

Thomas Bay Marsh, Brunswick, Maine 2012 Monitoring Report



Prepared By:

Matt Craig
Casco Bay Estuary Partnership
PO Box 9300
34 Bedford Street
Portland, ME 04104

Submitted To:

GOMC/NOAA CRP
#10-03 Thomas Bay
Marsh/Adams Road

Date Submitted:

January 15, 2013



About this Document

Note: This report has been updated from the first version to include Year 1 post-construction monitoring data from the 2012 field season. Additional updates will occur following Year 3 and Year 5.

Background

Thomas Bay Marsh is an approximately 70 acre finger coastal wetland located within the Town of Brunswick, Maine. The marsh adjoins the New Meadows River, a narrow tidal embayment in northeastern Casco Bay, where Adam's Road crosses a tidal creek, located at 43.901571° , - 69.890102°. Adam's Road causeway bisects Thomas Bay Marsh, and is one of the oldest roads in Brunswick, predating an 1894 topographic map of the area.

Historically, Adam's Road has restricted tidal exchange between the downstream and upstream marsh. A causeway forms the bed of Adam's Road where it crosses Thomas Bay Marsh. Until it was replaced in August 2011, the tidal creek passed under the road in a 60" diameter round metal culvert fitted within an older granite block structure. Over time, the altered velocity and flow direction resulted in the formation of scour pools upstream and downstream of the culvert. The culvert also restricted flow, reducing the volume of saltwater that reached the landward side of the road during flood tides. The restricted tidal range has affected marsh hydrology upstream of Adam's Road, leading to the expansion of scrub/shrub and freshwater wetland habitat.

In 2010, the Gulf of Maine Council/NOAA Habitat Restoration Partnership awarded a grant to a collaborative initiative between the Casco Bay Estuary Partnership (CBEP) and the Brunswick Public Works Department (BPW) to replace the existing round pipe with a larger volume pipe arch culvert. Construction occurred on August 17, 2011.

Specific project objectives were to:

- Restore degraded salt marsh habitat and wetlands;
- Increase tidal inundation of landward marsh and wetlands;
- Improve the ability of freshwater to drain out of the landward marsh; and
- Improve salt, sand, and sediment transport into the landward marsh.

Monitoring Plan

CBEP's staff is collecting pre- and post- construction monitoring data at Thomas Bay Marsh in accordance with a project-specific monitoring plan (CBEP 2011). The plan is focused on understanding changes in hydrology resulting from the increased tidal exchange, including channel morphology, salinity, and vegetation in the marsh, especially in and around the area of the transition from salt-tolerant salt marsh dominants to species more typical of brackish or freshwater tidal marsh. CBEP will monitor several parameters at pre-scheduled intervals through 2016: tidal channel hydrology and salinity, groundwater elevations, pore water salinity, vegetation, and channel adjustment.

In 2011 CBEP staff established ten monitoring stations, with Station 1 at the southern end of the marsh downstream of Adams Road, and Station 10 at the head of the marsh. These stations will serve as the primary data collection areas for the duration of monitoring activities. Stations 1 & 2 are downstream of Adams Road, and Stations 3 – 10 are upstream. CBEP set transects from the edge of the tidal creek to the upland edge for assessing vegetative cover at each station. Stations 2, 3, 7, 7A, 8, and 10 each have one deep and one shallow groundwater monitoring well, as well as one pore water salinity well. Pre-construction channel cross-sections were measured at Stations 2, 3, 7, 8, and 10. Approximate Station locations are provided in Figure 1. Tidal channel hydrology stations are shown in Figure 2.

CBEP staff created a database in Microsoft Access to store and manage monitoring data. All site-specific monitoring data will be entered into the database and eventually, the database will link to photos and scanned drawings recorded during vegetation and cross section surveys. A copy of the database is available from CBEP.

