each transect for 2011 and 2012 can be found in Appendix B.3.

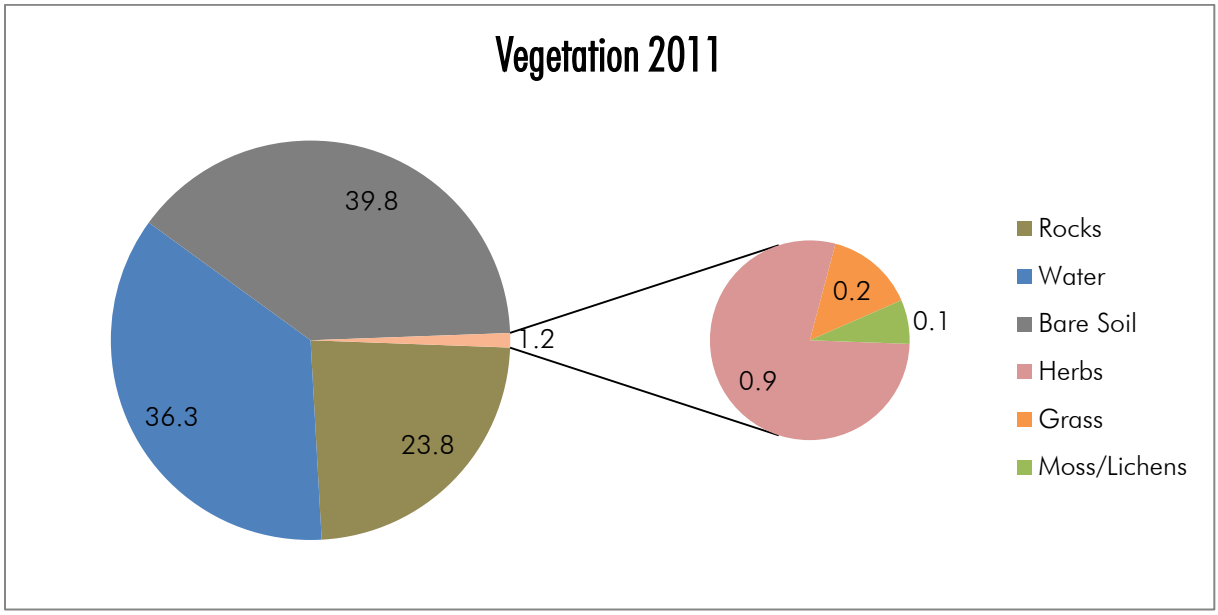

Figure 39: Combined Vegetative Cover 2011

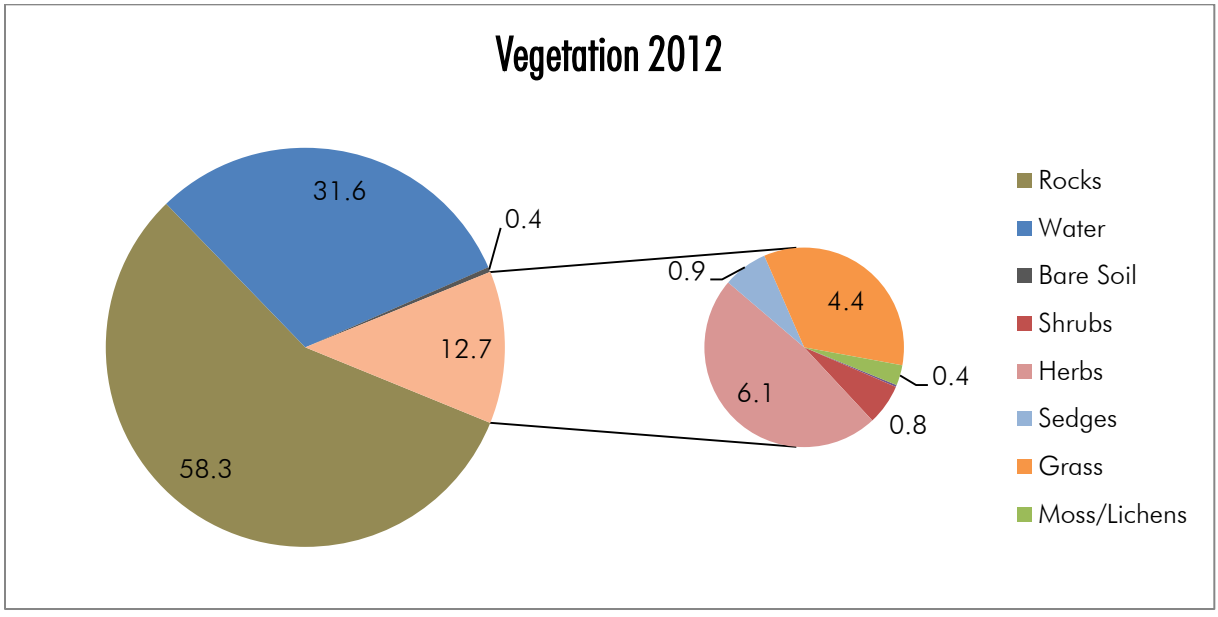

Figure 40: Combined Vegetative Cover 2012

The most marked change between 2011 and 2012 is in the percentage of bare soil found within the restoration area, decreasing from 39.8% to 0.4% of the surveyed area. This is likely due primarily to residual sediments from the impoundment being washed downstream between monitoring years. Colonization by vegetation may also have played a minor role. Following bare soil, the percentage of rocks in the surveyed area saw the greatest change increasing from 23.8% to 58.3%. This is nearly proportional with the decrease in bare soil, possibly indicating that bare soil being washed downstream exposed larger substrate material underneath. The percentage of water within the surveyed area changed very little, as would be expected barring drastically different flow conditions during surveys. Vegetative cover increased noticeably from immediately after dam removal and channel work to the following summer, increasing from 1.2% to 12.7%. Herbs make up the largest proportion of vegetation in both survey years, followed by grasses. In 2012, Herbs make up proportionally less of the vegetation types due to an increase in grasses, and the presence of sedges and shrubs in the surveyed area.

3.7 Grain Size Surveys

Substrate composition expressed as grain size frequency is shown graphically for each of the transects from which Wolman 100 pebble counts were taken. The graphs represent the cumulative compossition of substrate materials within each successive size class. Appendix A.1 contains detailed grain size data. Refer to Appendix B.2 for graphs representing percent composition of particle size classes.

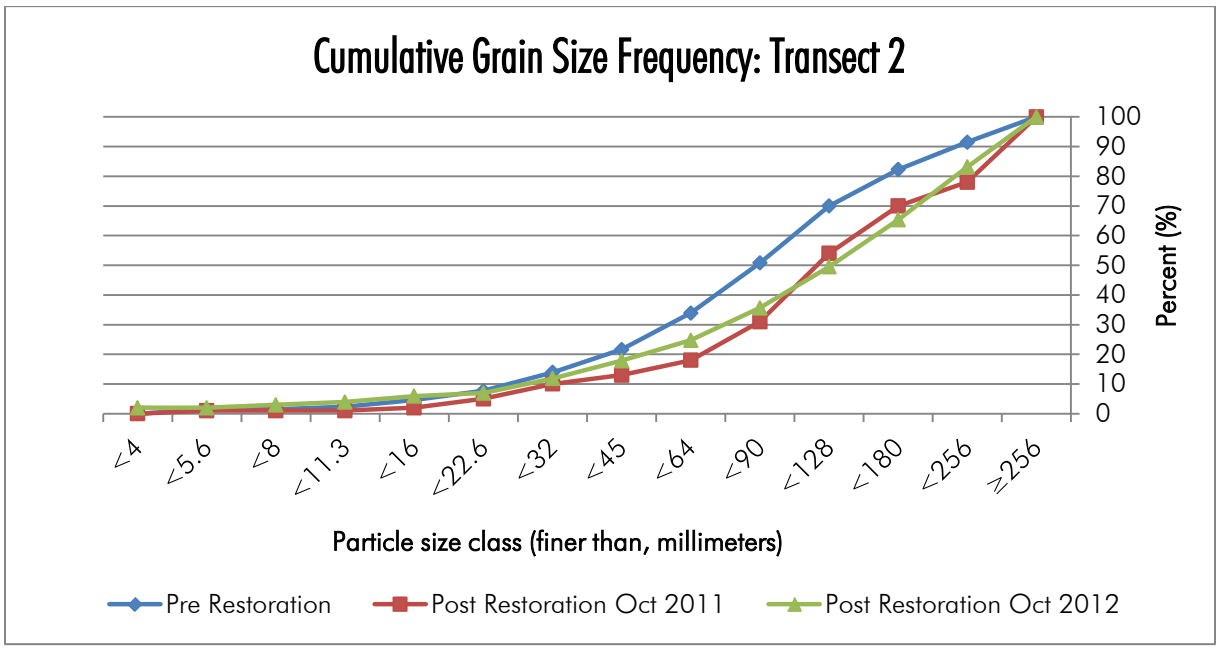

Figure 41: Cumulative Grain Size Frequencies: Transect 2

Transect 2 is located 50 meters downstream of the former dam. Little change in grain size is exhibited at this site, likely due to the fact that it was not within the restoration area, and that little to no finer materials from the impoundment settled at this location. The gradient below the impoundment is relatively steep, likely preventing settlement of fine materials.

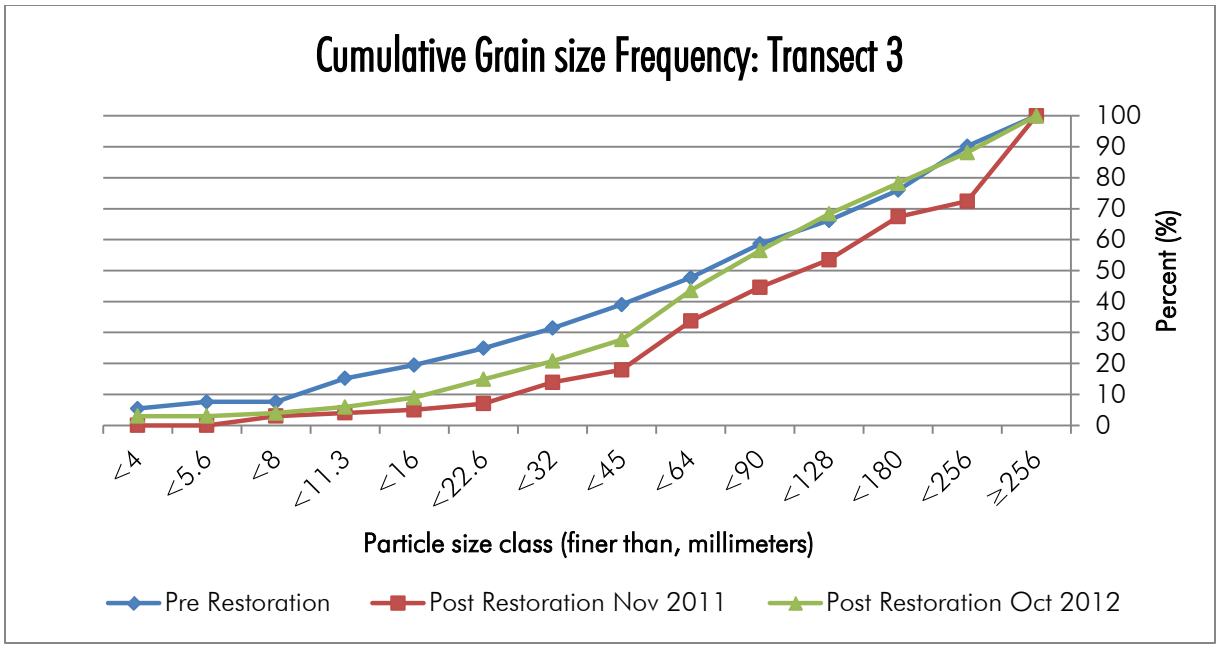

Figure 42: Cumulative Grain Size Frequencies: Transect 3

Transect 3 is located 10 meters downstream of the former dam. Little change in grain size is exhibited at this site, likely due to the fact that it was not within the restoration area, and that little to no finer materials from the impoundment settled at this location. The gradient below the impoundment is relatively steep (refer to Section 3.1.2: Longitudinal Profile), likely preventing settlement of fine materials.

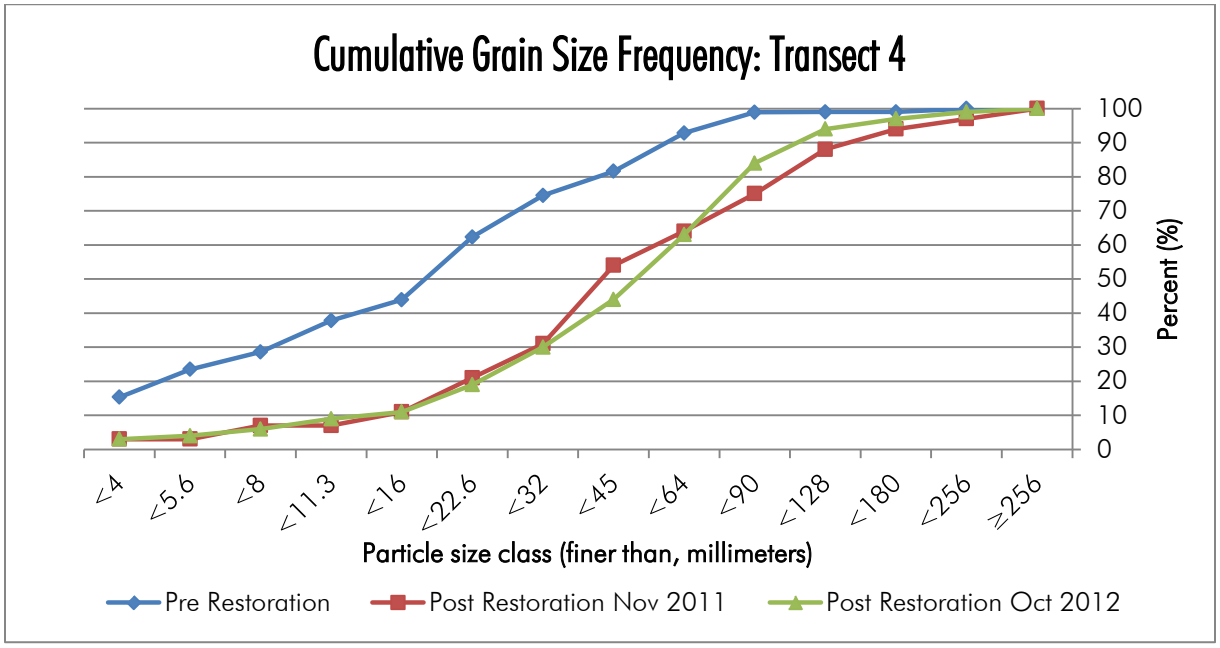

Figure 43: Cumulative Grain Size Frequencies: Transect 4

Transect 4 is immediately upstream of the former dam. Prior to removal of the dam, accumulated sediments were removed from the impoundment. In addition, much of the remaining finer material was liberated after the dam was removed. This likely explains the significant decrease in the proportion of grain grain sizes in all categories under 11.3 millimeters post-restoration.

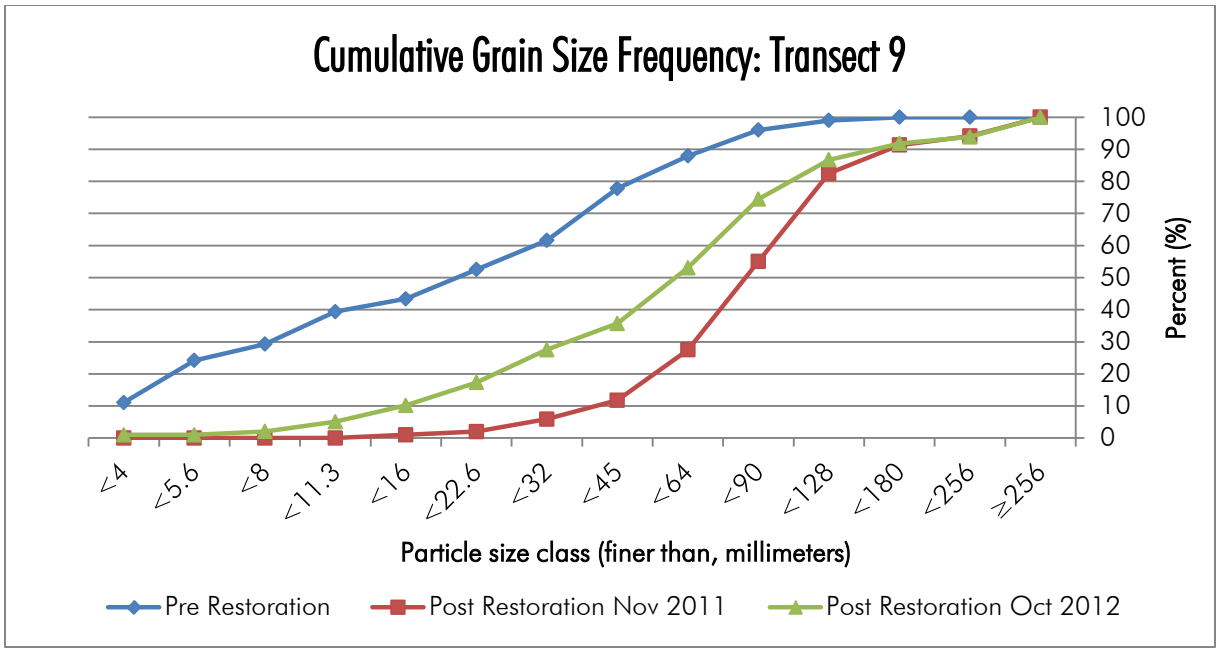

Figure 44: Cumulative Grain Size Frequencies: Transect 9

Transect 9 is located 40 meters upstream of the former dam, within the former impoundment. A notable decrease in the proportion of material <8 millimeters is appararent, and likely due to increased flow from the dam removal carrying finer material downstream.

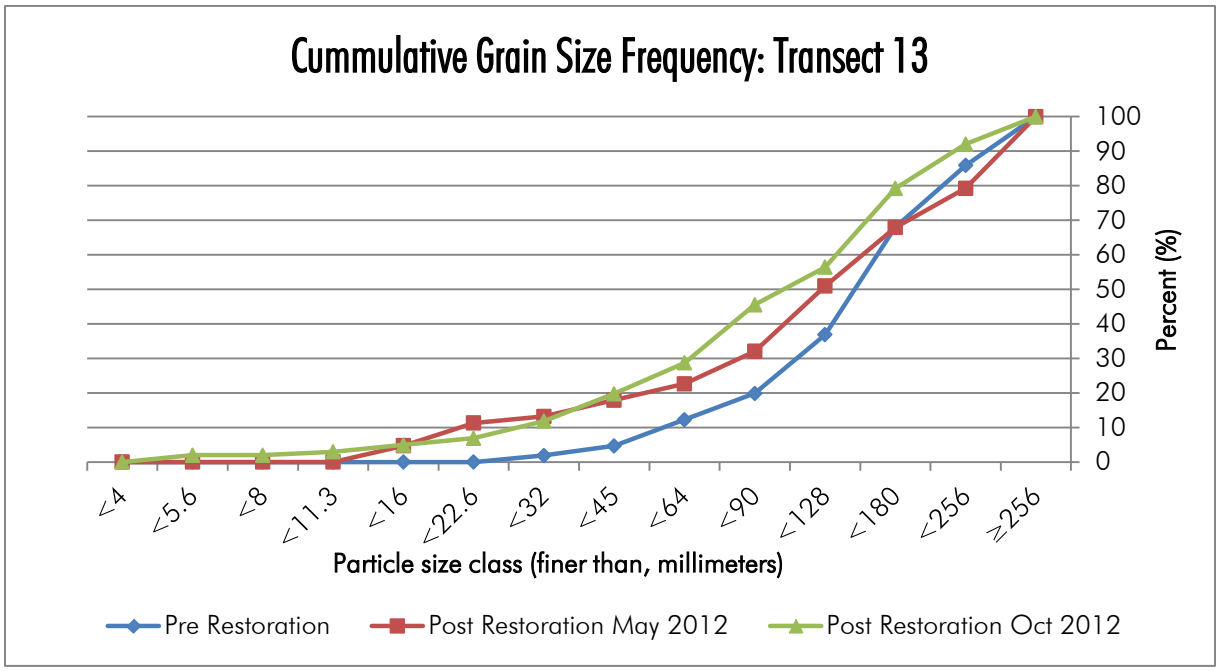

Figure 45: Cumulative Grain Size Frequencies: Transect 13

Transect 13 is located 120 meters upstream of the former dam, in the location where the grade control structure was installed. Very little change in grain size distribution is noted at this site, likely due to the fact that the gradient at the location changed little from the construction of the grade control (refer to Section 3.1.2: Longitudinal Profile), and that it is at the upstream margin of the restoration area.

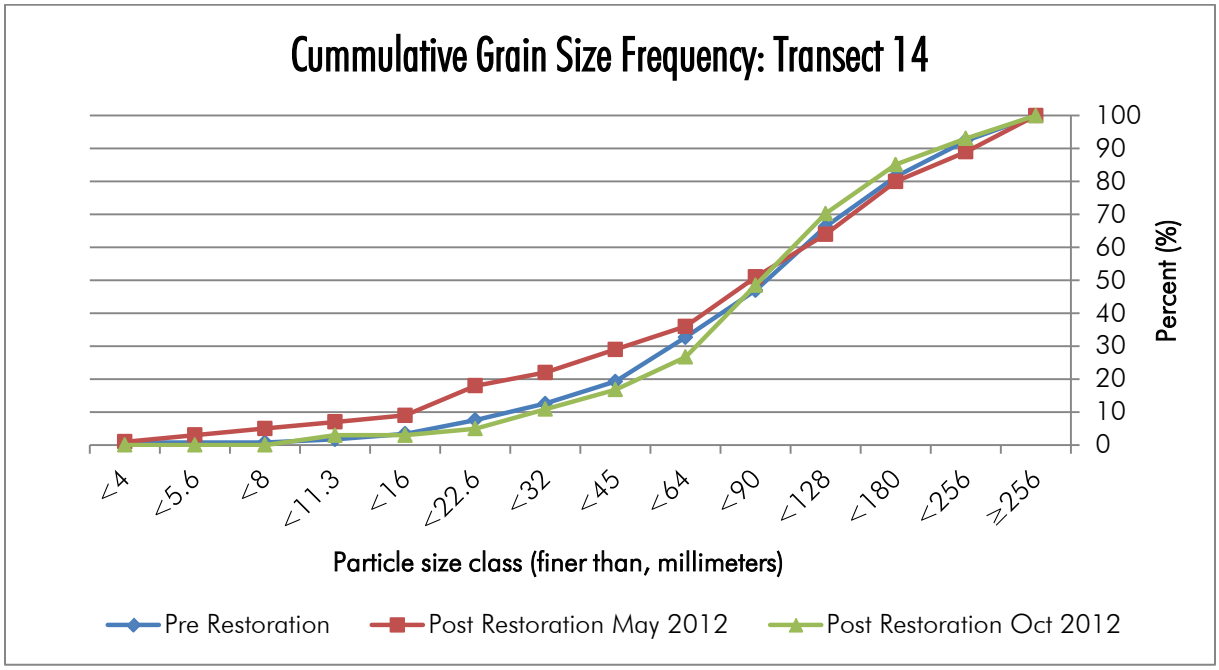

Figure 46: Cumulative Grain Size Frequencies: Transect 14

Transect 14 is located 180 meters upstream of the former dam. Very little change is noted in grain size distribution. This site is well upstream of the restoration, and outside of the influence of the former dam.

4.0 Lessons Learned

While a strong effort was made to establish and maintain monitoring protocols that would provide meaningful data to evaluate the results of the removal of the dam and habitat restoration work at Moose River, some issues became apparent in the preparation of this report that will be useful in guiding the establishment and execution of similar monitoring programs in the future.

1. Quality metadata is an important component of a monitoring program spanning multiple parameters over a multi-phase project. Changes in staff and the passage of time obscure the knowledge of how some monitoring activities were carried out, or the reasoning behind changes made to monitoring protocols. Care should be exercised to record all pertinent metadata in the same location as the monitoring data collected.
2. Care should be taken in the establishment of monitoring sites to avoid confounding factors that that may obscure the impacts of dam removal or other restoration activities.
3. Monitoring locations should be kept consistent throughout the life of the project in order to allow comparability of data throughout all phases.
4. Longer term monitoring of fish communities may be required to gauge the impact of the dam removal at Moose River.
5. Large scale disturbance related to dam removal and related bank and channel work has the potential to displace monuments related to cross sections. Care should be taken to ensure that at least one monument per transect is in a location unlikely to be disturbed, and that such measures as transect length and azimuth are recorded to allow for easy re-establishment of cross sections.

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6.0 Appendices

A.0 Appendix A: Monitoring Data

A.1 Grain Size

Table A1: Pre-Restoration Grain Size Data

Transect #	Sampling Date	Time	Size Class (mm)	Count	Frequency (%)	Cumulative Finer (%)	Notes
9	2011-09-06	11:00	≥256	0	0.0	100	Head of impoundment - parallel with lower end of big rock
9	2011-09-06	11:00	<256	0	0.0	100	
9	2011-09-06	11:00	<180	1	1.0	100	
9	2011-09-06	11:00	<128	3	3.0	99	
9	2011-09-06	11:00	<90	8	8.1	96	
9	2011-09-06	11:00	<64	10	10.1	88	
9	2011-09-06	11:00	<45	16	16.2	78	
9	2011-09-06	11:00	<32	9	9.1	62	
9	2011-09-06	11:00	<22.6	9	9.1	53	
9	2011-09-06	11:00	<16	4	4.0	43	
9	2011-09-06	11:00	<11.3	10	10.1	39	
9	2011-09-06	11:00	<8	5	5.1	29	
9	2011-09-06	11:00	<5.6	13	13.1	24	
9	2011-09-06	11:00	<4	11	11.1	11	
4	2011-09-06	10:30	≥256	0	0.0	100	Just above dam - upper end of grassy island.
4	2011-09-06	10:30	<256	1	1.0	100	
4	2011-09-06	10:30	<180	0	0.0	99	
4	2011-09-06	10:30	<128	0	0.0	99	
4	2011-09-06	10:30	<90	6	6.1	99	
4	2011-09-06	10:30	<64	11	11.2	93	
4	2011-09-06	10:30	<45	7	7.1	82	
4	2011-09-06	10:30	<32	12	12.2	75	
4	2011-09-06	10:30	<22.6	18	18.4	62	
4	2011-09-06	10:30	<16	6	6.1	44	
4	2011-09-06	10:30	<11.3	9	9.2	38	
4	2011-09-06	10:30	<8	5	5.1	29	
4	2011-09-06	10:30	<5.6	8	8.2	24	
4	2011-09-06	10:30	<4	15	15.3	15	
2	2011-08-09	12:00	≥256	11	8.5	100	Just above confluence with East branch.
2	2011-08-09	12:00	<256	12	9.2	92	
2	2011-08-09	12:00	<180	16	12.3	82	

Transect #	Sampling Date	Time	Size Class (mm)	Count	Frequency (%)	Cumulative Finer (%)	Notes
2	2011-08-09	12:00	<128	25	19.2	70	
2	2011-08-09	12:00	<90	22	16.9	51	
2	2011-08-09	12:00	<64	16	12.3	34	
2	2011-08-09	12:00	<45	10	7.7	22	
2	2011-08-09	12:00	<32	8	6.2	14	
2	2011-08-09	12:00	<22.6	4	3.1	8	
2	2011-08-09	12:00	<16	3	2.3	5	
2	2011-08-09	12:00	<11.3	1	0.8	2	
2	2011-08-09	12:00	<8	0	0.0	2	
2	2011-08-09	12:00	<5.6	2	1.5	2	
2	2011-08-09	12:00	<4	0	0.0	0	
3	2011-09-06	9:00	≥256	9	9.8	100	Head of riffle immediately below dam plunge pool.
3	2011-09-06	9:00	<256	13	14.1	90	
3	2011-09-06	9:00	<180	9	9.8	76	
3	2011-09-06	9:00	<128	7	7.6	66	
3	2011-09-06	9:00	<90	10	10.9	59	
3	2011-09-06	9:00	<64	8	8.7	48	
3	2011-09-06	9:00	<45	7	7.6	39	
3	2011-09-06	9:00	<32	6	6.5	31	
3	2011-09-06	9:00	<22.6	5	5.4	25	
3	2011-09-06	9:00	<16	4	4.3	20	
3	2011-09-06	9:00	<11.3	7	7.6	15	
3	2011-09-06	9:00	<8	0	0.0	8	
3	2011-09-06	9:00	<5.6	2	2.2	8	
3	2011-09-06	9:00	<4	5	5.4	5	
13	2011-09-07	13:00	≥256	15	14.2	100	11m above transect #13 - at foot of riffle and head of pool.
13	2011-09-07	13:00	<256	19	17.9	86	
13	2011-09-07	13:00	<180	33	31.1	68	
13	2011-09-07	13:00	<128	18	17.0	37	
13	2011-09-07	13:00	<90	8	7.6	20	
13	2011-09-07	13:00	<64	8	7.6	12	
13	2011-09-07	13:00	<45	3	2.8	5	
13	2011-09-07	13:00	<32	2	1.9	2	
13	2011-09-07	13:00	<22.6	0	0.0	0	
13	2011-09-07	13:00	<16	0	0.0	0	
13	2011-09-07	13:00	<11.3	0	0.0	0	
13	2011-09-07	13:00	<8	0	0.0	0	
13	2011-09-07	13:00	<5.6	0	0.0	0	

Transect #	Sampling Date	Time	Size Class (mm)	Count	Frequency (%)	Cumulative Finer (%)	Notes
13	2011-09-07	13:00	<4	0	0.0	0	
14	2011-09-07	13:00	≥256	9	7.6	100	Transect # 14 - at bend in river, close to road
14	2011-09-07	13:00	<256	13	10.9	92	
14	2011-09-07	13:00	<180	18	15.1	82	
14	2011-09-07	13:00	<128	23	19.3	66	
14	2011-09-07	13:00	<90	17	14.3	47	
14	2011-09-07	13:00	<64	16	13.5	33	
14	2011-09-07	13:00	<45	8	6.7	19	
14	2011-09-07	13:00	<32	6	5.0	13	
14	2011-09-07	13:00	<22.6	5	4.2	8	
14	2011-09-07	13:00	<16	2	1.7	3	
14	2011-09-07	13:00	<11.3	1	0.8	2	
14	2011-09-07	13:00	<8	0	0.0	1	
14	2011-09-07	13:00	<5.6	0	0.0	1	
14	2011-09-07	13:00	<4	1	0.8	1	

Table A2: Post-Restoration Grain Size Data

Site ID#	Date	Time	Size Class (mm)	Count	Frequency (%)	Cumulative Finer (%)	Notes
3	2011-11-29	11:40	≥256	28	27.7	100	At first riffle below old dam site.
3	2011-11-29	11:40	<256	5	5.0	72	
3	2011-11-29	11:40	<180	14	13.9	67	
3	2011-11-29	11:40	<128	9	8.9	54	
3	2011-11-29	11:40	<90	11	10.9	45	
3	2011-11-29	11:40	<64	16	15.8	34	
3	2011-11-29	11:40	<45	4	4.0	18	
3	2011-11-29	11:40	<32	7	6.9	14	
3	2011-11-29	11:40	<22.6	2	2.0	7	
3	2011-11-29	11:40	<16	1	1.0	5	
3	2011-11-29	11:40	<11.3	1	1.0	4	
3	2011-11-29	11:40	<8	3	3.0	3	
3	2011-11-29	11:40	<5.6	0	0.0	0	
3	2011-11-29	11:40	<4	0	0.0	0	
4	2011-11-29	13:00	≥256	3	3.0	100	
4	2011-11-29	13:00	<256	3	3.0	97	
4	2011-11-29	13:00	<180	6	6.0	94	
4	2011-11-29	13:00	<128	13	13.0	88	
4	2011-11-29	13:00	<90	11	11.0	75	
4	2011-11-29	13:00	<64	10	10.0	64	
4	2011-11-29	13:00	<45	23	23.0	54	
4	2011-11-29	13:00	<32	10	10.0	31	
4	2011-11-29	13:00	<22.6	10	10.0	21	
4	2011-11-29	13:00	<16	4	4.0	11	
4	2011-11-29	13:00	<11.3	0	0.0	7	
4	2011-11-29	13:00	<8	4	4.0	7	
4	2011-11-29	13:00	<5.6	0	0.0	3	
4	2011-11-29	13:00	<4	3	3.0	3	
9	2011-11-29	13:50	≥256	6	5.9	100	Above old impoundment area, close to parking lot (downstream of it).
9	2011-11-29	13:50	<256	3	2.9	94	
9	2011-11-29	13:50	<180	9	8.8	91	
9	2011-11-29	13:50	<128	28	27.5	83	
9	2011-11-29	13:50	<90	28	27.5	55	
9	2011-11-29	13:50	<64	16	15.7	28	
9	2011-11-29	13:50	<45	6	5.9	12	
9	2011-11-29	13:50	<32	4	3.9	6	
9	2011-11-29	13:50	<22.6	1	1.0	2	

Site ID#	Date	Time	Size Class (mm)	Count	Frequency (%)	Cumulative Finer (%)	Notes
9	2011-11-29	13:50	<16	1	1.0	1	
9	2011-11-29	13:50	<11.3	0	0.0	0	
9	2011-11-29	13:50	<8	0	0.0	0	
9	2011-11-29	13:50	<5.6	0	0.0	0	
9	2011-11-29	13:50	<4	0	0.0	0	
2	2011-10-11	15:00	≥256	22	22.0	100	At confluence of East and West branches.
2	2011-10-11	15:00	<256	8	8.0	78	
2	2011-10-11	15:00	<180	16	16.0	70	
2	2011-10-11	15:00	<128	23	23.0	54	
2	2011-10-11	15:00	<90	13	13.0	31	
2	2011-10-11	15:00	<64	5	5.0	18	
2	2011-10-11	15:00	<45	3	3.0	13	
2	2011-10-11	15:00	<32	5	5.0	10	
2	2011-10-11	15:00	<22.6	3	3.0	5	
2	2011-10-11	15:00	<16	1	1.0	2	
2	2011-10-11	15:00	<11.3	0	0.0	1	
2	2011-10-11	15:00	<8	0	0.0	1	
2	2011-10-11	15:00	<5.6	1	1.0	1	
2	2011-10-11	15:00	<4	0	0.0	0	
13	2012-10-01	9:35	≥256	8	7.9	100	
13	2012-10-01	9:35	<256	13	12.9	92	
13	2012-10-01	9:35	<180	23	22.8	79	
13	2012-10-01	9:35	<128	11	10.9	56	
13	2012-10-01	9:35	<90	17	16.8	46	
13	2012-10-01	9:35	<64	9	8.9	29	
13	2012-10-01	9:35	<45	8	7.9	20	
13	2012-10-01	9:35	<32	5	5.0	12	
13	2012-10-01	9:35	<22.6	2	2.0	7	
13	2012-10-01	9:35	<16	2	2.0	5	
13	2012-10-01	9:35	<11.3	1	1.0	3	
13	2012-10-01	9:35	<8	0	0.0	2	
13	2012-10-01	9:35	<5.6	2	2.0	2	
13	2012-10-01	9:35	<4	0	0.0	0	
9	2012-10-01	11:00	≥256	6	6.1	100	
9	2012-10-01	11:00	<256	2	2.0	94	
9	2012-10-01	11:00	<180	5	5.1	92	
9	2012-10-01	11:00	<128	12	12.2	87	
9	2012-10-01	11:00	<90	21	21.4	74	
9	2012-10-01	11:00	<64	17	17.4	53	

Site ID#	Date	Time	Size Class (mm)	Count	Frequency (%)	Cumulative Finer (%)	Notes
9	2012-10-01	11:00	<45	8	8.2	36	
9	2012-10-01	11:00	<32	10	10.2	28	
9	2012-10-01	11:00	<22.6	7	7.1	17	
9	2012-10-01	11:00	<16	5	5.1	10	
9	2012-10-01	11:00	<11.3	3	3.1	5	
9	2012-10-01	11:00	<8	1	1.0	2	
9	2012-10-01	11:00	<5.6	0	0.0	1	
9	2012-10-01	11:00	<4	1	1.0	1	
14	2012-10-01	10:30	≥256	7	6.9	100	
14	2012-10-01	10:30	<256	8	7.9	93	
14	2012-10-01	10:30	<180	15	14.9	85	
14	2012-10-01	10:30	<128	22	21.8	70	
14	2012-10-01	10:30	<90	22	21.8	49	
14	2012-10-01	10:30	<64	10	9.9	27	
14	2012-10-01	10:30	<45	6	5.9	17	
14	2012-10-01	10:30	<32	6	5.9	11	
14	2012-10-01	10:30	<22.6	2	2.0	5	
14	2012-10-01	10:30	<16	0	0.0	3	
14	2012-10-01	10:30	<11.3	3	3.0	3	
14	2012-10-01	10:30	<8	0	0.0	0	
14	2012-10-01	10:30	<5.6	0	0.0	0	
14	2012-10-01	10:30	<4	0	0.0	0	
4	2012-10-01	11:20	≥256	1	1.0	100	
4	2012-10-01	11:20	<256	2	2.0	99	
4	2012-10-01	11:20	<180	3	3.0	97	
4	2012-10-01	11:20	<128	10	10.0	94	
4	2012-10-01	11:20	<90	21	21.0	84	
4	2012-10-01	11:20	<64	19	19.0	63	
4	2012-10-01	11:20	<45	14	14.0	44	
4	2012-10-01	11:20	<32	11	11.0	30	
4	2012-10-01	11:20	<22.6	8	8.0	19	
4	2012-10-01	11:20	<16	2	2.0	11	
4	2012-10-01	11:20	<11.3	3	3.0	9	
4	2012-10-01	11:20	<8	2	2.0	6	
4	2012-10-01	11:20	<5.6	1	1.0	4	
4	2012-10-01	11:20	<4	3	3.0	3	
2	2012-10-01	12:05	≥256	17	16.8	100	
2	2012-10-01	12:05	<256	18	17.8	83	
2	2012-10-01	12:05	<180	16	15.8	65	
2	2012-10-01	12:05	<128	14	13.9	50	

Site ID#	Date	Time	Size Class (mm)	Count	Frequency (%)	Cumulative Finer (%)	Notes
2	2012-10-01	12:05	<90	11	10.9	36	
2	2012-10-01	12:05	<64	7	6.9	25	
2	2012-10-01	12:05	<45	6	5.9	18	
2	2012-10-01	12:05	<32	5	5.0	12	
2	2012-10-01	12:05	<22.6	1	1.0	7	
2	2012-10-01	12:05	<16	2	2.0	6	
2	2012-10-01	12:05	<11.3	1	1.0	4	
2	2012-10-01	12:05	<8	1	1.0	3	
2	2012-10-01	12:05	<5.6	0	0.0	2	
2	2012-10-01	12:05	<4	2	2.0	2	
3	2012-10-01	11:45	≥256	15	14.9	100	
3	2012-10-01	11:45	<256	10	9.9	88	
3	2012-10-01	11:45	<180	10	9.9	78	
3	2012-10-01	11:45	<128	12	11.9	68	
3	2012-10-01	11:45	<90	13	12.9	56	
3	2012-10-01	11:45	<64	16	15.8	44	
3	2012-10-01	11:45	<45	7	6.9	28	
3	2012-10-01	11:45	<32	6	5.9	21	
3	2012-10-01	11:45	<22.6	6	5.9	15	
3	2012-10-01	11:45	<16	3	3.0	9	
3	2012-10-01	11:45	<11.3	2	2.0	6	
3	2012-10-01	11:45	<8	1	1.0	4	
3	2012-10-01	11:45	<5.6	0	0.0	3	
3	2012-10-01	11:45	<4	3	3.0	3	
13	2012-05-18	11:00	≥256	22	20.8	100	Upstream of impoundment area. Part of the 2011 dataset that wasn't able to be completed in 2011.
13	2012-05-18	11:00	<256	12	11.3	79	
13	2012-05-18	11:00	<180	18	17.0	68	
13	2012-05-18	11:00	<128	20	18.9	51	
13	2012-05-18	11:00	<90	10	9.4	32	
13	2012-05-18	11:00	<64	5	4.7	23	
13	2012-05-18	11:00	<45	5	4.7	18	
13	2012-05-18	11:00	<32	2	1.9	13	
13	2012-05-18	11:00	<22.6	7	6.6	11	
13	2012-05-18	11:00	<16	5	4.7	5	
13	2012-05-18	11:00	<11.3	0	0.0	0	
13	2012-05-18	11:00	<8	0	0.0	0	
13	2012-05-18	11:00	<5.6	0	0.0	0	

Site ID#	Date	Time	Size Class (mm)	Count	Frequency (%)	Cumulative Finer (%)	Notes
13	2012-05-18	11:00	<4	0	0.0	0	
14	2012-05-18	13:20	≥256	11	11.0	100	Upstream of impoundment area. Part of the 2011 dataset that wasn't able to be completed in 2011.
14	2012-05-18	13:20	<256	9	9.0	89	
14	2012-05-18	13:20	<180	16	16.0	80	
14	2012-05-18	13:20	<128	13	13.0	64	
14	2012-05-18	13:20	<90	15	15.0	51	
14	2012-05-18	13:20	<64	7	7.0	36	
14	2012-05-18	13:20	<45	7	7.0	29	
14	2012-05-18	13:20	<32	4	4.0	22	
14	2012-05-18	13:20	<22.6	9	9.0	18	
14	2012-05-18	13:20	<16	2	2.0	9	
14	2012-05-18	13:20	<11.3	2	2.0	7	
14	2012-05-18	13:20	<8	2	2.0	5	
14	2012-05-18	13:20	<5.6	2	2.0	3	
14	2012-05-18	13:20	<4	1	1.0	1	

A.2 Water Quality Data

Table A3: Pre-Restoration Water Quality Data

Date	Location	Time	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	pH	Total Dissolved Solids (g/L)	DOSAT (%)	Turbidity (NTU)
07-Jul-10	MS85		22.56	0.047	7.98	6.52	0.0	92.3	1.5
07-Jul-10	MS80		27.20	0.046	7.50	6.78	0.0	94.4	1.2
07-Jul-10	MS15		26.23	0.076	7.84	7.29	0.1	97.1	1.5
07-Jul-10	MS10		24.12	0.083	8.03	7.15	0.1	95.7	1.6
28-Jul-10	MS85	10:30	17.79	0.038	8.09	5.91	0.0	85.1	
28-Jul-10	MS80	11:00	20.73	0.037	8.49	6.24	0.0	94.7	
28-Jul-10	MS15	11:45	19.89	0.062	8.97	7.09	0.0	98.5	
28-Jul-10	MS10	13:06	19.02	0.073	9.24	7.12	0.1	99.1	
20-Aug-10	MS85	10:30	17.05	0.040	7.74	6.05	0.0	80.1	0.0
20-Aug-10	MS80	11:05	20.26	0.038	7.32	6.29	0.0	80.9	
20-Aug-10	MS15	12:00	18.52	0.066	8.64	7.37	0.0	92.2	0.0
20-Aug-10	MS10	12:30	17.39	0.079	8.67	7.11	0.1	90.5	0.0
01-Oct-10	MS85	13:00	19.89	0.044	6.51	6.27	0.0	71.5	
01-Oct-10	MS80	13:30	20.14	0.044	7.77	7.16		85.7	
01-Oct-10	MS15	14:00	21.35	0.077	7.90	7.34	0.1	89.2	
01-Oct-10	MS10	14:30	21.01	0.084	7.94	7.07	0.1	89.0	
14-Jun-11	MS85	13:03	12.36	0.038	11.31	6.20	0.0	105.8	2.4
14-Jun-11	MS80		13.56	0.039	10.75	6.38	0.0	103.3	3.2
14-Jun-11	MS15	14:15	13.11	0.068	11.76	6.83	0.0	112.0	3.5
14-Jun-11	MS10	14:40	12.33	0.076	11.69	6.96	0.1	109.3	2.8
06-Jul-11	MS10	9:35	18.71	0.074	9.07	6.80	0.1	97.2	0.0
06-Jul-11	MS15	10:00	19.02	0.073	9.20	6.98	0.1	99.2	0.0
06-Jul-11	MS80	11:00	22.73	0.041	8.31	6.69	0.0	96.4	0.0
06-Jul-11	MS85	12:30	20.85	0.042	8.10	6.11	0.0	90.6	0.0
20-Jul-11	MS10	10:30	18.70	0.071		6.93	0.1		3.2
20-Jul-11	MS15	10:45	18.45	0.070		7.15	1.6		1.6
20-Jul-11	MS80	11:17	22.24	0.038		6.81	0.0		0.7
20-Jul-11	MS85	11:37	18.69	0.039		6.43	0.0		2.1
04-Aug-11	MS85	9:25	15.99	0.000	8.20	4.81	0.0	83.1	33.7
04-Aug-11	MS80	10:30	15.91	0.034	8.21	4.95	0.0	83.0	0.0
04-Aug-11	MS15	11:20	16.70	0.051	8.47	6.43	0.0	87.1	10.0
04-Aug-11	MS10		16.42	0.056	8.87	6.71	0.0	90.5	0.0
30-Aug-11	MS10	9:42	15.36	0.075	9.41	7.06			
30-Aug-11	MS15	10:00	16.01	0.067	9.41	7.09			
30-Aug-11	MS80	10:30	19.12	0.037	8.13	6.50			
30-Aug-11	MS85	11:00	16.48	0.038	8.14	6.03			