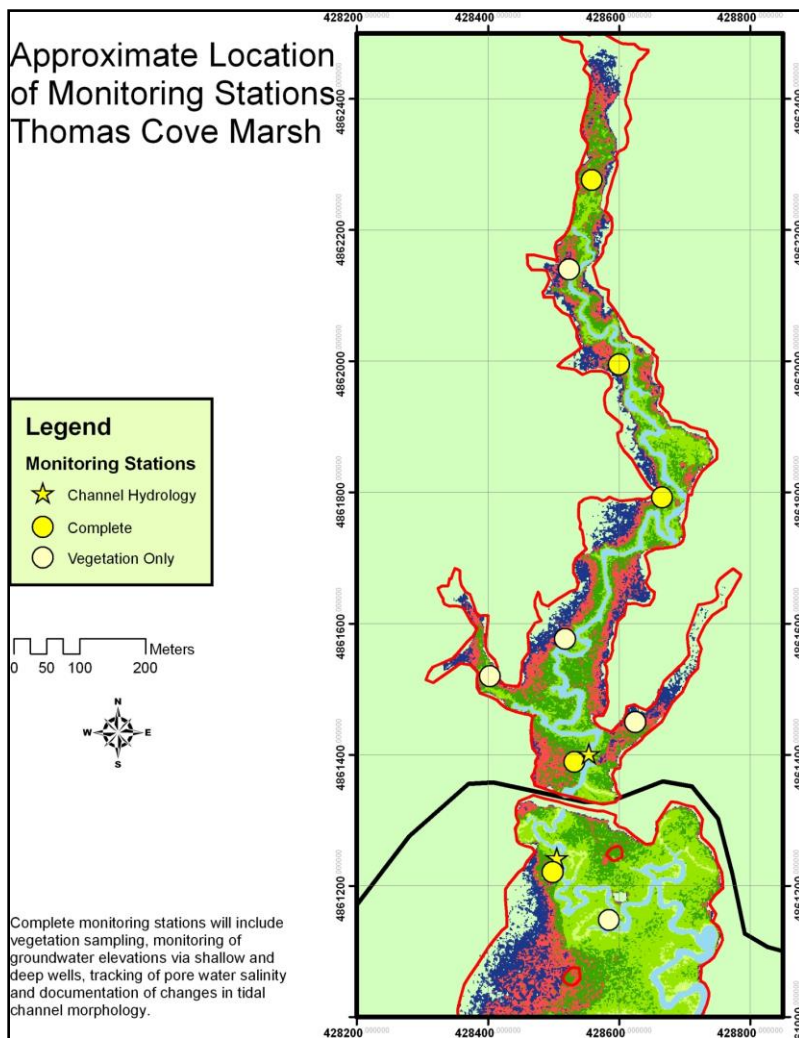


Figure 1. Approximate locations of monitoring stations at Thomas Bay Marsh.

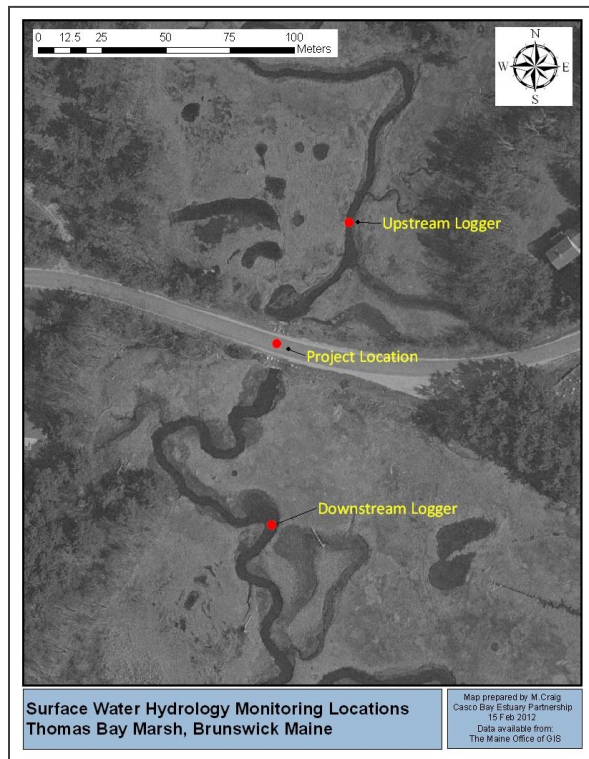
The monitoring plan specifies CBEP's reporting obligations to GOMC/NOAA for this project. CBEP is scheduled to prepare and submit annual data summaries to GOMC/NOAA in 2011 and 2012, as well as a final report in 2016. This document summarizes data collected in 2011.

Tidal Channel Hydrology Monitoring

Tidal stage data were collected in 2011 & 2012 upstream and downstream of Adams Road. All surface water elevations were tied to a local benchmark, referred to as the Top of Marsh Pin in engineering designs and surveys, using CBEP auto-levels staged on the shoulder of Adams Road. The elevation of the Marsh Pin, located adjacent to the upstream scour pool on the high marsh surface, is 5.25 feet NAVD 1988 (University of Southern Maine GIS Lab 2009).

Pre-construction, 2011

The pre-construction tidal stage data set referenced for this report was collected using In-Situ, Inc. AquaTroll 200 pressure transducer data loggers with vented cables between March 31 and May 26 2011 by CBEP. For this deployment, loggers were set horizontally within in



porous/drilled PVC piping secured to concrete blocks set on the creek bottom, with the cable running out of the creek channel and staked several feet above the high marsh surface on a metal fence post. Measurements were recorded at 15 minute intervals, spanning two spring tide cycles, including an 11.7 foot projected high tide event on April 19. CBEP staff periodically downloaded data in the field onto a laptop, and loggers remained submerged for the entire deployment period. Figures 3 & 4 plot pre-construction surface water hydrology data. Figure 5 plots data from May 16 to May 20 spring tide. Figure 6 plots the April 19 2011 spring tide.

Figure 2. Surface water hydrology monitoring locations.

Surface water salinity was also recorded with the loggers. Figure 7 plots surface water salinity with 24 hour rainfall from April 1 to April 30.

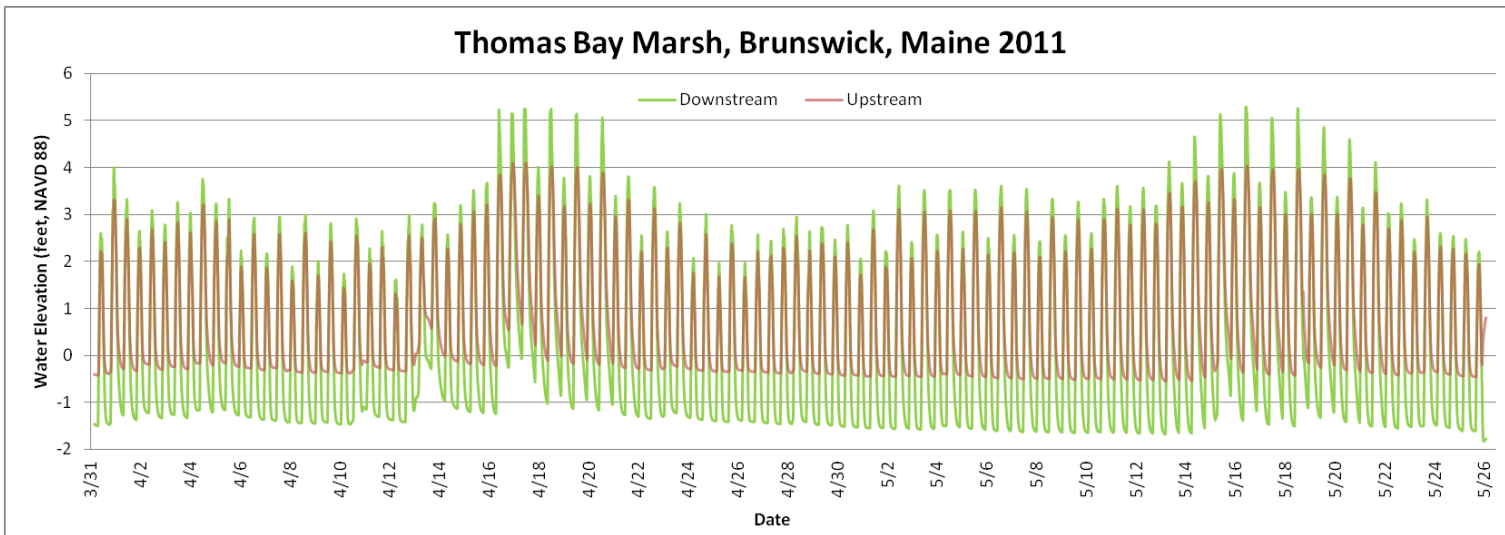


Figure 3. Thomas Bay Marsh pre-construction data from March 31 to May 26, 2011.