Table A4: Post-Restoration Water Quality Data

Date	Location	Time	Temperature (°C)	Conductivity (mS/cm)	DO (mg/L)	pH	Total Dissolved Solids (g/L)	DOSAT (%)	Turbidity (NTU)
13-Sep-11	MS10	11:57	17.00						
13-Sep-11	MS15	13:28	19.00						
13-Sep-11	MS80	13:50	19.00						
13-Sep-11	MS85		19.20						
28-Sep-11	MS10	10:15	11.85	0.077	10.81	6.32	0.05	99.5	
28-Sep-11	MS15	11:00	12.22	0.057	11.02	6.54	0.05	102.8	
28-Sep-11	MS80	11:30	15.88	0.041	9.53	6.52	0.03	96.2	
28-Sep-11	MS85	11:53	13.19	0.041	9.83	6.3	0.03	93.6	
18-Oct-11	MS10	10:40	11.21	0.056	11.15	6.81	0.04	101.5	
18-Oct-11	MS15	12:00	11.78	0.055	11.03	6.62	0.04	101.8	
18-Oct-11	MS80	14:05	12.26	0.036	10.62	5.03	0.02	99.1	
18-Oct-11	MS85	13:20	12.41	0.036	10.06	5.01	0.02	94.2	
4-May-12	MS10	13:30	10.30	0.043	10.9	7.04	0.04	98.0	
4-May-12	MS15	14:00	11.80	0.038	10.2	7.11	0.03	95.0	
4-May-12	MS80	15:00	9.60	0.023	11.3	6.3	0.02	99.0	
4-May-12	MS85		11.20	0.023	11.4	6.16	0.02	104.0	
1-Jun-12	MS10	13:30	16.20	0.056	8.2	7.1	0.04	84.0	
1-Jun-12	MS15	14:45	20.10	0.057	7.5	7.15	0.04	82.0	
1-Jun-12	MS80	15:30	17.90	0.032	7.8	6.51	0.02	82.0	
1-Jun-12	MS85	16:00	17.80	0.032	7.8	6.32	0.02	82.0	
6-Jul-12	MS10	10:04	18.80	0.070	7.3	6.91	0.05	79.0	
6-Jul-12	MS15	10:58	20.00	0.070	8.4	7.24	0.05	93.0	
6-Jul-12	MS80	11:32	20.90	0.039	7.9	6.46	0.03	88.0	
6-Jul-12	MS85	12:15	19.00	0.038	7.2	6.23	0.03	76.0	
3-Aug-12	MS10	9:45	19.73	0.068	8.28	7.24	0.00	90.6	6.7
3-Aug-12	MS15	10:22	20.34	0.064	8.32	7.33	0.00	92.0	2.4
3-Aug-12	MS80	10:50	21.62	0.044	7.87	6.91	0.00	89.6	3
3-Aug-12	MS85	11:20	20.25	0.044	7.48	6.5	0.00	82.7	1.6
14-Sep-12	MS10	10:00	16.44	0.057	9.76	6.54	0.00	99.8	10.3
14-Sep-12	MS15	10:34	14.95	0.057	10.03	6.5	0.00	99.4	2
14-Sep-12	MS80	11:15	15.47	0.042	9.44	5.04	0.00	94.6	2.9
14-Sep-12	MS85	11:45	14.90	0.041	9.29	4.98	0.00	92.0	1.3
2-Oct-12	MS10	10:30	12.90	0.065	10.12	6.44	0.00	95.7	0.2
2-Oct-12	MS15	11:00	13.59	0.053	10.17	6.51	0.00	97.8	30.8
2-Oct-12	MS80	12:02	13.58	0.038	9.5	4.99	0.00	91.0	0.6
2-Oct-12	MS85	12:30	13.91	0.039	9.24	4.9	0.00	89.2	0

A.3 Fyke Net Catch Data

Date	Location	Temperature (°C)	Fish species	#Captured	Size or Maturity	Notes
7/9/2009	400m upstream of saltwater					Net deployed. Water at normal level
8/9/2009	400m upstream of saltwater		*Salmo salar* (salmon)	1	parr	
9/9/2009	400m upstream of saltwater	14	*Salmo salar* (salmon)	2	parr	
10/9/2009	400m upstream of saltwater	13				*Rana clamitans* (Green frog) in net. *Anguilla rostrata* (American eel) above wing net.
11/9/2009	400m upstream of saltwater	10				*Semotilus atromaculatus* (Creek chub) and *Pungitius pungitius* (Nine spine stickleback) confirmed in the mouth of small spring brook entering dam
12/9/2009	400m upstream of saltwater					Net empty
13/9/2009	400m upstream of saltwater	16				Net empty
14/9/2009	400m upstream of saltwater		*Anguilla rostrata* (American eel)	2	adult (45-50cm)	25cm *Salvelinus fontinalis* (Brook trout) was caught in pool at foot of the dam
15/9/2009	400m upstream of saltwater	14.4	*Salvelinus fontinalis* (Brook trout)	1	adult (20cm)	
16/9/2009	400m upstream of saltwater	12.6	*Anguilla rostrata (American eel)*	1	adult (38-42cm)	water level up
17/9/2009	400m upstream of saltwater	10.4				Net empty
18/9/2009	400m upstream of saltwater					Net empty
19/9/2009	400m upstream of saltwater					Net empty
24/9/2009	400m upstream of saltwater					Water level up. Wing net filled with leaves and washed out. Net empty
25/9/2009	400m upstream of saltwater	11.4				Wing net filled with leaves and washed out. Net empty

26/9/2009	400m upstream of saltwater	11.2				Net empty
27/9/2009	400m upstream of saltwater	10.6	*Salvelinus fontinalis (Brook trout)*	1	23cm	Discovered hole in net
28/9/2009	400m upstream of saltwater					Net empty
29/9/2009	400m upstream of saltwater					Water level rising. Net empty
30/9/2009	400m upstream of saltwater					Water level rising. Net and wings washed out.
4/10/2009	400m upstream of saltwater					Net removed due to high water and continued rain.
5/6/2010	50m upstream of impoundment		White sucker	1		
5/6/2010	50m upstream of impoundment		minnow	1		
10/6/2010	50m upstream of impoundment		White sucker	1		
11/6/2010	50m upstream of impoundment		*Salmo salar* (salmon)	1	parr (16 cm)	
12/6/2010	50m upstream of impoundment		Salmo salar (salmon)	1	parr	
13/6/2010	50m upstream of impoundment		Salmo salar (salmon)	2	parr	
13/6/2010	50m upstream of impoundment		*Salvelinus fontinalis* (Brook trout)	1		
14/6/2010	50m upstream of impoundment		Salmo salar (salmon)	1	parr	
14/6/2010	50m upstream of impoundment		*Salvelinus fontinalis* (Brook trout)	1		
16/6/2010	50m upstream of impoundment		Salmo salar (salmon)	1	parr	

A.4 Electrofishing Catch Data

Table A5: Pre-Restoration Electrofishing Data

Site #	Date	Time	Pass #	Species	Fork Length (cm)
MR1	2011-08-30	16:00	1	American Eel	31
MR1	2011-08-30	16:00	1	American Eel	15
MR2	2011-09-05	8:00	1	Brook Trout	19
MR2	2011-09-05	8:00	1	Brook Trout	17.5
MR2	2011-09-05	8:00	1	American Eel	29
MR2	2011-09-05	8:00	1	American Eel	32
MR2	2011-09-05	8:00	1	American Eel	14
MR2	2011-09-05	8:00	1	American Eel	35
MR2	2011-09-05	8:00	1	American Eel	32
MR2	2011-09-05	8:00	1	American Eel	32
MR2	2011-09-05	8:00	1	American Eel	29
MR2	2011-09-05	8:00	1	American Eel	20
MR2	2011-09-05	8:00	1	American Eel	25
MR2	2011-09-05	8:00	1	American Eel	27
MR2	2011-09-05	8:00	1	American Eel	20
MR2	2011-09-05	8:00	1	American Eel	15
MR2	2011-09-05	8:00	2	Brook Trout	16
MR2	2011-09-05	8:00	2	Brook Trout	16.5
MR2	2011-09-05	8:00	2	American Eel	14
MR2	2011-09-05	8:00	2	Brook Trout	17
MR2	2011-09-05	8:00	2	White Sucker	17
MR2	2011-09-05	8:00	2	American Eel	28
MR2	2011-09-05	8:00	2	American Eel	32
MR2	2011-09-05	8:00	2	American Eel	18
MR2	2011-09-05	8:00	2	American Eel	22
MR2	2011-09-05	8:00	2	American Eel	19
MR2	2011-09-05	8:00	2	American Eel	20
MR2	2011-09-05	8:00	2	American Eel	25
MR2	2011-09-05	8:00	2	American Eel	17
MR2	2011-09-05	8:00	2	American Eel	12
MR2	2011-09-05	8:00	2	American Eel	13
MR3	2011-08-23	9:20	1	American Eel	30
MR3	2011-08-23	9:20	1	American Eel	30
MR3	2011-08-23	9:20	1	American Eel	25
MR3	2011-08-23	9:20	1	American Eel	24
MR3	2011-08-23	9:20	1	American Eel	15
MR3	2011-08-23	9:20	1	American Eel	20

Site #	Date	Time	Pass #	Species	Fork Length (cm)
MR3	2011-08-23	9:20	1	White Sucker	13
MR3	2011-08-23	9:20	2	Creek Chub	3
MR3	2011-08-23	9:20	2	Creek Chub	9
MR3	2011-08-23	9:20	2	Atlantic Salmon parr	9.6
MR3	2011-08-23	9:20	2	Creek Chub	7
MR3	2011-08-23	9:20	2	Creek Chub	8
MR3	2011-08-23	9:20	2	American Eel	35
MR3	2011-08-23	9:20	2	American Eel	35
MR3	2011-08-23	9:20	2	American Eel	15
MR3	2011-08-23	9:20	2	American Eel	35
MR3	2011-08-23	9:20	2	American Eel	25
MR3	2011-08-23	9:20	2	American Eel	25
MR3	2011-08-23	9:20	2	American Eel	16
MR3	2011-08-23	9:20	2	American Eel	25
MR3	2011-08-23	9:20	2	American Eel	21
MR3	2011-08-23	9:20	2	American Eel	17
MR3	2011-08-23	9:20	2	American Eel	15
MR3	2011-08-23	9:20	2	American Eel	20
MR3	2011-08-23	9:20	2	American Eel	11
MR3	2011-08-23	9:20	2	American Eel	18
MR3	2011-08-23	9:20	2	American Eel	16
MR3	2011-08-23	9:20	2	American Eel	6
MR3	2011-08-23	9:20	3	Brook Trout	9
MR3	2011-08-23	9:20	3	American Eel	38
MR3	2011-08-23	9:20	3	American Eel	29
MR3	2011-08-23	9:20	3	American Eel	31
MR3	2011-08-23	9:20	3	American Eel	17
MR3	2011-08-23	9:20	3	American Eel	20
MR3	2011-08-23	9:20	3	American Eel	30
MR4	2011-09-12	13:24	1	American Eel	28
MR4	2011-09-12	13:24	1	American Eel	29
MR4	2011-09-12	13:24	1	American Eel	35
MR4	2011-09-12	13:24	1	American Eel	27
MR4	2011-09-12	13:24	1	American Eel	30
MR4	2011-09-12	13:24	1	American Eel	29
MR4	2011-09-12	13:24	2	American Eel	36
MR4	2011-09-12	13:24	2	American Eel	28
MR4	2011-09-12	13:24	2	American Eel	32
MR4	2011-09-12	13:24	2	American Eel	29
MR4	2011-09-12	13:24	2	American Eel	29
MR4	2011-09-12	13:24	2	American Eel	20

Site #	Date	Time	Pass #	Species	Fork Length (cm)
MR4	2011-09-12	13:24	2	American Eel	19
MR4	2011-09-12	13:24	2	American Eel	23
MR4	2011-09-12	13:24	2	American Eel	21
MR4	2011-09-12	13:24	2	American Eel	15
MR4	2011-09-12	13:24	2	American Eel	15
MR4	2011-09-12	13:24	2	American Eel	14
MR4	2011-09-12	13:24	2	American Eel	22
MR4	2011-09-12	13:24	2	American Eel	14
MR4	2011-09-12	13:24	2	Creek Chub	4
MR4	2011-09-12	13:24	3	Brook Trout	17.25
MR4	2011-09-12	13:24	3	American Eel	32
MR4	2011-09-12	13:24	3	American Eel	35
MR4	2011-09-12	13:24	3	American Eel	15
MR4	2011-09-12	13:24	3	American Eel	22
MR4	2011-09-12	13:24	3	American Eel	26
MR4	2011-09-12	13:24	3	American Eel	17
MR4	2011-09-12	13:24	3	American Eel	15
MR4	2011-09-12	13:24	3	American Eel	16
MR4	2011-09-12	13:24	3	American Eel	14
MR4	2011-09-12	13:24	3	American Eel	15
MR4	2011-09-12	13:24	3	American Eel	13

Table A6: Post-Restoration Electrofishing Data

Site #	Date	Time	Pass #	Species	Fork Length (cm)
MR1	2012-09-25	14:04	1	American Eel	58
MR1	2012-09-25	14:04	1	American Eel	50
MR1	2012-09-25	14:04	1	American Eel	21
MR1	2012-09-25	14:04	1	American Eel	31
MR1	2012-09-25	14:04	1	American Eel	36
MR1	2012-09-25	14:04	1	American Eel	19
MR1	2012-09-25	14:04	1	American Eel	35
MR1	2012-09-25	14:04	1	American Eel	18
MR1	2012-09-25	14:04	1	American Eel	27
MR1	2012-09-25	14:04	1	American Eel	30
MR1	2012-09-25	14:04	1	American Eel	23
MR1	2012-09-25	14:04	1	American Eel	17
MR1	2012-09-25	14:04	1	American Eel	15
MR1	2012-09-25	14:04	1	American Eel	28
MR1	2012-09-25	14:04	1	American Eel	17

Site #	Date	Time	Pass #	Species	Fork Length (cm)
MR1	2012-09-25	14:04	1	American Eel	16
MR1	2012-09-25	14:04	1	American Eel	20
MR1	2012-09-25	14:04	1	American Eel	13
MR1	2012-09-25	14:04	1	American Eel	14
MR1	2012-09-25	14:04	1	American Eel	16
MR1	2012-09-25	14:04	1	American Eel	21
MR1	2012-09-25	14:04	1	American Eel	20
MR1	2012-09-25	14:04	1	American Eel	27
MR1	2012-09-25	14:04	1	American Eel	16
MR1	2012-09-25	14:04	2	Brook Trout	19
MR1	2012-09-25	14:04	2	Brook Trout	18
MR1	2012-09-25	14:04	2	White Sucker	6
MR1	2012-09-25	14:04	2	White Sucker	7
MR1	2012-09-25	14:04	2	Brook Trout	7.5
MR1	2012-09-25	14:04	2	American Eel	12
MR1	2012-09-25	14:04	2	American Eel	33
MR1	2012-09-25	14:04	2	American Eel	31
MR1	2012-09-25	14:04	2	American Eel	15
MR1	2012-09-25	14:04	2	American Eel	20
MR1	2012-09-25	14:04	2	American Eel	14
MR1	2012-09-25	14:04	2	American Eel	32
MR1	2012-09-25	14:04	2	American Eel	24
MR1	2012-09-25	14:04	2	American Eel	15
MR1	2012-09-25	14:04	2	American Eel	22
MR1	2012-09-25	14:04	2	American Eel	22
MR1	2012-09-25	14:04	2	American Eel	15
MR1	2012-09-25	14:04	2	American Eel	35
MR1	2012-09-25	14:04	2	American Eel	19
MR1	2012-09-25	14:04	2	American Eel	20
MR1	2012-09-25	14:04	2	American Eel	20
MR1	2012-09-25	14:04	2	American Eel	19
MR1	2012-09-25	14:04	2	American Eel	27
MR1	2012-09-25	14:04	2	American Eel	20
MR1	2012-09-25	14:04	2	American Eel	26
MR1	2012-09-25	14:04	2	American Eel	22
MR1	2012-09-25	14:04	2	American Eel	17
MR1	2012-09-25	14:04	2	American Eel	16
MR1	2012-09-25	14:04	2	American Eel	16
MR2	2012-09-19	13:10	1	Brook Trout	15.3
MR2	2012-09-19	13:10	1	American Eel	30
MR2	2012-09-19	13:10	1	American Eel	15

Site #	Date	Time	Pass #	Species	Fork Length (cm)
MR2	2012-09-19	13:10	1	American Eel	19
MR2	2012-09-19	13:10	1	American Eel	37
MR2	2012-09-19	13:10	1	American Eel	33.5
MR2	2012-09-19	13:10	1	American Eel	18
MR2	2012-09-19	13:10	1	American Eel	25
MR2	2012-09-19	13:10	1	American Eel	26
MR2	2012-09-19	13:10	1	American Eel	28
MR2	2012-09-19	13:10	1	American Eel	16
MR2	2012-09-19	13:10	1	American Eel	24.5
MR2	2012-09-19	13:10	1	American Eel	25
MR2	2012-09-19	13:10	1	American Eel	14
MR2	2012-09-19	13:10	1	American Eel	24
MR2	2012-09-19	13:10	1	American Eel	15
MR2	2012-09-19	13:10	1	American Eel	18
MR2	2012-09-19	13:10	1	American Eel	16
MR2	2012-09-19	13:10	1	American Eel	60
MR2	2012-09-19	13:10	1	American Eel	24
MR2	2012-09-19	13:10	1	American Eel	12
MR2	2012-09-19	13:10	2	Brook Trout	10
MR2	2012-09-19	13:10	2	American Eel	34
MR2	2012-09-19	13:10	2	American Eel	26
MR2	2012-09-19	13:10	2	American Eel	25
MR2	2012-09-19	13:10	2	American Eel	23
MR2	2012-09-19	13:10	2	American Eel	17
MR2	2012-09-19	13:10	2	American Eel	19
MR2	2012-09-19	13:10	2	American Eel	11
MR3	2012-09-18	11:00	1	Brook Trout	19.5
MR3	2012-09-18	11:00	1	Brook Trout	21.5
MR3	2012-09-18	11:00	1	American Eel	89
MR3	2012-09-18	11:00	1	American Eel	33
MR3	2012-09-18	11:00	1	American Eel	13
MR3	2012-09-18	11:00	1	American Eel	23
MR3	2012-09-18	11:00	1	American Eel	28
MR3	2012-09-18	11:00	1	American Eel	11
MR3	2012-09-18	11:00	1	American Eel	28
MR3	2012-09-18	11:00	1	American Eel	24
MR3	2012-09-18	11:00	1	American Eel	16
MR3	2012-09-18	11:00	1	American Eel	24
MR3	2012-09-18	11:00	1	American Eel	25
MR3	2012-09-18	11:00	1	American Eel	24

Site #	Date	Time	Pass #	Species	Fork Length (cm)
MR3	2012-09-18	11:00	1	American Eel	20
MR3	2012-09-18	11:00	2	American Eel	21
MR3	2012-09-18	11:00	2	American Eel	28
MR3	2012-09-18	11:00	2	American Eel	12
MR3	2012-09-18	11:00	2	American Eel	23
MR3	2012-09-18	11:00	2	American Eel	31
MR3	2012-09-18	11:00	2	American Eel	22
MR3	2012-09-18	11:00	2	American Eel	20
MR3	2012-09-18	11:00	2	American Eel	24
MR3	2012-09-18	11:00	2	American Eel	14
MR3	2012-09-18	11:00	2	American Eel	27
MR3	2012-09-18	11:00	2	American Eel	15
MR3	2012-09-18	11:00	2	American Eel	26
MR3	2012-09-18	11:00	2	American Eel	15
MR3	2012-09-18	11:00	3	Brook Trout	8.8
MR3	2012-09-18	11:00	3	Brook Trout	24
MR3	2012-09-18	11:00	3	Brook Trout	20
MR3	2012-09-18	11:00	3	American Eel	33
MR3	2012-09-18	11:00	3	American Eel	30
MR3	2012-09-18	11:00	3	American Eel	16
MR3	2012-09-18	11:00	3	American Eel	18
MR3	2012-09-18	11:00	3	American Eel	17
MR3	2012-09-18	11:00	3	American Eel	23
MR3	2012-09-18	11:00	3	American Eel	18
MR3	2012-09-18	11:00	3	American Eel	29
MR4	2012-09-20	12:51	1	American Eel	20
MR4	2012-09-20	12:51	1	American Eel	24
MR4	2012-09-20	12:51	1	American Eel	35
MR4	2012-09-20	12:51	1	American Eel	34
MR4	2012-09-20	12:51	1	American Eel	17.5
MR4	2012-09-20	12:51	1	American Eel	34
MR4	2012-09-20	12:51	1	American Eel	33
MR4	2012-09-20	12:51	1	American Eel	25
MR4	2012-09-20	12:51	1	American Eel	17
MR4	2012-09-20	12:51	1	American Eel	11
MR4	2012-09-20	12:51	2	Brook Trout	20
MR4	2012-09-20	12:51	2	American Eel	31
MR4	2012-09-20	12:51	2	American Eel	27
MR4	2012-09-20	12:51	2	American Eel	33
MR4	2012-09-20	12:51	2	American Eel	19
MR4	2012-09-20	12:51	2	American Eel	16

Site #	Date	Time	Pass #	Species	Fork Length (cm)
MR4	2012-09-20	12:51	2	American Eel	22
MR4	2012-09-20	12:51	2	American Eel	25
MR4	2012-09-20	12:51	3	American Eel	10.5
MR4	2012-09-20	12:51	3	American Eel	34
MR4	2012-09-20	12:51	3	American Eel	31
MR4	2012-09-20	12:51	3	American Eel	21
MR4	2012-09-20	12:51	3	American Eel	33.5
MR4	2012-09-20	12:51	3	American Eel	19
MR4	2012-09-20	12:51	3	American Eel	16
MR4	2012-09-20	12:51	3	American Eel	20

A.5 Vegetation Transect Data

Table A7: Post-Restoration Vegetation Data, Year 1

Transect #	Plot #	Date	Moss/ Lichens	Ferns	Grass	Sedges	Herbs	Shrubs	Bare Soil	Water	Rocks	Plant Species Present	Notes
4	1	19-Oct-11	0	0	0	0	1	0	75	0	25	Burdock	1% means that a species is present, but in an amount less than 5%. All other % covers are rounded to the nearest 5%.
4	2	19-Oct-11	0	0	0	0	0	0	45	50	5		
4	3	19-Oct-11	0	0	0	0	0	0	0	50	50		
5	1	19-Oct-11	0	0	1	0	0	0	90	0	10		
5	2	19-Oct-11	0	0	0	0	0	0	0	100	0		
5	3	19-Oct-11	0	0	0	0	0	0	0	0	100		
6	1	19-Oct-11	1	0	1	0	5	0	25	0	80	Buttercup, Purple-stemmed aster, Plantain	
6	2	19-Oct-11	0	0	0	0	0	0	0	25	75		
6	3	19-Oct-11	0	0	1	0	1	0	0	0	100	Buttercup, Plantain, Canada goldenrod	
7	1	19-Oct-11	0	0	0	0	0	0	0	100	0		
7	2	19-Oct-11	0	0	0	0	0	0	0	100	0		
7	3	19-Oct-11	0	0	0	0	1	0	100	0	0		
8	1	19-Oct-11	1	0	0	0	10	0	15	0	75	Rush species, Wild carrot	
8	2	19-Oct-11	0	0	0	0	0	0	0	100	0		
8	3	19-Oct-11	0	0	0	0	0	0	0	100	0		
9	1	19-Oct-11	0	0	0	0	0	0	70	25	5		
9	2	19-Oct-11	0	0	0	0	0	0	0	100	0		
9	3	19-Oct-11	0	0	0	0	0	0	100	0	0		
10	1	19-Oct-11	0	0	1	0	1	0	55	20	25	Plantain, Field mint	
10	2	19-Oct-11	0	0	0	0	0	0	0	100	0		
10	3	19-Oct-11	0	0	0	0	1	0	95	0	5	Dandelion, Red clover	Plot partially covered with hay.
11	1	19-Oct-11	0	0	0	0	0	0	95	0	5		
11	2	19-Oct-11	0	0	0	0	1	0	95	0	5	St. John's-wort, Knapweed	Plants found in plots were mostly dead and very small (i.e. too small and dishevelled for accurate ID)
11	3	19-Oct-11	0	0	0	0	1	0	95	0	5	St. John's-wort	