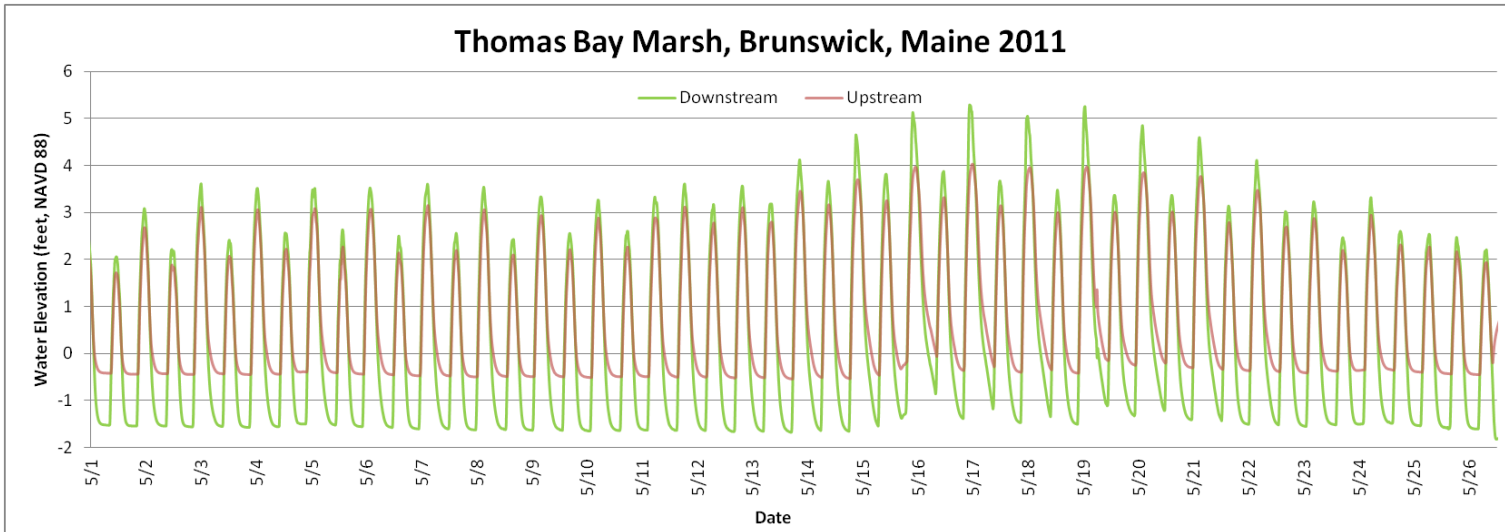


Figure 4. Thomas Bay Marsh pre-construction data from May 1 to May 26, 2011.

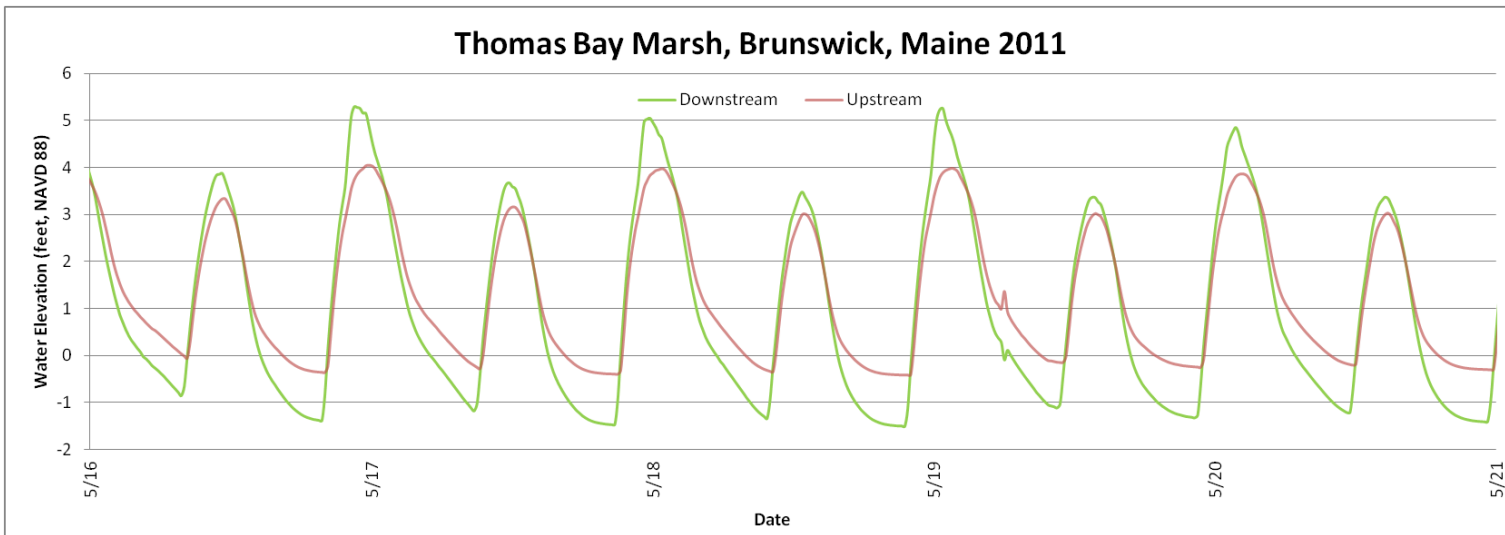


Figure 5. Thomas Bay Marsh pre-construction data, May 16 to May 20, 2011.

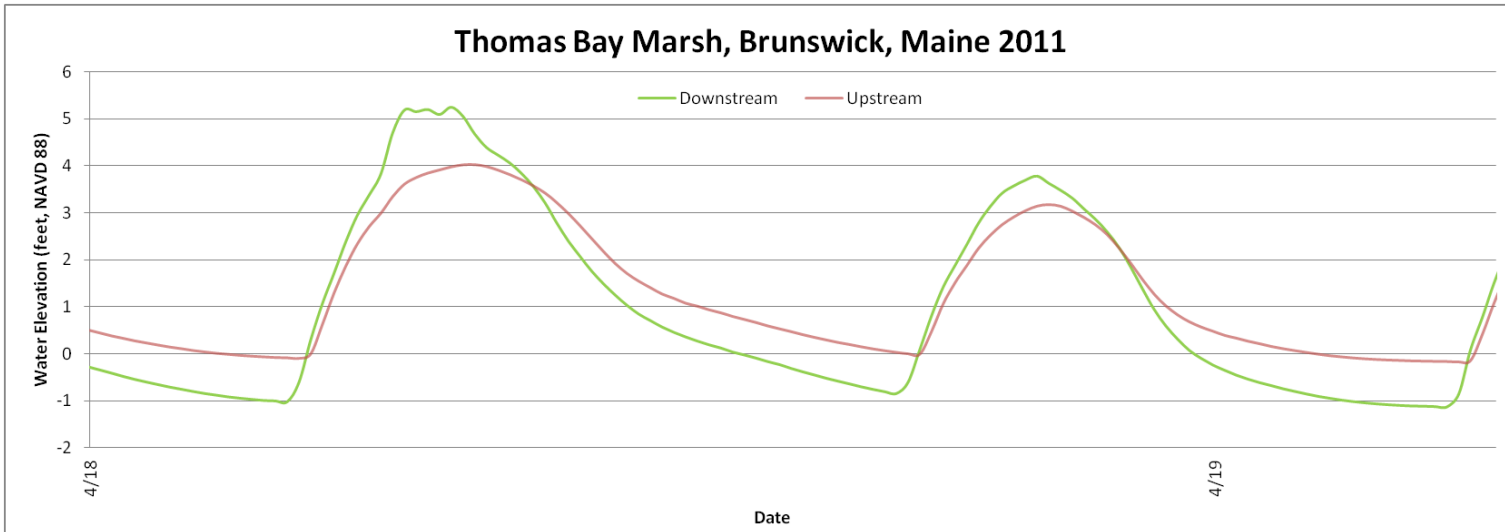


Figure 6. Thomas Bay Marsh pre-construction data, April 18 to April 19 spring tide, 2011.