Table A8: Post-Restoration Vegetation Data, Year 2

Transect #	Date	Plot #	Moss/ Lichens	Ferns	Grass	Sedges	Herbs	Shrubs	Bare Soil	Water	Rocks	Plant Species Present
5	03-Aug-12	1	0	0	10	1	5	0	0	0	90	Jewelweed, lady's thumb
5	03-Aug-12	2	0	0	0	0	0	0	0	0	100	
5	03-Aug-12	3	0	0	5	0	10	0	0	0	90	Jewelweed
4	03-Aug-12	1	0	0	0	0	0	0	0	30	70	
4	03-Aug-12	2	0	0	15	10	5	0	0	100	50	Clover, fragrant bedstraw, bishop's cap, chickweed, hawkweed
4	03-Aug-12	3	0	0	0	0	0	0	0	100	0	
6	03-Aug-12	1	0	0	0	0	0	0	0	60	40	
6	03-Aug-12	2	0	0	0	0	0	0	0	10	90	
6	03-Aug-12	3	0	0	0	0	0	0	0	100	0	
7	03-Aug-12	1	0	0	0	0	0	0	0	70	30	
7	03-Aug-12	2	0	0	1	0	20	0	0	0	80	Purple-stemmed aster, coltsfoot, jewelweed, ox-eye daisy, fragrant bedstraw, fringed bindweed, wood sorrel, chickweed
7	03-Aug-12	3	0	0	1	1	5	0	5	0	90	Cow vetch, dandelion
8	03-Aug-12	1	0	0	0	0	0	0	0	99	1	
8	03-Aug-12	2	0	0	1	0	20	0	0	0	80	Jewelweed, field mint, marsh gold cap, common strawberry, birch seedling, maple seedling, plantain spp.
8	03-Aug-12	3	0	0	0	0	0	0	0	90	10	
9	03-Aug-12	1	10	0	50	0	10	10	0	0	0	Speckled alder, queen anne's lace, broad-leaved meadowsweet
9	03-Aug-12	2	0	0	1	0	30	0	0	0	50	Field mint, jewelweed, evening primrose, bedstraw, sorrel, skunk cabbage
9	03-Aug-12	3	0	0	0	0	0	10	0	60	30	Willow
10	03-Aug-12	1	0	0	20	10	30	0	0	5	50	Spearmint, chickweed
10	03-Aug-12	2	0	0	0	0	0	0	0	5	95	
10	03-Aug-12	3	0	0	0	0	0	0	0	30	70	
11	03-Aug-12	1	0	0	1	0	10	0	0	0	90	Evening primrose, queen ann's lace, knapweed, chickweed spp, hawkweed, wood anemone
11	03-Aug-12	2	0	0	0	0	1	0	0	0	99	Hawkweed, coltsfoot
11	03-Aug-12	3	0	0	0	0	1	0	5	0	95	Sticky groundsel

A.6 Cross-Sectional Elevation Profile Data

Table A9: Pre-Restoration Cross-Sectional Elevation Transect Data

Point	Transect #	Northing	Easting	Elevation	Side of River:
2017	1	4946810.261	5413496.025	24.012	East
Offset Horizontal Distance(0.3m)	Horizontal Distance (m)	Vertical Distance to hard surface (m)	Vertical distance to water surface (m)	Elevation Profile	Notes (Significant geomorphic features, etc)
0.70	1.00	-0.17		23.84	
1.70	2.00	-0.50		23.51	Japanese Knotweed
2.30	2.60	-0.60		23.41	Edge of Veg
2.70	3.00	-0.61		23.40	
3.70	4.00	-0.84		23.17	
4.70	5.00	-0.91		23.10	
5.40	5.70	-1.06		22.95	water's edge
6.20	6.50	-1.18		22.83	
6.70	7.00	-1.15		22.86	
7.20	7.50	-1.00		23.01	boulder
7.70	8.00	-1.18		22.83	
8.20	8.50	-0.75		23.26	boulder
8.70	9.00	-1.24		22.77	rock/water surface
9.20	9.50	-1.46		22.55	
9.70	10.00	-1.48		22.53	
10.20	10.50	-1.24		22.77	
10.70	11.00	-1.38		22.63	
11.20	11.50	-1.41		22.60	
11.70	12.00	-1.62		22.39	
12.20	12.50	-1.45		22.56	
12.70	13.00	-1.45		22.56	
13.20	13.50	-1.36		22.65	
13.70	14.00	-1.30		22.71	water's edge
14.20	14.50	-1.12		22.89	
14.70	15.00	-1.11		22.90	
15.35	15.65	-0.80		23.21	veg starts
15.70	16.00	-0.50		23.51	
16.25	16.55	-0.24		23.77	end/rebar
Point	Transect #	Northing	Easting	Elevation	Side of River:
2002	2	4946788.308	5413501.302	24.301	East
Offset Horizontal Distance (0.4m)	Horizontal Distance (m)	Vertical Distance to hard surface (m)	Vertical distance to water surface (m)	Elevation Profile	Notes (Significant geomorphic features, etc)
0.60	1.00	-0.24		24.06	vegetation
1.60	2.00	-0.58		23.72	vegetation
2.60	3.00	-0.50		23.80	vegetation

3.60	4.00	-0.52		23.78	vegetation
4.28	4.68	-0.82		23.48	water's edge
4.60	5.00	-0.86		23.44	
5.10	5.50	-0.86		23.44	
5.60	6.00	-0.96		23.34	
6.10	6.50	-0.87		23.43	
6.60	7.00	-0.94		23.36	
7.10	7.50	-0.91		23.39	
7.60	8.00	-0.92		23.38	
8.10	8.50	-0.94		23.36	
8.60	9.00	-0.93	0.77	23.37	
9.10	9.50	-0.94		23.36	
9.60	10.00	-0.96		23.34	
10.10	10.50	-0.90		23.40	
10.60	11.00	-0.99		23.31	
11.10	11.50	-0.85		23.45	
11.60	12.00	-0.84		23.46	
12.10	12.50	-1.00		23.30	
12.60	13.00	-0.80		23.50	
13.10	13.50	-0.83		23.47	
13.60	14.00	-0.75		23.55	
13.33	13.73	-0.85		23.45	water's edge
14.10	14.50	-0.70		23.60	
15.10	15.50	-0.25		24.05	
15.45	15.85	-0.16		24.14	end/rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
2003	3	4946750.482	5413510.835	25.329	East
Offset Horizontal Distance (0.0m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
	1.00	-0.90		24.43	
	2.00	-0.67		24.66	
	2.82	-1.16		24.17	water's edge
	3.00	-1.11		24.22	cobbles
	3.50	-1.20		24.13	
	4.00	-1.11		24.22	
	4.50	-1.15		24.18	
	5.00	-1.18		24.15	
	5.50	-1.11		24.22	
	6.00	-1.16	1.06	24.17	
	6.50	-1.35		23.98	
	7.00	-1.28		24.05	
	7.50	-1.04		24.29	
	8.00	-0.90		24.43	

8.50	-1.05		24.28	
9.00	-1.09		24.24	
9.50	-0.97		24.36	
10.00	-0.83		24.50	
10.50	-1.00		24.33	
11.00	-0.99		24.34	
11.50	-0.94		24.39	
12.00	-0.99		24.34	water's edge
12.50	-0.82		24.51	
13.00	-0.80		24.53	
13.50	-0.84		24.49	
14.00	-0.87		24.46	
14.50	-0.89		24.44	
15.00	-0.98		24.35	edge of veg
15.50	-0.90		24.43	
16.00	-0.74		24.59	
16.50	-0.73		24.60	
17.00	-0.58		24.75	
17.50	-0.49		24.84	
18.00	-0.34		24.99	
18.50	-0.23		25.10	
18.95	-0.21		25.12	end/rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
2004	4	4946735.365	5413517.341	27.607	East
Offset Horizontal Distance (0.0m)	Horizontal Distance (m)	Vertical Distance to hard surface (m)	Vertical distance to water surface (m)	Elevation Profile	Notes (Significant geomorphic features, etc)
	1.00	-0.22		27.39	over fish passage through fence AND vegetation
	2.00	-0.45		27.16	vegetation
	3.00	-0.23	2.00	27.38	mesh fence over fish passage
	3.00	-2.63		24.98	bottom of fish passageway
	4.00	-0.43	1.90	27.18	mesh fence over fish passage
	4.00	-2.55		25.06	bottom of fish passageway
	5.00	-0.35	1.94	27.26	mesh fence over fish passage
	5.00	-2.43		25.18	bottom of fish passageway
	6.00	-1.90		25.71	
	7.00	-2.29		25.32	boulders
	8.00	-2.55		25.06	
	9.00	-2.78		24.83	gravel
	10.00	-2.76		24.85	gravel
	11.00	-2.62		24.99	gravel

	12.00	-2.56		25.05	gravel
	13.00	-2.53		25.08	silty
	14.00	-2.46	1.66	25.15	silty and rocky
	15.00	-2.40		25.21	silty and rocky
	16.00	-2.41		25.20	silty and rocky
	17.00	-2.54		25.07	silty and rocky
	18.00	-2.58		25.03	silty and rocky
	19.00	-2.80		24.81	
	20.00	-2.85		24.76	very soft mud and plant debris
	21.00	-3.00		24.61	
	22.00	-3.10		24.51	
	23.00	-1.95		25.66	boulders
	24.00	-1.73		25.88	boulders
	25.00	-0.92		26.69	boulders
	26.00	-0.30		27.31	boulders/end-rebar
	24.30	-1.75		25.86	water's edge

Point	Transect #	Northing	Easting	Elevation	Side of River:
2005	5	4946732.398	5413519.926	27.855	East
Offset Horizontal Distance(0.28m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile (m)**	**Notes (Significant geomorphic features, etc)**
0.72	1.00	-0.09		27.77	transect is between birch and fishway grasses
1.72	2.00	-0.22		27.64	grasses
2.72	3.00	-0.39		27.47	grasses
3.72	4.00	-0.36		27.50	grasses
4.72	5.00	-0.70		27.16	grasses
5.72	6.00	-0.94		26.92	grasses
6.72	7.00	-1.98		25.88	water's edge
7.72	8.00	-1.60		26.26	on boulder
8.72	9.00	-2.81		25.05	boulder
9.72	10.00	-2.87		24.99	boulder
10.72	11.00	-2.70		25.16	gravel
11.72	12.00	-2.57		25.29	gravel
12.72	13.00	-2.54		25.32	gravel
13.72	14.00	-2.53		25.33	gravel
14.72	15.00	-2.45		25.41	silty mud
15.72	16.00	-2.45		25.41	silty mud
16.72	17.00	-2.45		25.41	silty mud
17.72	18.00	-2.36		25.50	
18.72	19.00	-2.33		25.53	rocky with silty mud
19.72	20.00	-2.36		25.50	
20.72	21.00	-2.45		25.41	silty

21.72	22.00	-2.43		25.43	silty
22.72	23.00	-2.55		25.31	boulders
23.72	24.00	-2.62		25.24	boulders
24.72	25.00	-2.38		25.48	boulders
25.72	26.00	-2.10	1.53	25.76	water's edge
26.72	27.00	-0.59		27.27	
27.72	28.00	-0.39		27.47	
28.70	28.98	-0.25		27.61	end/rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
2006	6	4946730.061	5413523.641	27.543	East
Offset Horizontal Distance(0.24m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
0.76	1.00	-0.12		27.42	transect is close to birch tree vegetation
1.76	2.00	-0.20		27.34	vegetation
2.76	3.00	-0.39		27.15	vegetation
3.76	4.00	-0.65		26.89	vegetation
4.76	5.00	-0.86		26.68	vegetation
5.76	6.00	-1.01		26.53	vegetation
6.01	6.25	-1.68		25.86	water's edge
6.76	7.00	-1.54		26.00	
7.76	8.00	-2.07		25.47	
8.76	9.00	-2.40		25.14	
9.76	10.00	-2.55		24.99	
10.76	11.00	-2.51		25.03	
11.76	12.00	-2.40		25.14	
12.76	13.00	-2.25		25.29	
13.76	14.00	-2.14		25.40	
14.76	15.00	-2.21		25.33	
15.76	16.00	-2.32		25.22	
16.76	17.00	-2.42		25.12	
17.76	18.00	-2.45		25.09	sand
18.76	19.00	-2.47		25.07	
19.76	20.00	-2.59		24.95	
20.76	21.00	-2.82		24.72	
21.76	22.00	-2.99		24.55	
22.76	23.00	-3.10		24.44	
23.76	24.00	-3.20		24.34	
24.76	25.00	-3.22		24.32	
25.76	26.00	-3.10		24.44	
26.76	27.00	-2.97		24.57	mud and boulders
27.76	28.00	-2.00	1.6	25.54	
28.76	29.00	-2.25		25.29	

29.06	29.30	-1.67		25.87	water's edge
29.76	30.00	-1.37		26.17	
30.76	31.00	-0.74		26.80	
31.76	32.00	-0.36		27.18	
32.00	32.24	-0.52		27.02	end/rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
2007	7	4946720.863	5413531.014	26.783	East
Offset Horizontal Distance (0.0m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
	1.00	-0.06		26.723	grasses
	2.00	-0.16		26.623	grasses
	3.00	-0.30		26.483	grasses
	4.00	-0.50		26.283	grasses
	4.80	-0.74		26.043	water's edge
	5.00	-0.77		26.013	
	6.00	-0.78		26.003	
	7.00	-0.80		25.983	
	8.00	-1.80		24.983	
	9.00	-1.21		25.573	
	10.00	-1.28		25.503	
	11.00	-1.23		25.553	
	12.00	-1.21		25.573	
	13.00	-1.30		25.483	
	14.00	-1.45		25.333	
	15.00	-1.49		25.293	
	16.00	-1.54		25.243	
	17.00	-1.60		25.183	
	18.00	-1.66		25.123	
	19.00	-1.75		25.033	
	20.00	-1.90		24.883	
	21.00	-2.11		24.673	
	22.00	-2.23		24.553	
	23.00	-2.33		24.453	
	24.00	-2.49		24.293	
	25.00	-2.67		24.113	
	26.00	-2.80		23.983	
	27.00	-2.98		23.803	
	28.00	-2.98		23.803	
	29.00	-2.86		23.923	
	30.00	-2.70		24.083	
	31.00	-2.53	1.07	24.253	
	32.00	-1.53		25.253	
	33.00	-1.60		25.183	

	34.00	-1.10		25.683	water's edge
	35.00	-0.91		25.873	boulders
	36.00	-0.11		26.673	
	36.20	-0.08		26.703	end/rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
2009	8	4946711.511	5413536.527	26.901	East
Offset Horizontal Distance (0.0m)	Horizontal Distance (m)	Vertical Distance to hard surface (m)	Vertical distance to water surface (m)	Elevation Profile	Notes (Significant geomorphic features, etc)
	-3.30				bankfull
	0.00	-0.37		26.53	
	1.00	-0.45		26.45	
	2.00	-0.56		26.34	
	3.00	-0.71		26.19	
	4.00	-0.80		26.10	
	4.50	-0.98		25.92	edge of veg
	5.00	-1.06		25.84	
	6.00	-1.16		25.74	
	6.40	-1.19		25.71	water's edge
	7.00	-1.34		25.56	
	8.00	-1.47		25.43	
	9.00	-1.58		25.32	
	10.00	-1.68		25.22	
	11.00	-1.79		25.11	
	12.00	-1.86		25.04	
	13.00	-1.94		24.96	
	14.00	-2.00		24.90	
	15.00	-2.04		24.86	
	16.00	-2.03		24.87	
	17.00	-2.12		24.78	
	18.00	-2.34		24.56	
	19.00	-2.35		24.55	
	20.00	-2.38		24.52	
	21.00	-2.43		24.47	
	22.00	-2.55	1.5	24.35	
	23.00	-2.60		24.30	
	24.00	-2.61		24.29	
	25.00	-2.64		24.26	
	26.00	-2.99		23.91	
	27.00	-3.06		23.84	
	28.00	-3.19		23.71	
	29.00	-3.28		23.62	
	30.00	-3.26		23.64	
	31.00	-3.22		23.68	

32.00	-3.21		23.69	
33.00	-3.23		23.67	
34.00	-3.06		23.84	
35.00	-3.12		23.78	
36.00	-2.80		24.10	
37.00	-2.53		24.37	
37.40	-2.36		24.54	water's edge
38.00	-1.74		25.16	
39.00	-1.12		25.78	
39.80	-0.75		26.15	end/rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
2010	9	4946711.511	5413536.527	26.894	East
Offset Horizontal Distance(0.15m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
0.85	1.00	-0.06		26.83	
1.55	1.70	-0.12		26.77	edge of ved
1.85	2.00	-0.20		26.69	
2.85	3.00	-0.34		26.55	
3.85	4.00	-0.49		26.40	
4.85	5.00	-0.55		26.34	
5.85	6.00	-0.64		26.25	
6.35	6.50	-0.70		26.19	water's edge
6.85	7.00	-0.72		26.17	
7.85	8.00	-0.73		26.16	
8.85	9.00	-0.85		26.04	
9.85	10.00	-1.10		25.79	
10.85	11.00	-1.30		25.59	up to 11.2m is sand (depth of 1.35) sand ends
11.85	12.00	-1.50		25.39	cobbles
12.85	13.00	-1.49		25.40	
13.85	14.00	-1.53		25.36	
14.85	15.00	-1.51		25.38	
15.85	16.00	-1.56		25.33	
16.85	17.00	-1.63		25.26	
17.85	18.00	-1.70		25.19	
18.85	19.00	-1.67		25.22	
19.85	20.00	-1.74		25.15	
20.85	21.00	-1.78		25.11	
21.85	22.00	-1.85		25.04	
22.85	23.00	-1.71		25.18	
23.85	24.00	-1.61		25.28	
24.85	25.00	-1.61		25.28	
25.85	26.00	-1.69		25.20	

26.85	27.00	-1.84		25.05	
27.85	28.00	-1.80		25.09	
28.85	29.00	-1.99		24.90	
29.85	30.00	-1.99		24.90	
30.85	31.00	-1.97		24.92	
31.85	32.00	-1.97		24.92	
32.85	33.00	-1.89		25.00	
33.85	34.00	-1.94		24.95	0.97
34.85	35.00	-1.84		25.05	
35.85	36.00	-1.62		25.27	
36.85	37.00	-1.17		25.72	
37.85	38.00	-0.97		25.92	
38.05	38.20	-1.15		25.74	water's edge
38.75	38.90	-0.56		26.33	end/rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
2012	10	4946690.493	5413542.73	27.147	East
Offset Horizontal Distance (0.0m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
	0.50	-0.52		26.63	
	2.00	-0.67		26.48	
	3.00	-0.80		26.35	
	4.00	-0.80		26.35	
	5.00	-0.83		26.32	
	6.00	-0.90		26.25	
	7.00	-0.99		26.16	
	7.45	-1.27		25.88	
	7.87	-1.43		25.72	
	8.25	-1.40		25.75	
	8.50	-1.40		25.75	
	8.75	-1.38		25.77	
	9.00	-1.43		25.72	
	9.25	-1.43		25.72	
	9.50	-1.45		25.70	
	9.75	-1.41		25.74	
	10.00	-1.41		25.74	
	10.25	-1.44		25.71	
	10.50	-1.42		25.73	
	10.75	-1.45		25.70	
	11.00	-1.41		25.74	
	11.25	-1.49		25.66	
	11.50	-1.49		25.66	
	11.75	-1.50	1.35	25.65	
	12.00	-1.43		25.72	

12.25	-1.45	25.70	
12.50	-1.46	25.69	
12.75	-1.47	25.68	
13.00	-1.50	25.65	
13.25	-1.39	25.76	
13.50	-1.40	25.75	
13.75	-1.37	25.78	
14.00	-1.43	25.72	
14.25	-1.40	25.75	
14.50	-1.37	25.78	
14.75	-1.39	25.76	
15.00	-1.30	25.85	
15.25	-1.43	25.72	
15.50	-1.39	25.76	
15.75	-1.42	25.73	
16.00	-1.38	25.77	
16.25	-1.40	25.75	
16.50	-1.36	25.79	
16.62	-1.35	25.80	edge of channel branch
16.75	-1.33	25.82	
17.00	-1.35	25.80	
17.25	-1.31	25.84	
17.50	-1.32	25.83	
17.75	-1.31	25.84	
18.00	-1.30	25.85	
18.25	-1.28	25.87	
19.00	-1.28	25.87	
20.00	-1.29	25.86	
21.00	-1.25	25.90	
22.00	-1.26	25.89	
23.00	-1.36	25.79	
24.00	-1.33	25.82	
25.00	-1.35	25.80	
26.00	-1.30	25.85	
27.00	-1.30	25.85	
28.00	-1.31	25.84	
29.00	-1.34	25.81	
30.00	-1.55	25.60	beginning of 2nd channel
31.00	-1.63	25.52	
31.25	-1.69	25.46	
31.50	-1.69	25.46	
31.75	-1.70	25.45	
32.00	-1.71	25.44	
32.25	-1.73	25.42	

	32.50	-1.75		25.40	
	32.75	-1.77		25.38	
	33.00	-1.74		25.41	
	33.25	-1.75		25.40	
	33.50	-1.75		25.40	
	33.75	-1.80		25.35	
	34.00	-2.04		25.11	
	34.25	-2.13		25.02	
	34.50	-2.15		25.00	
	34.75	-2.11		25.04	
	35.00	-2.00		25.15	
	35.50	-2.03		25.12	
	36.00	-2.10		25.05	
	36.50	-2.10		25.05	
	37.00	-2.23	1.58	24.92	
	37.50	-2.00		25.15	
	38.00	-1.95		25.20	
	38.50	-1.68		25.47	water's edge
	39.00	-1.43		25.72	
	39.50	-1.29		25.86	
	40.00	-0.82		26.33	
	40.50	-0.94		26.21	
	41.00	-0.69		26.46	
	41.29	-0.30		26.85	

Point	Transect #	Northing	Easting	Elevation	Side of River:
2013	11	4946677.015	5413545.089	27.543	East
Offset Horizontal Distance (0.0m)	Horizontal Distance (m)	Vertical Distance to hard surface (m)	Vertical distance to water surface (m)	Elevation Profile	Notes (Significant geomorphic features, etc)
	-3.10				bankfull
	1.00	-0.04		27.50	
	2.00	-0.18		27.36	sand
	3.00	-0.21		27.33	sand
	4.00	-0.26		27.28	
	4.60	-0.30		27.24	bank break
	5.00	-0.54		27.00	cobble
	5.50	-0.75		26.79	
	6.00	-0.94		26.60	
	6.50	-1.08		26.46	
	6.80	-1.12		26.42	water's edge
	7.25	-1.30		26.24	
	7.50	-1.40		26.14	
	7.75	-1.51		26.03	
	7.95	-1.47	1.12	26.07	Thalweg