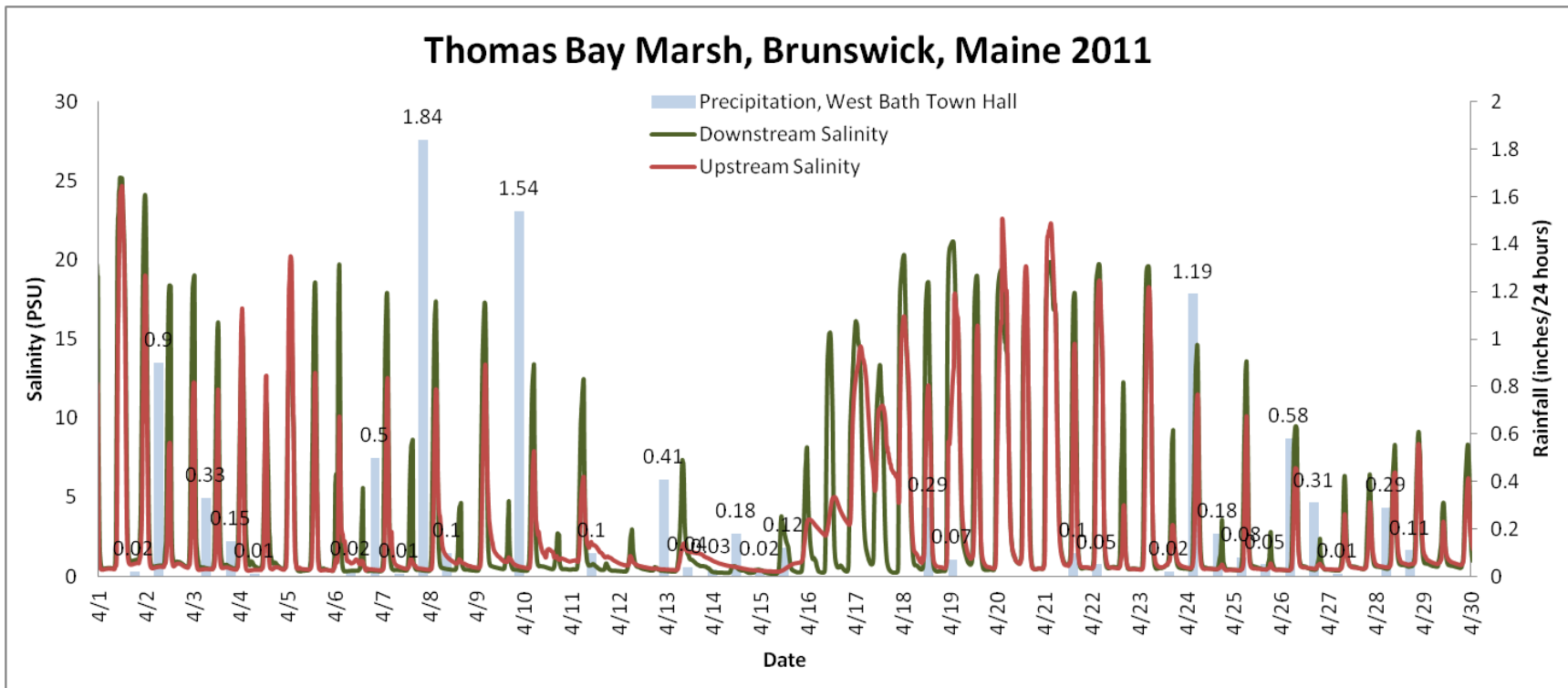
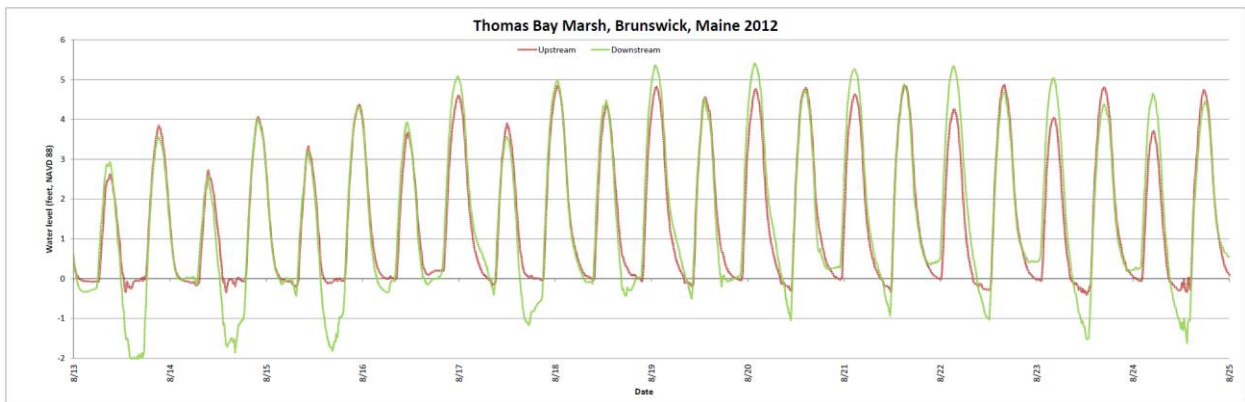
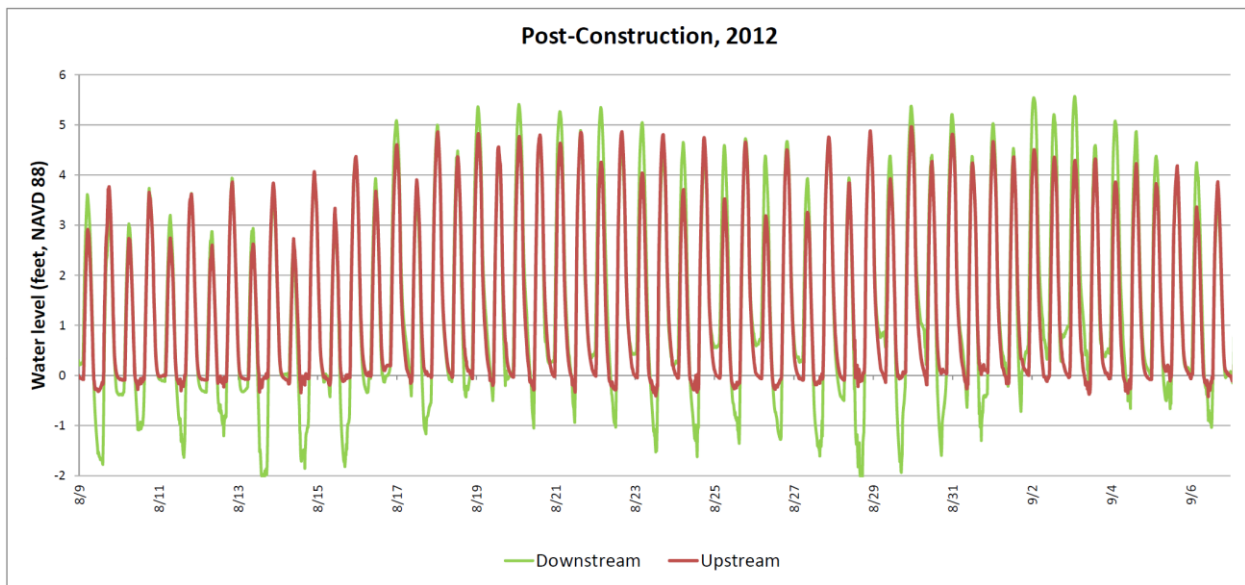