8.25	-1.46	26.08	
8.50	-1.48	26.06	
8.75	-1.46	26.08	
9.00	-1.46	26.08	
9.25	-1.35	26.19	
9.50	-1.45	26.09	
9.75	-1.20	26.34	rock
10.00	-0.90	26.64	rock
10.50	-0.83	26.71	rock
10.75	-0.98	26.56	
11.00	-1.30	26.24	
11.25	-1.50	26.04	
11.50	-1.55	25.99	
11.75	-1.58	25.96	
12.00	-1.56	25.98	
12.25	-1.04	26.50	
12.50	-1.36	26.18	
12.75	-1.38	26.16	
13.00	-1.35	26.19	
13.25	-1.05	26.49	
13.50	-1.22	26.32	
14.00	-1.28	26.26	
14.55	-1.18	26.36	water's edge
15.50	-1.10	26.44	vegetation
16.50	-1.10	26.44	
17.50	-0.95	26.59	
18.50	-0.88	26.66	
19.50	-0.88	26.66	
20.50	-0.72	26.82	
21.50	-0.72	26.82	
22.50	-0.61	26.93	
23.50	-0.62	26.92	
24.50	-0.68	26.86	
25.50	-0.81	26.73	
26.50	-0.80	26.74	
27.50	-0.93	26.61	
28.50	-0.94	26.60	
29.50	-0.98	26.56	
30.50	-0.97	26.57	
31.50	-1.09	26.45	
32.50	-1.45	26.09	
33.00	-1.60	25.94	
33.50	-1.82	25.72	water's edge
34.00	-1.95	25.59	

34.50	-1.92		25.62	
35.00	-2.01		25.53	
35.50	-2.10		25.44	
36.00	-2.18		25.36	
36.50	-2.32		25.22	
37.00	-2.15		25.39	
37.50	-2.25		25.29	
38.00	-1.80		25.74	water's edge
38.50	-1.44		26.10	
39.00	-1.40		26.14	
39.50	-0.91		26.63	bankfull
40.00	-0.65		26.89	
40.40	-0.35		27.19	end/rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
1249	12	4946636.575	5413538.676	27.579 (+.72)	West

Offset Horizontal Distance (0.0m)	Horizontal Distance (m)	Vertical Distance to hard surface (m)	Vertical distance to water surface (m)	Elevation Profile	Notes (Significant geomorphic features, etc)
	0.20	-0.72		26.86	grass before bankfull
	1.00	-0.80		26.78	
	2.00	-0.80		26.78	
	3.00	-0.85		26.73	
	4.00	-0.86		26.72	alders start, change of veg
	5.00	-0.82		26.76	
	6.00	-0.88		26.70	
	6.50	-0.86		26.72	
	7.50	-0.80		26.78	
	8.50	-0.74		26.84	
	9.50	-0.70		26.88	
	10.50	-0.58		27.00	
	11.50	-0.56		27.02	
	11.80	-0.48		27.10	bankfull
	12.50	-0.46		27.12	
	13.00	-0.48		27.10	
	13.50	-0.46		27.12	veg ends
	14.00	-0.46		27.12	
	14.50	-0.50		27.08	
	15.00	-0.53		27.05	
	15.50	-0.53		27.05	
	16.00	-0.63		26.95	
	16.50	-0.70		26.88	start of gravle
	17.00	-0.69		26.89	

	17.50	-0.75		26.83	
	17.90	-0.83		26.75	water's edge
	18.25	-0.86		26.72	end of gravel
	18.75	-0.91		26.67	
	19.00	-0.98		26.60	
	19.50	-0.90		26.68	
	20.00	-0.88		26.70	
	20.50	-0.50		27.08	
	21.00	-0.98		26.60	
	21.50	-0.80		26.78	
	22.00	-1.01		26.57	
	22.50	-0.96		26.62	
	23.00	-1.00		26.58	
	23.50	-0.99		26.59	
	24.00	-1.04		26.54	
	24.50	-1.10		26.48	
	25.00	-1.14		26.44	
	25.50	-1.20		26.38	
	26.00	-1.22	0.8	26.36	Thalweg
	26.50	-1.20		26.38	
	27.00	-1.03		26.55	
	27.50	-0.89		26.69	
	28.00	-1.04		26.54	
	28.50	-1.00		26.58	
	29.00	-0.93		26.65	
	29.20	-0.86		26.72	water's edge
	30.00	-0.62		26.96	veg
	31.00	-0.54		27.04	veg
	32.00	-0.48		27.10	veg
	33.00	-0.46		27.12	bankfull
	34.00	-0.44		27.14	
	35.00	-0.42		27.16	
	36.00	-0.41		27.17	
	36.40	-0.42		27.16	end/rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
2015	13	4946629.383	5413573.955	27.656	East
Offset Horizontal Distance (0.0m)	Horizontal Distance (m)	Vertical Distance to hard surface (m)	Vertical distance to water surface (m)	Elevation Profile	Notes (Significant geomorphic features, etc)
	-1.40				bankfull
	0.00				edge of alder trees
	0.90	-0.56		27.10	edge of shurbs

	2.50	-0.56		27.10	edge of sand/gravel changes to boulder/cobble
	3.50	-0.65		27.01	cobbles
	4.50	-0.82		26.84	cobbles
	5.00	-0.91		26.75	
	5.50	-1.01		26.65	
	6.00	-1.08		26.58	
	6.50	-1.18		26.48	water's edge
	6.75	-1.30		26.36	
	7.00	-1.36		26.30	
	7.25	-1.46		26.20	
	7.50	-1.46		26.20	
	7.75	-1.48		26.18	
	8.00	-1.53		26.13	
	8.25	-1.55		26.11	
	8.50	-1.53		26.13	
	8.75	-1.50		26.16	
	9.00	-1.59		26.07	
	9.25	-1.54		26.12	
	9.50	-1.63		26.03	
	9.75	-1.64		26.02	
	10.00	-1.76		25.90	
	10.25	-1.60		26.06	
	10.50	-1.80		25.86	
	10.75	-1.78		25.88	
	11.00	-1.82		25.84	
	11.25	-1.85	1.2	25.81	thalweg
	11.50	-1.80		25.86	
	11.75	-1.72		25.94	
	12.00	-1.52		26.14	
	12.20	-1.20		26.46	water's edge
	12.75				bankfull

Point	Transect #	Northing	Easting	Elevation	Side of River:
2016	14	4946583.779	5413610.045	29.043	East
Offset Horizontal Distance (0.0m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
	0.90	-0.34		28.70	bankfull
	1.90	-0.36		28.68	vegetation change
	3.30	-0.55		28.49	edge of bank
	3.45	-0.56		28.48	
	4.25	-0.57		28.47	
	4.50	-0.56		28.48	edge of water
	4.75	-0.54		28.50	

	5.00	-0.62		28.42	
	5.25	-0.62		28.42	
	5.50	-0.60		28.44	
	5.75	-0.60		28.44	
	6.00	-0.56		28.48	
	6.25	-0.66		28.38	
	6.50	-0.60		28.44	
	6.75	-0.56		28.48	
	7.00	-0.54		28.50	
	7.25	-0.54		28.50	
	7.50	-0.44		28.60	
	7.75	-0.54		28.50	
	8.00	-0.71		28.33	
	8.25	-0.50		28.54	
	8.50	-0.51		28.53	
	8.75	-0.88		28.16	edge if channel
	9.00	-0.92		28.12	
	9.25	-0.84		28.20	
	9.50	-0.88		28.16	
	9.75	-0.94		28.10	
	10.00	-1.04	0.61	28.00	Thalweg
	10.25	-0.78		28.26	edge of channel
	10.50	-0.64		28.40	rock
	10.75	-0.26		28.78	rock
	11.00	-0.80		28.24	
	11.25	-0.30		28.74	
	11.35				end/rebar
	12.30				bankfull

Point	Transect #	Northing	Easting	Elevation	Side of River:
2061	15	4946575.255	5413680.005	30.63	East
Offset Horizontal Distance (0.0m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
	-10.70				bankfull
	1.20	-0.27		30.36	
	1.85	-0.50		30.13	water's edge
	2.30	-0.36		30.27	rock
	2.66	-0.68		29.95	
	3.10	-0.68		29.95	
	3.55	-0.58		30.05	
	3.65	-0.67		29.96	thalweg
	4.00	-0.60		30.03	
	4.25	-0.55		30.08	
	4.50	-0.52		30.11	

4.75	-0.51	30.12	
5.00	-0.52	30.11	
5.25	-0.51	30.12	
5.50	-0.48	30.15	
5.75	-0.26	30.37	
6.00	-0.36	30.27	
6.25	-0.31	30.32	
6.50	-0.28	30.35	
6.75	-0.26	30.37	
7.00	-0.34	30.29	
7.25	-0.35	30.28	
7.50	-0.40	30.23	
7.75	-0.36	30.27	
8.00	-0.20	30.43	rock/shore
8.25	-0.16	30.47	rock/shore
8.50	-0.16	30.47	rock/shore
8.75	-0.12	30.51	rock/shore
9.00	-0.28	30.35	rock/shore
9.25	-0.30	30.33	rock/shore
9.50	-0.30	30.33	rock/shore
9.75	-0.31	30.32	rock/shore
10.00	-0.31	30.32	edge of vegetation
19.50			bankfull

Table A10: Post-Restoration Cross-Sectional Elevation Transect Data

Point	Transect #	Northing	Easting	Elevation	Side of River:
1204	2	4946781.696	5413483.872	26.270	West
Offset Horizontal Distance (0.4m)	Horizontal Distance (m)	Vertical Distance to hard surface (m)	Vertical distance to water surface (m)	Elevation Profile	Notes (Significant geomorphic features, etc)
-0.40	0.00	1.44		24.30	Roadside
0.60	1.00	1.69		24.05	
1.60	2.00	2.25		23.49	
2.60	3.00	2.93		22.82	
3.60	4.00	3.58		22.16	
4.60	5.00	3.81		21.93	
5.60	6.00	4.24	0	21.50	Water's Edge
6.10	6.50	4.47	0.11	21.27	
6.60	7.00	4.57	0.32	21.17	
7.10	7.50	4.60	0.212	21.14	
7.60	8.00	4.45	0.24	21.30	
8.10	8.50	4.54	0.27	21.20	
8.60	9.00	4.52	0.25	21.22	
9.10	9.50	4.63	0.35	21.11	
9.60	10.00	4.64	0.435	21.11	
10.10	10.50	4.73	0.42	21.01	
10.60	11.00	4.76	0.46	20.98	
11.10	11.50	4.76	0.43	20.98	
11.60	12.00	4.61	0.285	21.13	
12.10	12.50	4.55	0.25	21.19	
12.60	13.00	4.56	0.3	21.18	
13.10	13.50	4.59	0.36	21.15	
13.60	14.00	4.61	0.27	21.13	
14.10	14.50	4.56	0.22	21.18	
14.60	15.00	4.54	0.17	21.21	
15.10	15.50	4.54	0.235	21.20	
15.60	16.00	4.50	0.12	21.24	water's edge
16.60	17.00	4.18		21.56	
17.60	18.00	4.17		21.57	end
Point	Transect #	Northing	Easting	Elevation	Side of River:
1213	4	4946724.769	5413492.773	28.101	West
Offset Horizontal Distance (0.0m)	Horizontal Distance (m)	Vertical Distance to hard surface (m)	Vertical distance to water surface (m)	Elevation Profile	Notes (Significant geomorphic features, etc)
	0.00	1.34		27.61	Marker @ roadside
	0.50	1.58		27.37	
	1.00	1.93		27.02	

1.50	2.36		26.59	
2.00	2.76		26.19	
2.50	3.07		25.87	
3.00	3.22		25.73	
3.50	3.33		25.62	
4.00	3.58		25.37	
4.50	3.90		25.05	
5.00	4.29		24.66	Toe of slope
5.50	4.30		24.65	
6.00	4.34		24.61	vegetation
6.50	4.30		24.65	
7.00	4.38		24.57	
7.50	4.34		24.61	
8.00	4.36		24.59	edge of vegetation
8.50	4.39		24.56	gravel bar/ veg
9.00	4.41		24.54	
9.50	4.45		24.49	
10.00	4.48		24.47	
10.50	4.44		24.50	
11.00	4.52		24.43	
11.50	4.57		24.38	
12.00	4.59		24.36	
12.50	4.65		24.30	
13.00	4.76		24.19	
13.40	4.80	0.01	24.14	water's edge
14.00	4.81	0	24.14	
14.50	4.84	0.025	24.11	
15.00	4.90	0.08	24.05	
15.50	4.90	0.125	24.05	
16.00	4.92	0.155	24.03	
16.50	4.96	0.14	23.99	
17.00	4.96	0.11	23.99	
17.50	4.97	0.05	23.98	
18.00	4.99	0.15	23.96	
18.50	5.03	0.09	23.92	
19.00	4.93	0.1	24.02	
19.50	4.98	0.105	23.97	
20.00	4.91	0.145	24.03	
20.50	5.05	0.145	23.90	
21.00	5.01	0.12	23.93	
21.50	5.02	0.1	23.93	
22.00	5.03	0.1	23.92	
22.50	5.07	0	23.88	
23.00	5.05		23.90	

23.50	*5.03*		23.92	
24.00	4.99		23.96	
24.50	5.03		23.92	clump of grass in water
25.00	4.92		24.03	edge of water/ bank armoring
25.50	4.78		24.17	
26.00	4.27		24.68	
26.50	4.00		24.94	
27.00	3.89		25.06	
27.50	3.45		25.50	
28.00	3.40		25.54	
28.50	3.21		25.74	
29.00	3.00		25.95	
29.50	2.88		26.06	
30.00	2.88		26.07	
30.10	2.77		26.18	end/ rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
1216	5	4946718.530	5413494.004	28.157	West
Offset Horizontal Distance(0.28m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile (m)**	**Notes (Significant geomorphic features, etc)**
-0.28	0.00	1.34		27.85	roadside elevation
0.72	1.00	1.65		27.55	
1.72	2.00	2.27		26.93	
2.72	3.00	2.68		26.51	
3.72	4.00	3.44		25.76	
4.72	5.00	4.34		24.85	toe of bank armouring
5.72	6.00	4.54		24.66	start of veg/ gravel bar
6.72	7.00	4.25		24.95	
7.72	8.00	4.33		24.87	
8.72	9.00	4.39		24.80	
9.72	10.00	4.42		24.77	
10.72	11.00	4.52		24.68	
11.72	12.00	4.57		24.63	
12.72	13.00	4.56		24.64	
13.72	14.00	4.72		24.47	end of gravel bar
14.72	15.00	4.84		24.36	
15.15	15.43	4.89	0.025	24.31	water's edge
15.22	15.50	4.88	0.01	24.31	
15.72	16.00	4.92	0.05	24.28	
16.22	16.50	4.95	0.09	24.25	
16.72	17.00	4.95	0.075	24.25	
17.22	17.50	4.98	0.08	24.22	
17.72	18.00	4.97	0.095	24.22	
18.22	18.50	4.98	0.1	24.22	

18.72	19.00	4.98	0.1	24.22	
19.22	19.50	5.04	0.17	24.16	
19.72	20.00	5.05	0.175	24.15	
20.22	20.50	4.04	0.15	25.16	
20.72	21.00	4.02	0.14	25.18	
21.22	21.50	4.97	0.09	24.23	
21.72	22.00	4.82	0	24.38	on rock in water
22.22	22.50	4.99	0.09	24.20	
22.72	23.00	5.00	0.1	24.20	
23.22	23.50	5.04	0.155	24.16	
23.72	24.00	5.04	0.12	24.15	
24.22	24.50	5.07	0.18	24.12	
24.72	25.00	5.12	0.15	24.08	
25.22	25.50	5.12	0.2	24.08	
25.72	26.00	5.15	0.2	24.05	
26.22	26.50	5.15	0.24	24.05	water's edge at bouldered brink
26.32	26.60	5.15	0.18	24.05	
26.72	27.00	4.48		24.72	
27.72	28.00	3.84		25.36	
28.72	29.00	3.64		25.56	
29.72	30.00	3.12		26.07	
30.72	31.00	2.83		26.36	
31.67	31.95	2.80		26.40	end/ rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
1217	6	4946712.840	5413494.911	28.282	West
Offset Horizontal Distance(0.24m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
-0.24	0.00	1.39		27.54	
0.76	1.00	2.02		26.92	
1.76	2.00	2.73		26.20	
2.76	3.00	3.48		25.46	
3.76	4.00	3.49		25.45	
4.76	5.00	4.08		24.86	
5.76	6.00	3.82		25.11	water's edge
6.70	6.94	4.67	0.2	24.26	
6.76	7.00	4.68	0.215	24.25	back eddy/ pool
7.26	7.50	4.71	0.23	24.22	back eddy/ pool
7.76	8.00	4.79	0.22	24.15	back eddy/ pool
8.26	8.50	4.55	0.09	24.39	
8.76	9.00	4.57	0.11	24.36	
9.04	9.28	4.48	0	24.46	edge of rockweir
9.26	9.50	4.43	0	24.50	rock weir
9.76	10.00	4.41		24.53	rock weir

10.26	10.50	4.41		24.53	rock weir
10.76	11.00	4.37		24.57	rock weir
11.26	11.50	4.56		24.37	rock weir
11.76	12.00	4.63		24.30	rock weir
12.26	12.50	4.66		24.28	rock weir
12.76	13.00	4.75		24.18	rock weir
13.26	13.50	4.71	0	24.23	edge of rockweir
13.76	14.00	4.79	0.07	24.15	water
14.26	14.50	4.82	0.085	24.11	
14.76	15.00	4.86	0.13	24.07	
15.26	15.50	4.86	0.135	24.08	
15.76	16.00	4.87	0.14	24.07	
16.26	16.50	4.89	0.14	24.05	
16.76	17.00	4.94	0.19	23.99	
17.26	17.50	4.98	0.125	23.95	
17.76	18.00	4.86	0.1	24.08	
18.26	18.50	4.86	0.03	24.07	
18.76	19.00	4.87	0.05	24.07	
19.26	19.50	4.93	0.09	24.00	
19.76	20.00	4.92	0.095	24.01	
20.26	20.50	4.93	0.115	24.01	
20.76	21.00	4.99	0.16	23.94	
21.76	22.00	4.98	0.125	23.95	
22.26	22.50	5.00	0.18	23.94	
22.76	23.00	5.06	0.235	23.87	
23.26	23.50	5.06	0.235	23.88	
23.76	24.00	5.04	0.2	23.90	
24.26	24.50	5.09	0.245	23.84	
24.76	25.00	5.03	0.18	23.90	
25.26	25.50	5.03	0.16	23.91	
25.76	26.00	5.02	0.15	23.91	
26.26	26.50	4.99	0.14	23.94	
26.76	27.00	5.00	0.125	23.94	
27.26	27.50	4.94	0.055	23.99	
27.76	28.00	4.91	0.02	24.02	water's edge
28.76	29.00	4.46		24.47	
29.76	30.00	3.83		25.10	
30.76	31.00	3.63		25.31	
31.76	32.00	3.02		25.91	
32.76	33.00	2.93		26.00	end/ rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
1219	7	4946706.680	5413496.113	28.204	West

Offset Horizontal Distance(0.0m)	Horizontal Distance (m)	Vertical Distance to hard surface (m)	Vertical distance to water surface (m)	Elevation Profile	Notes (Significant geomorphic features, etc)
	0.00	1.37		26.781	roadside pin
	1.00	1.86		26.292	
	2.00	2.13		26.021	
	3.00	2.97		25.188	
	4.00	3.42		24.734	
	5.00	4.04		24.109	
	6.00	3.85		24.301	
	6.85	5.08	0.51	23.069	edge/ water's edge
	7.00	5.08	0.53	23.072	
	7.50	5.03	0.42	23.124	
	8.00	4.97	0.4	23.180	
	8.50	4.95	0.39	23.201	
	9.00	4.87	0.335	23.288	
	9.50	4.72	0.35	23.431	
	10.00	4.59	0	23.566	edge of gravel bar
	10.50	4.48		23.677	gravel bar
	11.00	4.46		23.697	gravel bar
	11.50	4.42		23.738	gravel bar
	11.85	4.57		23.584	edge of gravel bar
	12.00	4.66	0.05	23.493	
	12.50	4.78	0.135	23.375	
	13.00	4.85	0.22	23.303	
	13.50	5.01	0.325	23.146	
	14.00	4.82	0.19	23.332	
	14.50	4.97	0.25	23.187	
	15.00	5.09	0.21	23.065	
	15.50	4.82	0.12	23.330	
	16.00	5.03	0.25	23.126	
	16.50	4.98	0.28	23.173	
	17.00	4.90	0.19	23.252	
	17.50	4.90	0.15	23.254	
	18.00	4.97	0.135	23.179	
	18.50	4.90	0.09	23.254	
	19.00	4.94	0.13	23.213	
	19.50	4.94	0.14	23.218	
	20.00	4.96	0.17	23.190	
	20.50	4.99	0.16	23.159	
	21.00	4.94	0.09	23.212	
	21.50	5.00	0.14	23.156	
	22.00	4.98	0.12	23.175	
	22.50	4.98	0.09	23.170	
	23.00	5.14	0.235	23.010	

23.50	5.16	0.235	22.993	
24.00	5.15	0.24	23.008	
24.50	5.04	0.125	23.109	
25.00	5.06	0.14	23.098	
25.50	5.02	0.1	23.136	
26.00	4.97	0.03	23.179	
26.50	4.96	0.05	23.191	
27.00	4.93	0.01	23.227	edge of water
28.00	4.65		23.499	
29.00	4.50		23.654	
30.00	4.27		23.888	
31.00	4.05		24.101	
32.00	3.52		24.629	
33.00	3.12		25.032	
34.00	2.72		25.437	
35.00	2.35		25.805	
36.00	2.04		26.109	
37.00	1.88		26.277	
37.90	1.72		26.431	end/ rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
1222	8	4946698.580	5413499.923	29.423	West
Offset Horizontal Distance (0.0m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
	0.00	1.36		26.90	stake at roadside
	1.00	2.01		26.26	
	2.00	2.54		25.72	
	3.00	3.01		25.25	
	4.00	3.67		24.59	
	5.00	4.25		24.01	
	5.85	4.43	0.015	23.84	water's edge
	6.00	4.63	0.25	23.63	
	6.50	4.66	0.28	23.60	
	7.00	4.60	0.2	23.66	
	7.50	4.53	0.115	23.73	
	8.00	4.50	0.13	23.76	
	8.50	4.50	0.125	23.76	
	9.00	4.49	0.08	23.77	
	9.50	4.56	0.16	23.70	
	10.00	4.54	0.15	23.72	
	10.50	4.57	0.175	23.69	
	11.00	4.57	0.17	23.70	
	11.50	4.51	0.11	23.76	
	12.00	4.43	0.125	23.83	

12.50	4.43	0.035	23.84	
12.70	4.37	0	23.90	water's edge
13.00	4.40		23.86	gravel/ vegetation bar
14.00	4.36		23.90	
15.00	4.41		23.86	
16.00	4.32		23.94	
17.00	4.38		23.88	
18.00	4.32		23.94	
19.00	4.31		23.95	
20.00	4.29		23.97	
21.00	4.36		23.90	
22.00	4.39		23.87	
23.00	4.45		23.81	
24.00	4.54		23.72	end of gravel bar
25.00	4.76	0.025	23.50	water's edge
25.50	4.80	0.05	23.46	
26.00	4.77	0	23.49	rock
26.50	4.85	0.05	23.42	
27.00	4.90	0.075	23.37	
27.50	4.68	0	23.58	rock
28.00	4.76	0.025	23.50	
28.20	4.73		23.53	edge of water
29.00	4.48		23.78	
30.00	4.31		23.95	
31.00	4.07		24.19	
32.00	3.88		24.39	
33.00	3.67		24.59	
34.00	3.44		24.82	
35.00	3.23		25.04	
36.00	3.00		25.26	
37.00	2.77		25.49	
38.00	2.57		25.69	
39.00	2.38		25.88	
40.00	2.20		26.06	
40.93	2.18		26.08	end / rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
1223	9	4946689.618	5413499.923	28.423	West
Offset Horizontal Distance(0.15m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
-0.15	0.00	0.51		26.89	roadside
0.85	1.00	0.83		26.57	
1.85	2.00	1.44		25.96	
2.85	3.00	1.83		25.58	

3.85	4.00	2.41		24.99	
4.85	5.00	2.81		24.60	
5.85	6.00	3.13		24.28	
6.85	7.00	3.48		23.93	
7.55	7.70	3.58	0.1	23.83	water's edge
7.85	8.00	3.72	0.07	23.69	
8.35	8.50	3.81	0.19	23.59	
8.85	9.00	3.61	0	23.79	
9.35	9.50	3.92	0.25	23.49	
9.85	10.00	3.90	0.27	23.50	
10.35	10.50	3.98	0.36	23.42	
10.85	11.00	3.96	0.43	23.45	
11.35	11.50	3.96	0.32	23.45	
11.85	12.00	3.96	0.33	23.44	
12.35	12.50	3.96	0.27	23.45	
12.85	13.00	3.92	0.25	23.48	
13.35	13.50	3.89	0.21	23.52	
13.85	14.00	3.74	0.08	23.66	
14.35	14.50	3.67	0	23.73	
14.85	15.00	3.70		23.70	edge of gravel bar - water among gravel
15.35	15.50	3.55		23.85	
15.85	16.00	3.52		23.88	
16.35	16.50	3.52	0.02	23.89	(still on gravel bar)
16.85	17.00	3.57	0.08	23.84	
17.35	17.50	3.52	0.02	23.88	
17.85	18.00	3.59	0.08	23.81	
18.35	18.50	3.52	0	23.88	
18.85	19.00	3.58	0.075	23.82	
19.35	19.50	3.54	0.015	23.86	
19.85	20.00	3.53	0	23.88	
20.35	20.50	3.55	0.06	23.85	
20.85	21.00	3.53	0	23.87	
21.35	21.50	3.55		23.86	
21.85	22.00	3.58		23.82	
22.35	22.50	3.58		23.82	
22.85	23.00	3.62		23.78	
23.35	23.50	3.62		23.78	
23.85	24.00	3.63		23.77	
24.35	24.50	3.65		23.75	
24.85	25.00	3.70		23.71	
25.35	25.50	3.73		23.68	
25.85	26.00	3.73	0	23.68	water's edge
26.35	26.50	3.82	0.07	23.59	

26.85	27.00	3.86	0.09	23.54	
27.35	27.50	3.86	0.075	23.54	
27.85	28.00	3.90	0.09	23.50	
28.35	28.50	3.86	0.075	23.54	
28.85	29.00	3.90	0.1	23.50	
29.35	29.50	3.93	0.09	23.47	
29.85	30.00	3.91	0.14	23.49	
30.35	30.50	3.86	0.09	23.55	
30.85	31.00	3.89	0.025	23.52	
31.35	31.50	3.83	0.05	23.58	water's edge
31.85	32.00	3.80	0	23.61	
32.85	33.00	3.52		23.88	
33.85	34.00	3.31		24.10	
34.85	35.00	3.11		24.29	
35.85	36.00	2.86		24.54	
36.85	37.00	2.69		24.71	
37.85	38.00	2.49		24.91	
38.85	39.00	2.50		24.91	
39.85	40.00	2.47		24.93	
40.85	41.00	2.30		25.10	
41.85	42.00	2.18		25.22	end/ rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
1227	10	4946674.574	5413503.317	28.245	West
Offset Horizontal Distance(0.0m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
	0.00	0.64		27.14	roadside
	1.00	1.18		26.61	
	2.00	1.95		25.84	
	3.00	2.28		25.51	
	4.00	2.55		25.24	
	5.00	2.87		24.92	
	5.40	3.11	0.075	24.67	water's edge (culvert sidestream)
	5.50	3.31	0.28	24.48	
	6.00	3.35	0.3	24.44	
	6.50	3.36	0.31	24.43	
	7.00	3.22	0.21	24.57	
	7.50	3.23	0.17	24.56	
	8.00	3.04	0	24.74	rock
	8.20	3.03	0	24.76	gravel bar edge
	8.50	2.91		24.87	
	9.00	2.97		24.82	
	9.50	2.96		24.83	
	10.00	2.96		24.83	

10.50	2.95		24.83	
11.00	2.96		24.83	
11.50	2.96		24.83	
11.85	3.04	0	24.75	water's edge
12.00	3.11	0.08	24.67	
12.50	3.19	0.17	24.60	
13.00	3.19	0.17	24.60	
13.50	3.28	0.28	24.50	
14.00	3.32	0.32	24.47	
14.50	3.28	0.28	24.50	
15.00	3.28	0.2	24.50	
15.50	3.24	0.25	24.55	
16.00	3.20	0.2	24.58	
16.50	3.20	0.3	24.59	
17.00	3.32	0.25	24.47	
17.50	3.23	0.13	24.56	
18.00	3.16	0.18	24.63	
18.50	3.19	0.15	24.60	
19.00	3.15	0.13	24.63	
19.50	3.13	0.12	24.66	
20.00	3.14	0.11	24.65	
20.50	3.11	0.03	24.68	rock in stream
21.00	3.07	0.08	24.72	cobbles
21.50	3.00	0	24.79	cobbles
22.00	3.04	0.01	24.75	cobbles
22.50	3.07	0.04	24.71	cobbles
23.00	3.09	0.07	24.69	cobbles
23.50	3.21	0.05	24.57	cobbles
24.00	3.26	0.09	24.52	
24.50	3.26	0.08	24.53	
25.00	3.21	0.02	24.58	
25.50	3.34	0.13	24.45	
26.00	3.39	0.175	24.40	
26.50	3.29	0.085	24.50	
27.00	3.38	0.16	24.41	
27.50	3.35	0.14	24.44	
28.00	3.34	0.105	24.45	
28.50	3.28	0.05	24.51	
29.00	3.30	0.065	24.49	
29.50	3.28	0.02	24.51	
30.00	3.29	0.02	24.50	
30.50	3.25	0	24.54	
31.00	3.26	0.005	24.53	
31.50	3.31	0.03	24.47	

	32.00	3.30	0.04	24.48	
	32.50	3.33	0.065	24.46	
	33.00	3.25	0	24.54	water's edge
	34.00	3.29		24.50	
	35.00	2.93		24.86	
	36.00	2.76		25.03	
	37.00	2.80		24.98	
	38.00	2.68		25.10	
	39.00	2.52		25.27	
	40.00	2.50		25.29	
	41.00	2.44		25.35	
	42.00	2.23		25.56	
	42.90	2.09		25.69	end/ rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
1233	11	4946657.172	5413508.666	28.161	West
Offset Horizontal Distance (0.0m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
	0.00	0.89		27.54	
	1.00	1.21		27.22	
	2.00	1.64		26.79	
	3.00	2.50		25.93	
	3.20	2.94	0	25.50	water's edge
	3.50	3.08	0.11	25.35	
	4.00	3.14	0.185	25.29	
	4.50	3.16	0.18	25.28	
	5.00	3.03	0.05	25.41	
	5.20	2.95	0	25.49	water's edge
	6.00	2.76		25.67	gravel point
	7.00	2.72		25.71	
	8.00	2.77		25.67	
	9.00	2.70		25.73	
	10.00	2.59		25.84	
	11.00	2.54		25.89	
	12.00	2.49		25.94	
	13.00	2.46		25.98	
	14.00	2.46		25.97	
	15.00	2.49		25.94	
	16.00	2.52		25.92	
	17.00	2.53		25.91	
	18.00	2.63		25.81	
	19.00	2.65		25.78	
	20.00	2.67		25.76	
	21.00	3.19	0	25.24	water's edge

21.50	3.30	0.14	25.13	
22.00	3.40	0.2	25.03	
22.50	3.46	0.25	24.97	
23.00	3.58	0.38	24.85	
23.50	3.54	0.3	24.90	
24.00	3.63	0.5	24.80	
24.50	3.64	0.49	24.79	
25.00	3.54	0.35	24.90	
25.50	3.59	0.37	24.84	
26.00	3.59	0.4	24.85	
26.50	3.59	0.39	24.84	
27.00	3.53	0.35	24.90	
27.50	3.48	0.295	24.95	
28.00	3.43	0.235	25.01	
28.50	3.40	0.285	25.03	
29.00	3.31	0.145	25.13	
29.50	3.28	0.09	25.16	
30.00	3.07	0	25.37	rock
30.50	3.23	0.06	25.21	
31.00	3.22	0.03	25.21	
31.50	3.08	0	25.35	rock
31.75	3.16	0	25.27	water's edge
32.00	3.13		25.30	
33.00	3.23		25.21	
34.00	3.20		25.23	
35.00	3.06		25.37	
36.00	3.21		25.22	
37.00	3.15		25.28	
38.00	2.81		25.62	
39.00	2.44		26.00	
40.00	2.25		26.18	
40.85	2.01		26.42	end/ rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
1249	12	4946636.575	5413538.676	27.579 (+.72)	West
Offset Horizontal Distance(0.0m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
	0.00	0.79		28.30	
	1.00	0.89		28.20	
	2.00	0.93		28.16	
	3.00	1.01		28.08	
	4.00	1.09		28.00	
	5.00	1.16		27.93	

6.00	1.18		27.91	
7.00	1.21		27.88	
8.00	1.20		27.89	
9.00	1.26		27.83	
10.00	1.27		27.82	
11.00	1.20		27.89	
12.00	1.25		27.84	
13.00	1.24		27.85	
14.00	1.25		27.84	
15.00	1.26		27.83	
16.00	1.27		27.82	
17.00	1.26		27.83	
18.00	1.41		27.68	
19.00	1.49		27.60	
20.00	1.82	0	27.27	water's edge
20.50	1.87	0.045	27.22	
21.00	1.95	0.1	27.14	
21.50	1.97	0.14	27.12	
22.00	1.96	0.175	27.13	
22.50	2.09	0.34	27.00	
23.00	2.16	0.4	26.93	
23.50	2.18	0.38	26.91	
24.00	2.15	0.36	26.94	
24.50	1.98	0.18	27.11	
25.00	1.96	0.165	27.13	
25.50	2.05	0.3	27.04	
26.00	2.14	0.34	26.95	
26.50	1.79	0	27.30	rock
26.93	1.85	0.035	27.24	water's edge
27.00	1.67		27.42	
28.00	1.20		27.89	
29.00	0.66		28.43	
30.00	0.63		28.46	
31.00	0.64		28.45	
32.00	0.76		28.33	
33.00	0.85		28.24	
34.00	0.99		28.10	
35.00	1.01		28.08	
36.00	1.01		28.08	end/ flagging tape

Point	Transect #	Northing	Easting	Elevation	Side of River:
1250	13	4946624.923	5413561.482	27.579	West
Offset Horizontal Distance(0.0m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**

0.00	1.74		27.65	At edge of the bank
0.35	2.79	0.135	26.61	Bank undercut, took at water's edge at bank
0.50	2.85	0.15	26.55	
1.00	3.00	0.35	26.39	
1.50	3.23	0.63	26.17	
2.00	3.67	0.75	25.72	
2.50	3.32	0.63	26.07	
3.00	3.24	0.555	26.16	
3.50	3.18	0.43	26.21	
4.00	3.00	0.33	26.40	
4.50	3.02	0.33	26.38	
5.00	2.95	0.34	26.45	
5.50	2.84	0.14	26.56	
6.00	2.78	0.8	26.62	
6.50	2.70	0.1	26.69	water's edge
7.00	2.68		26.72	
8.00	2.60		26.79	
9.00	2.51		26.89	
10.00	2.35		27.05	
11.00	2.17		27.23	
12.00	2.17		27.23	
13.00	2.26		27.14	
13.50	2.23		27.17	end/ rebar

Point	Transect #	Northing	Easting	Elevation	Side of River:
1259	15	4946563.935	5413677.153	30.750	West
Offset Horizontal Distance(0.0m)	**Horizontal Distance (m)**	**Vertical Distance to hard surface (m)**	**Vertical distance to water surface (m)**	**Elevation Profile**	**Notes (Significant geomorphic features, etc)**
	0	1.45		30.63	
	1	1.56		30.52	
	2	1.73		30.35	
	2.2	1.80	0.02	30.28	Left bank water's edge
	2.5	1.86	0.075	30.22	
	3	1.86	0.1	30.22	
	3.5	1.94	0.17	30.14	
	4	1.85	0.1	30.23	
	4.5	1.99	0.22	30.09	
	5	2.02	0.265	30.06	
	5.5	1.85	0.18	30.24	
	6	2.04	0.295	30.04	
	6.5	2.08	0.335	30.00	
	7	2.04	0.32	30.04	

7.5	2.08	0.38	30.01	
8	2.22	0.5	29.87	
8.5	2.11	0.7	29.97	
9	2.17	0.505	29.91	
9.5	1.99	0.25	30.09	
10	1.99	0.27	30.09	
10.5	1.86	0.13	30.22	
10.8	1.71	0	30.37	
11.1	1.61		30.47	Right bank water's edge

B.0 Appendix B – Monitoring Charts

B.1 Cross-Sectional Elevation Profiles

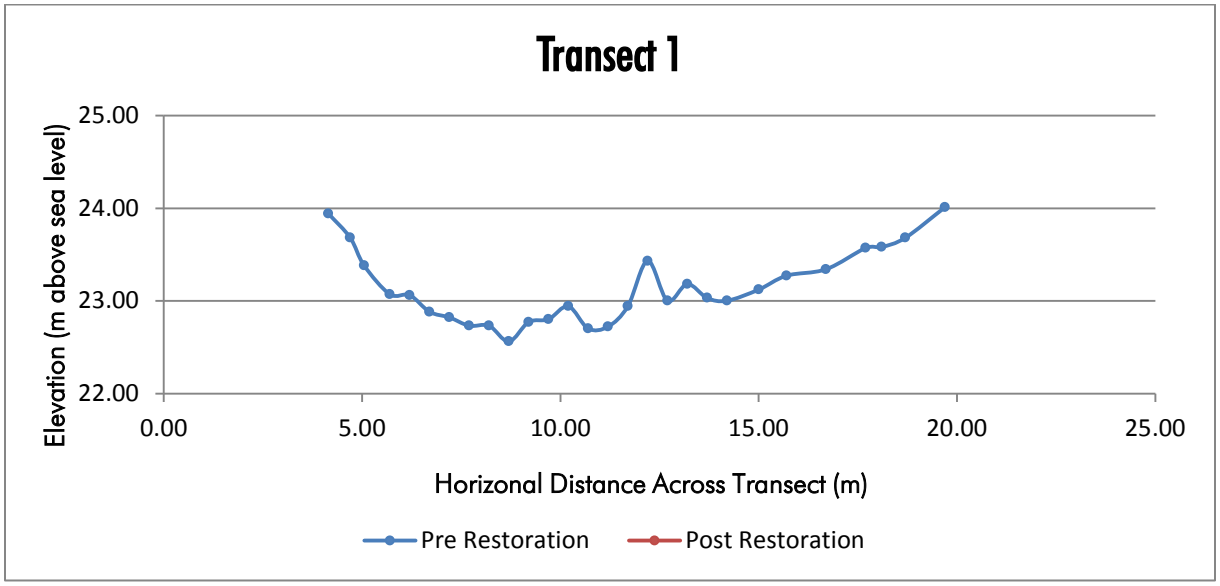

Figure B1: Cross Sectional Profile at Transect 1

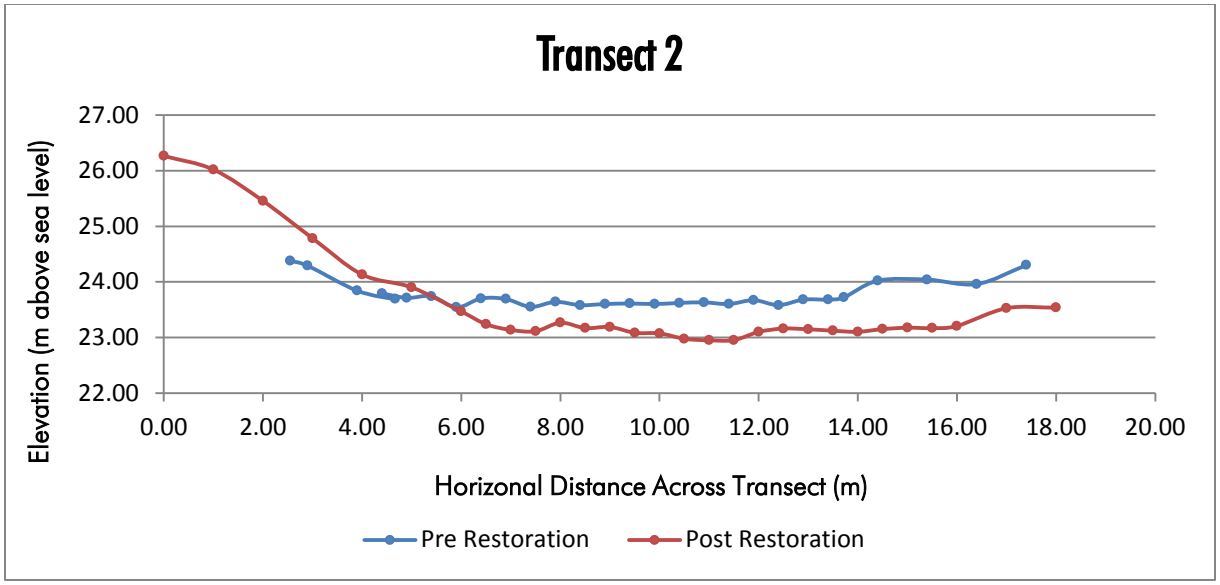

Figure B2: Cross Sectional Profile at Transect 2

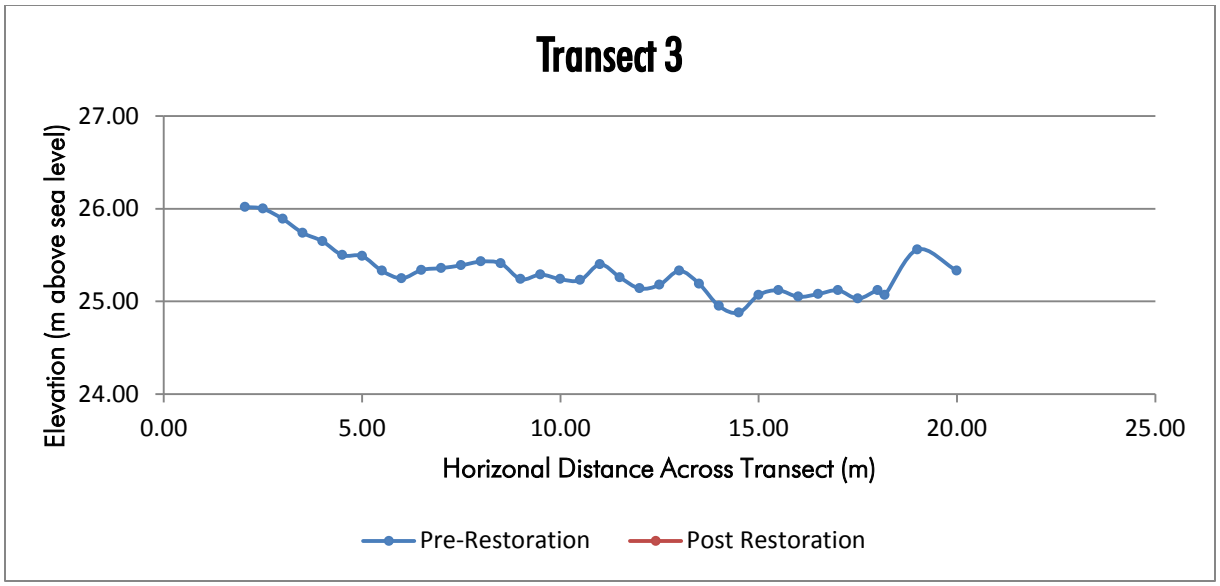

Figure B3: Cross Sectional Profile at Transect 3

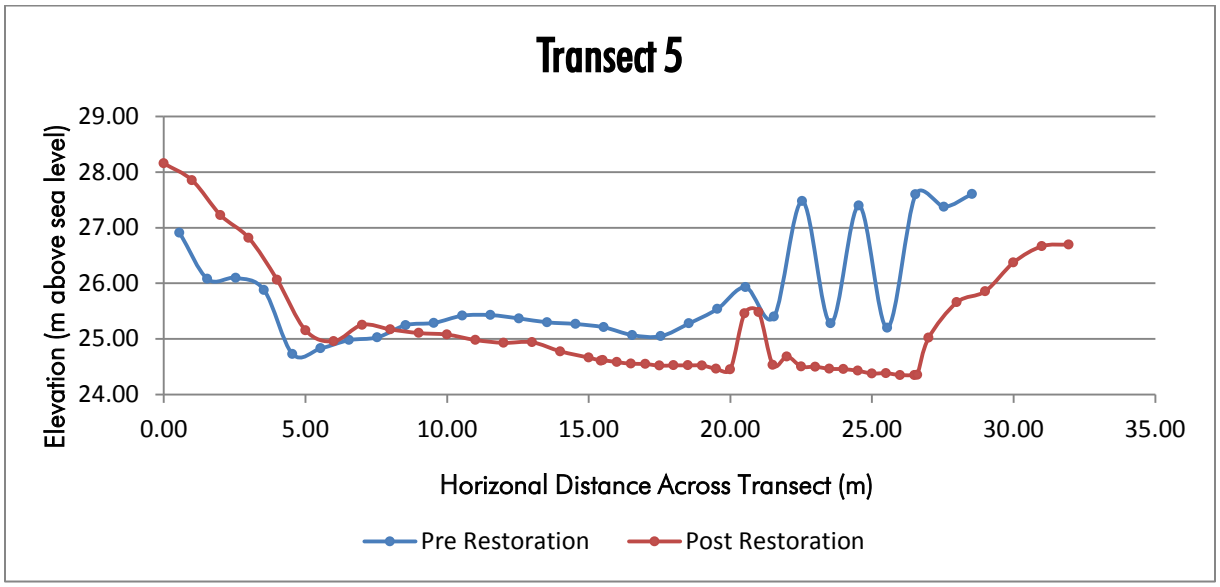

Figure B4: Cross Sectional Profile at Transect 5

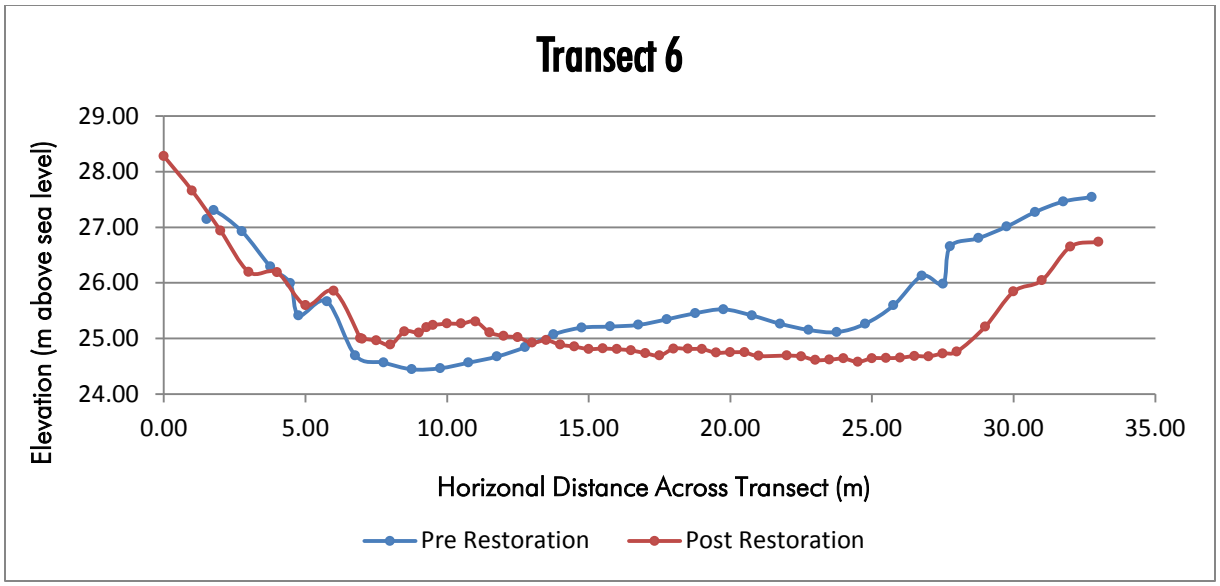

Figure B5: Cross Sectional Profile at Transect 6

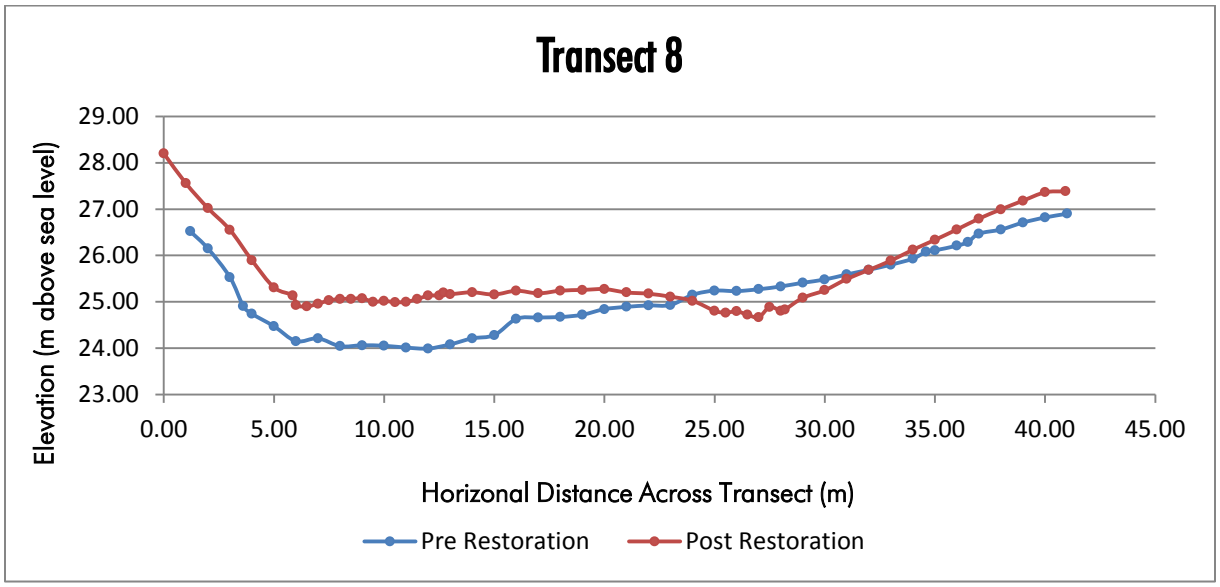

Figure B6: Cross Sectional Profile at Transect 7

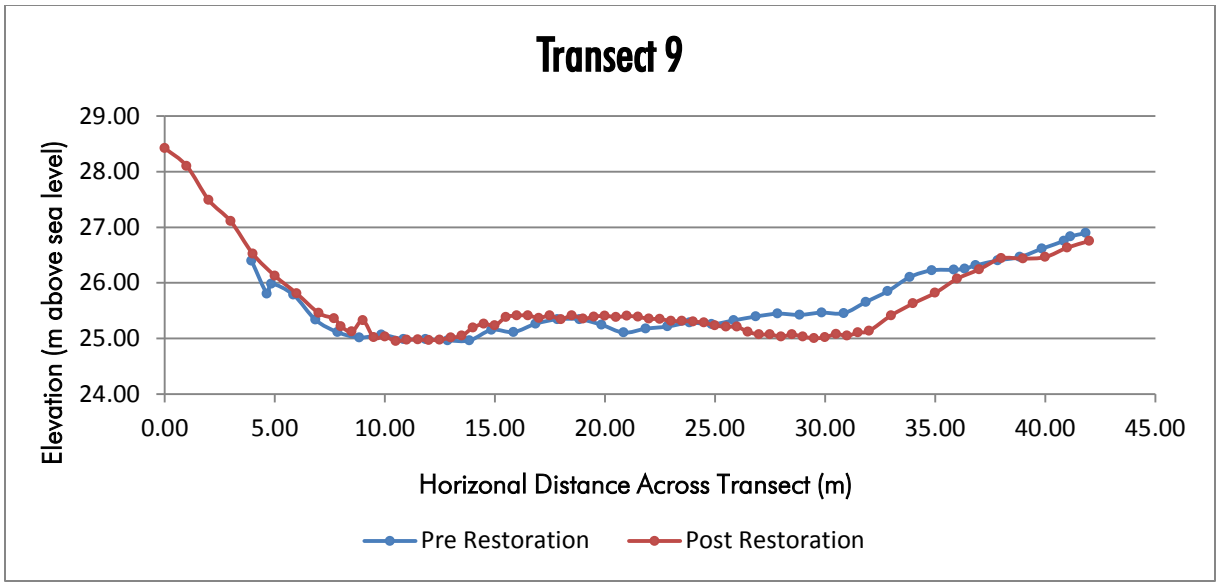

Figure B7: Cross Sectional Profile at Transect 9

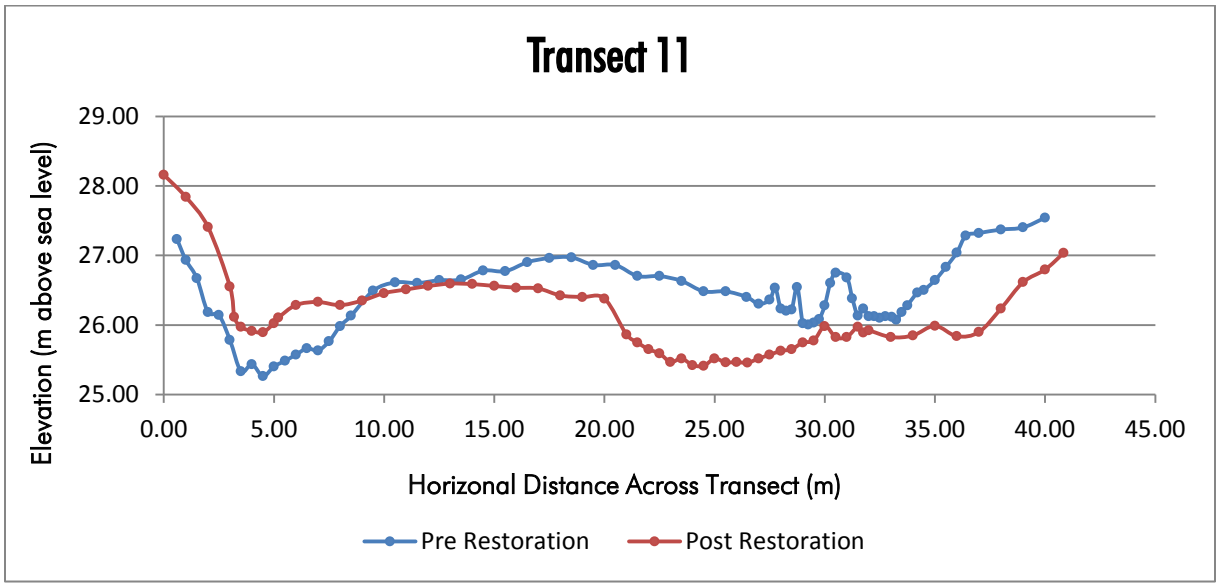

Figure B8: Cross Sectional Profile at Transect 11

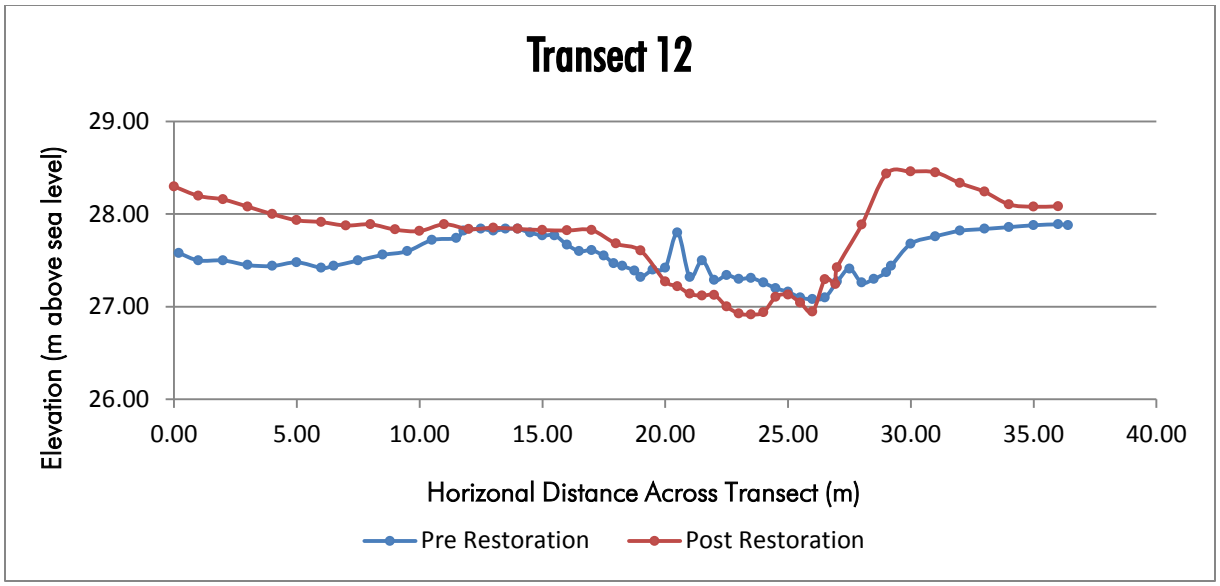

Figure B9: Cross Sectional Profile at Transect 12

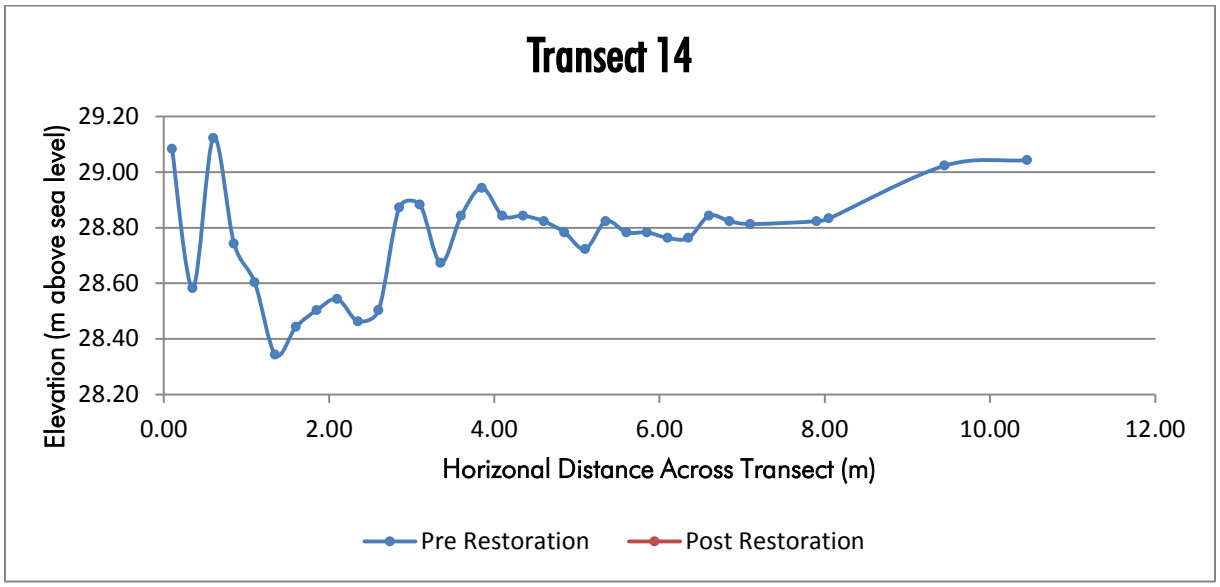

Figure B10: Cross Sectional Profile at Transect 14

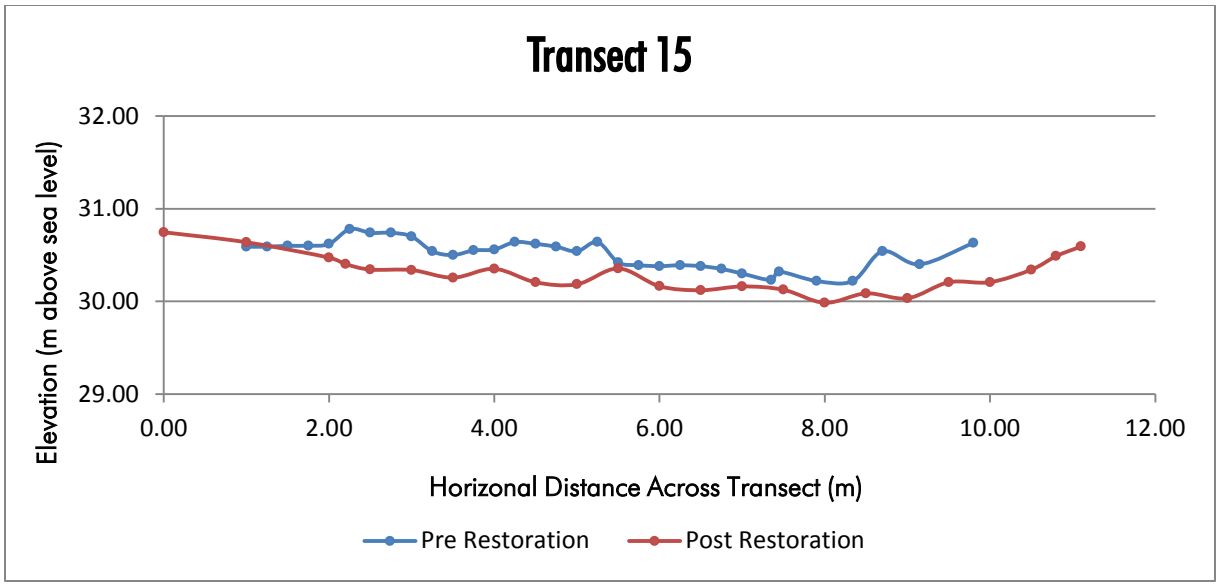

Figure B11: Cross Sectional Profile at Transect 15

B.2 Grain Size Profiles (Percent Composition per Substrate Class)

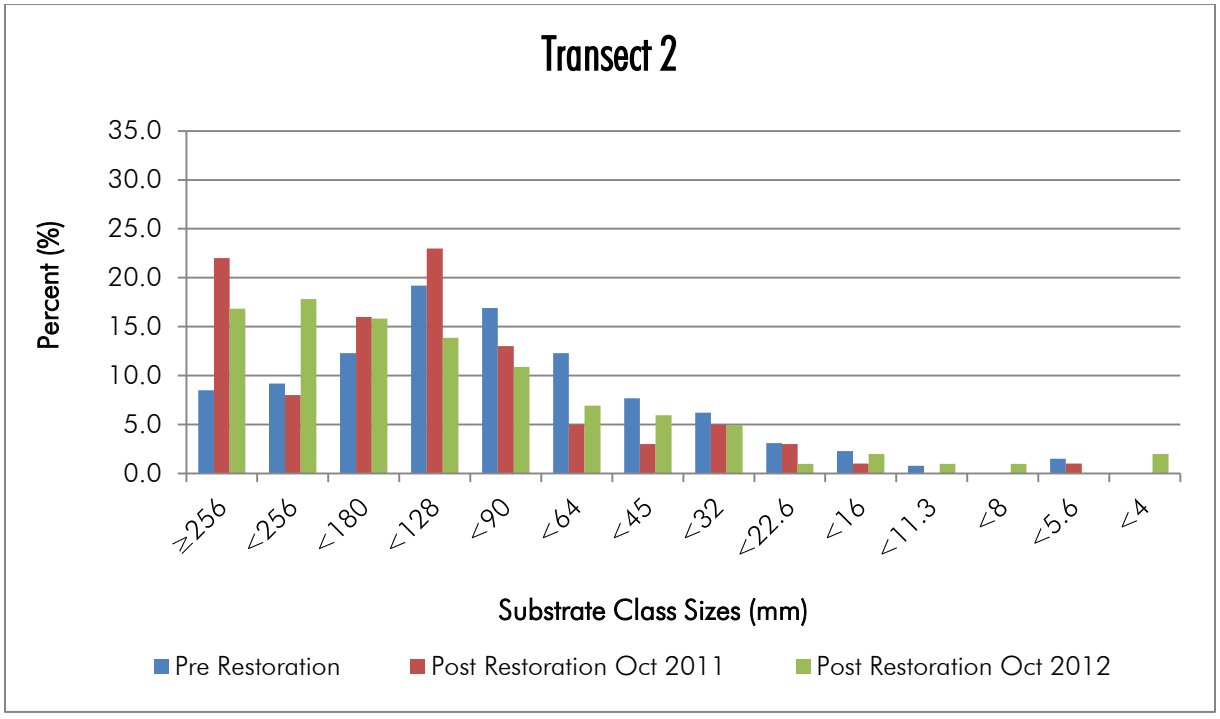

Figure B12: Percent Composition of Substrate Size Classes at Transect 2

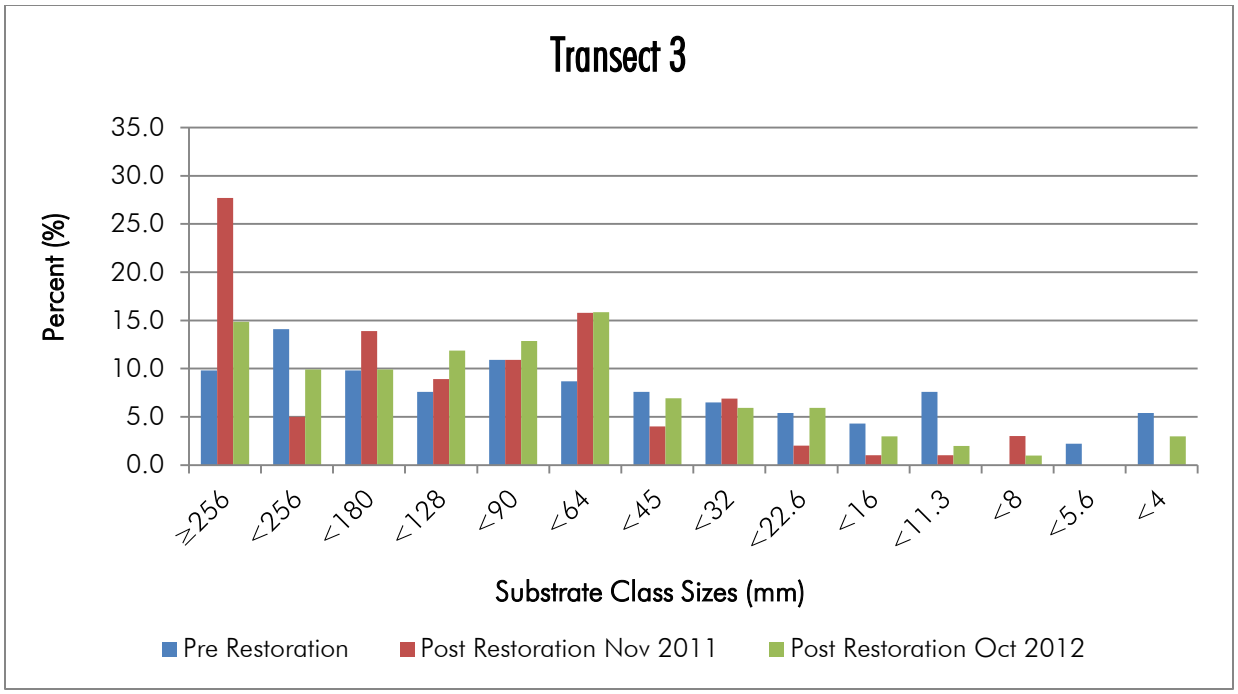

Figure B13: Percent Composition of Substrate Size Classes at Transect 3

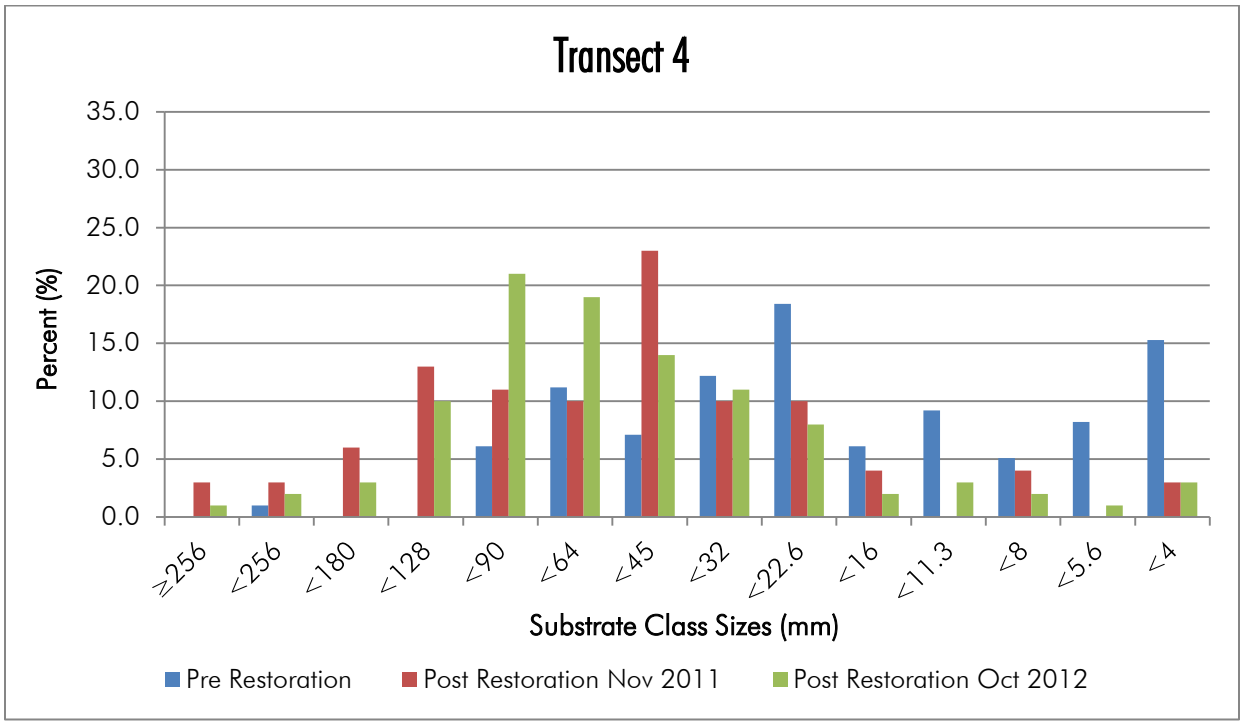

Figure B14: Percent Composition of Substrate Size Classes at Transect 4

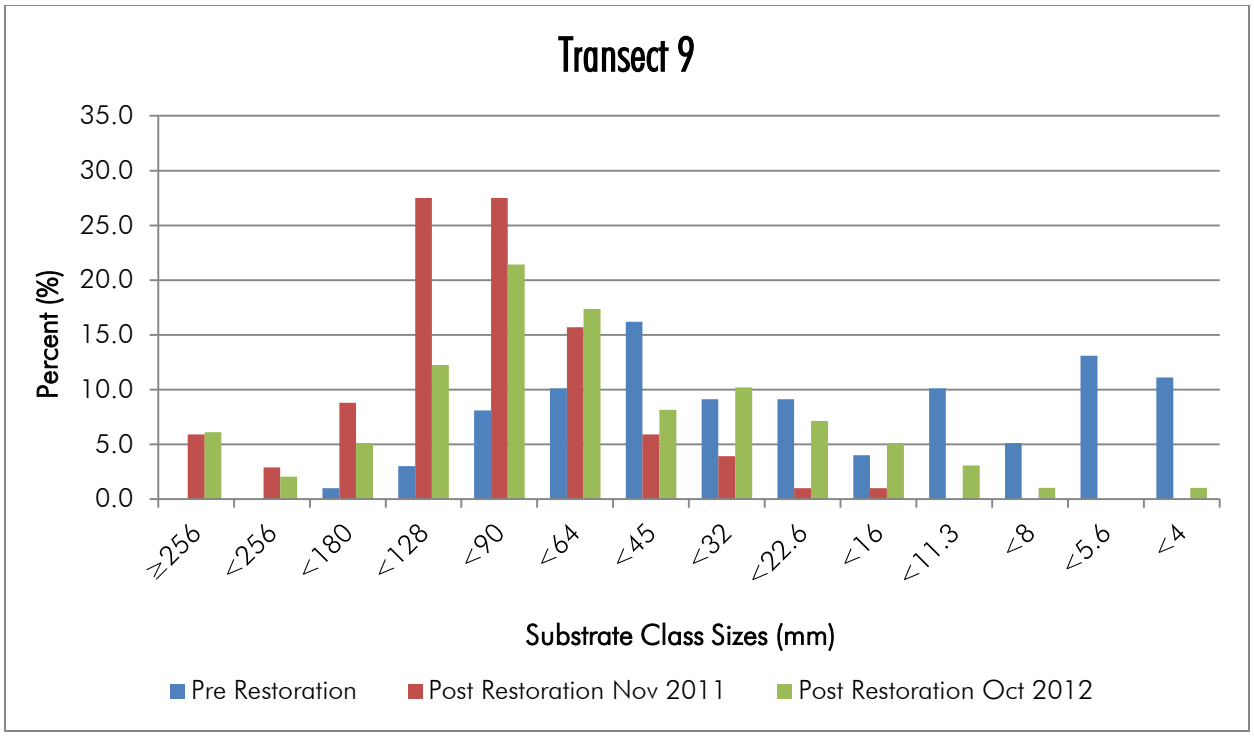

Figure B15: Percent Composition of Substrate Size Classes at Transect 9

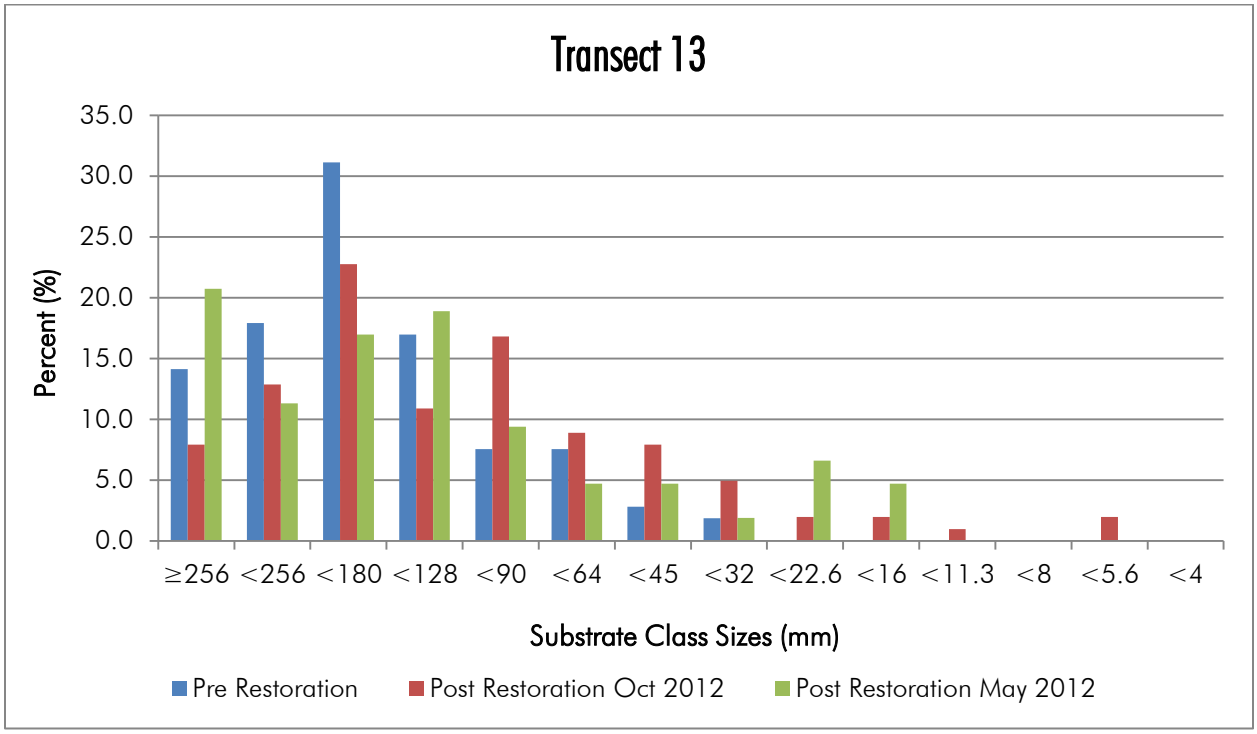

Figure B16: Percent Composition of Substrate Size Classes at Transect 13

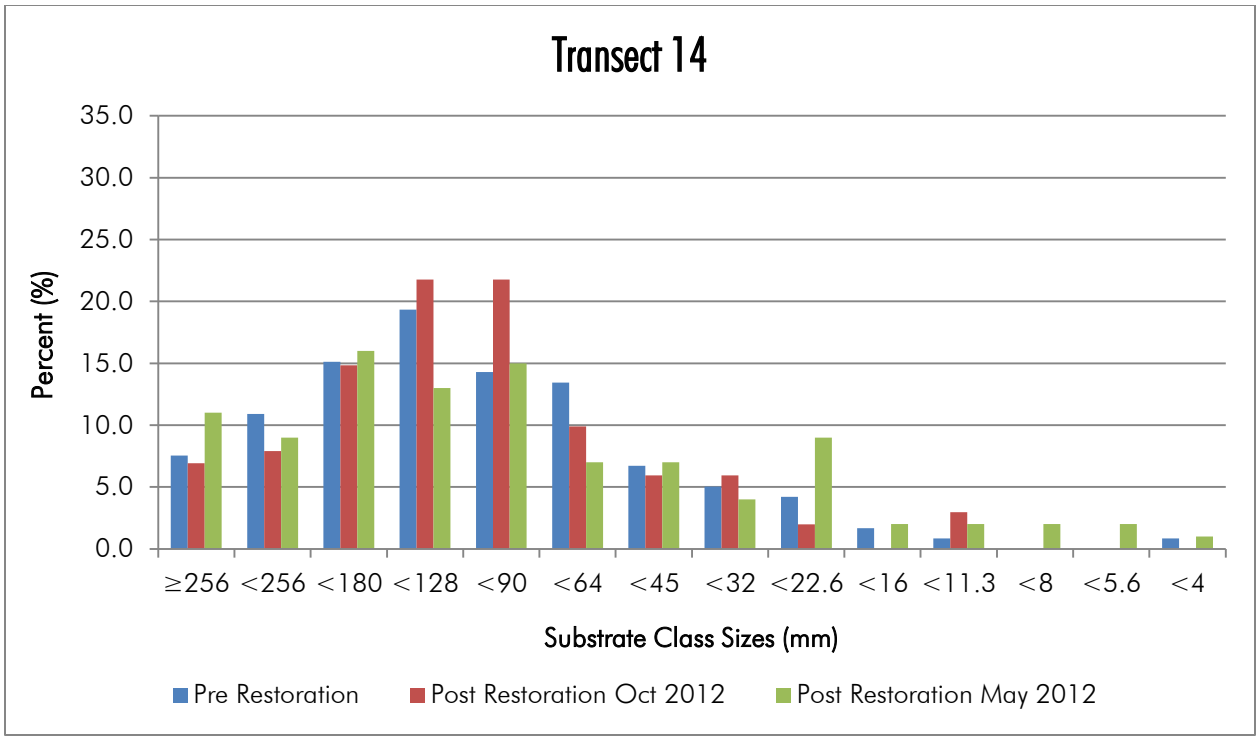

Figure B17: Percent Composition of Substrate Size Classes at Transect 14

B.3 Vegetation Transects

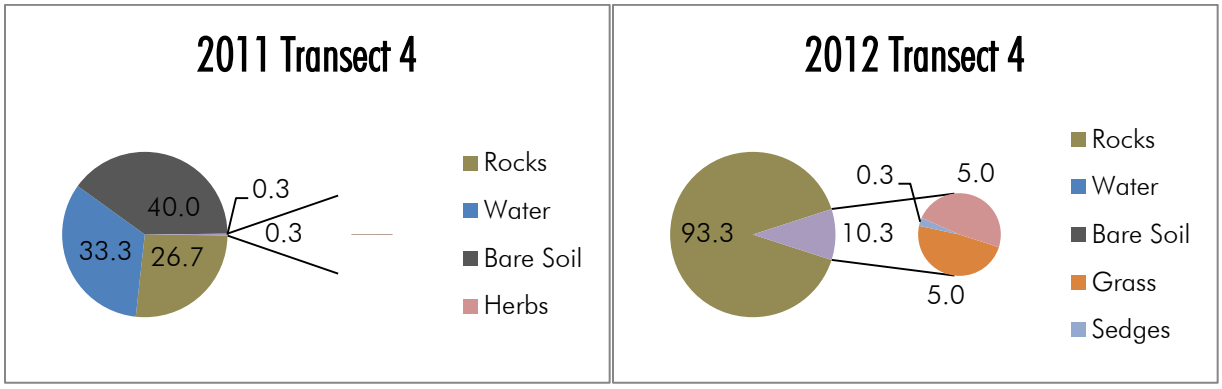

Figure B18: Vegetative Cover at Transect 4

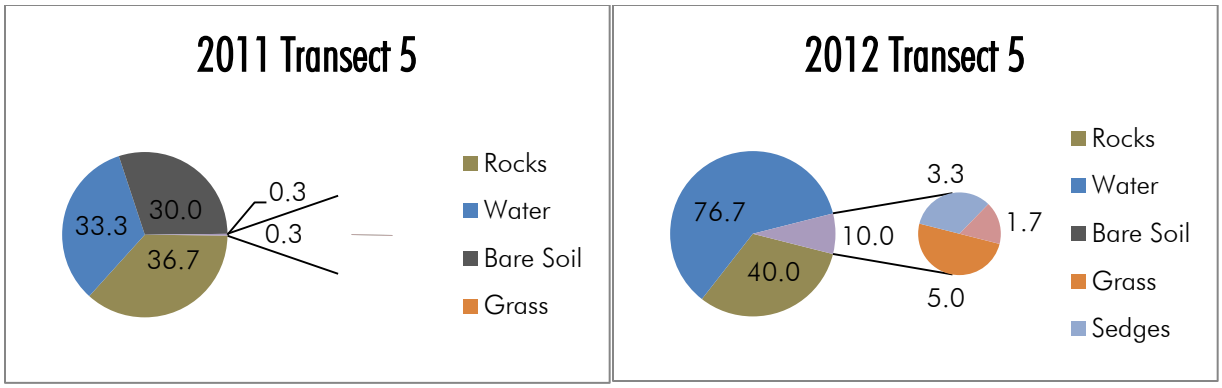

Figure B19: Vegetative Cover at Transect 5

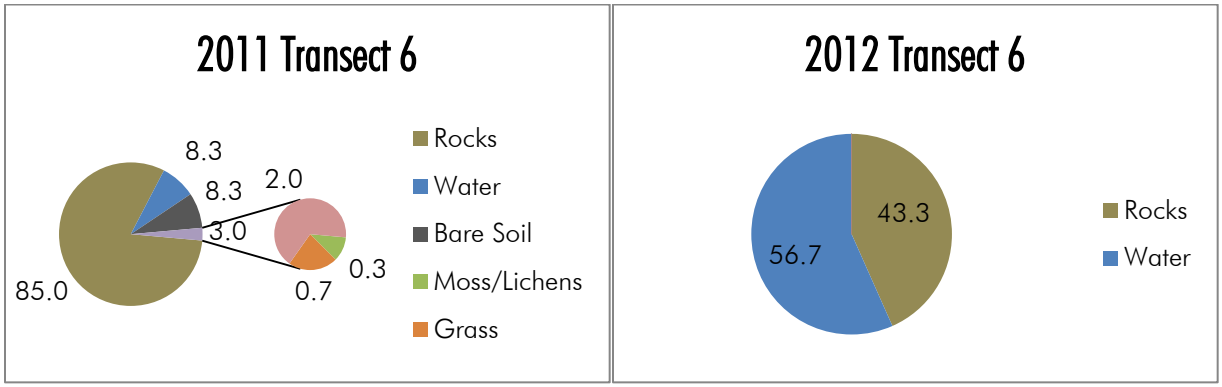

Figure B20: Vegetative Cover at Transect 6

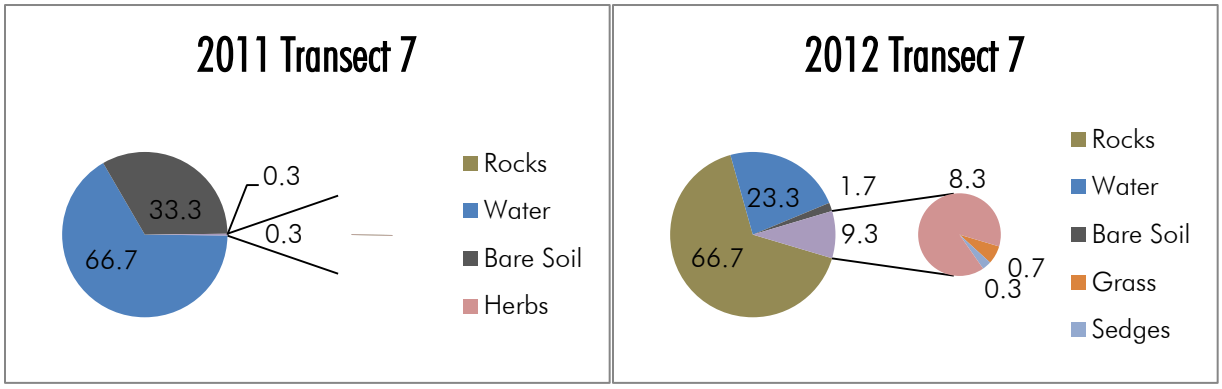

Figure B21: Vegetative Cover at Transect 7

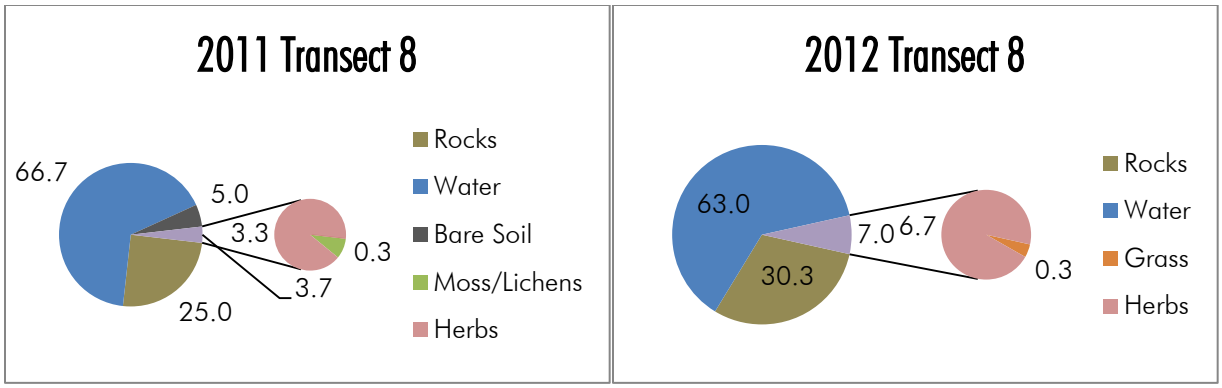

Figure B22: Vegetative Cover at Transect 8

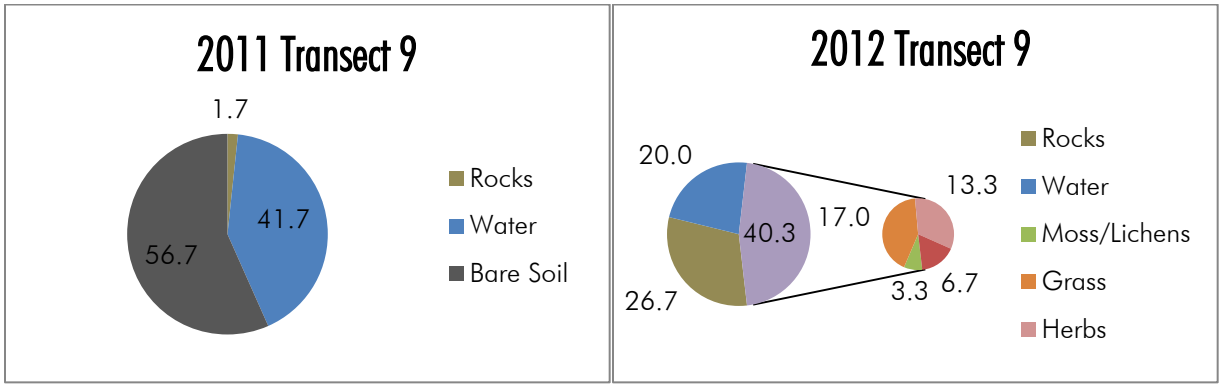

Figure B23: Vegetative Cover at Transect 9

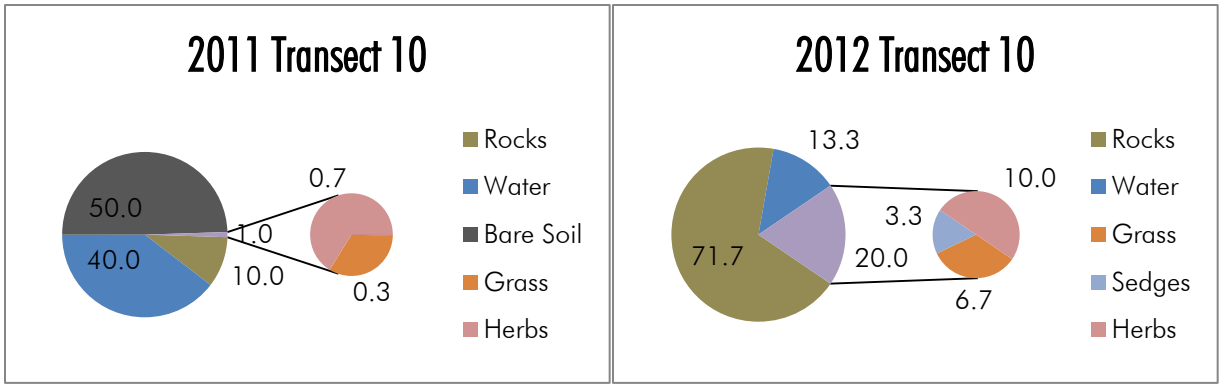

Figure B24: Vegetative Cover at Transect 10

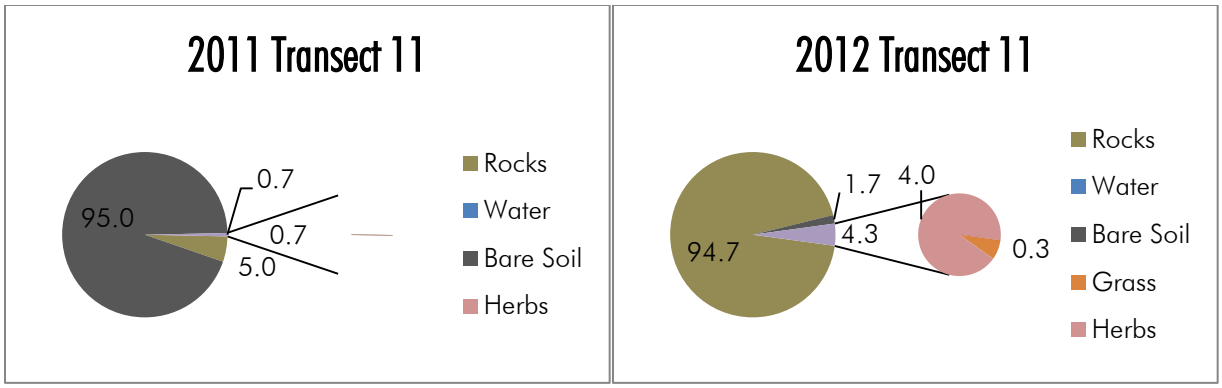

Figure B25: Vegetative Cover at Transect 11