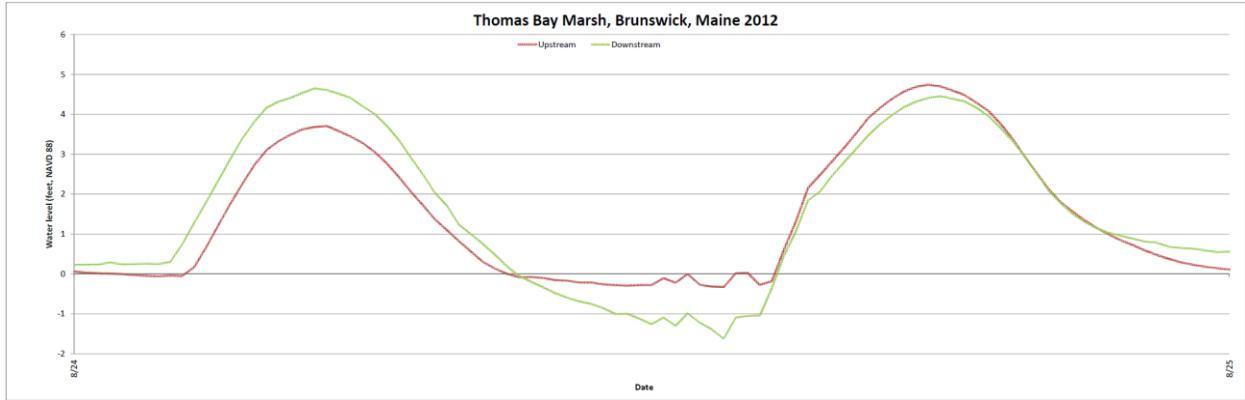


Figure 7. Thomas Bay Marsh pre-construction surface water salinity levels, April 2011.

Post-construction, 2012

CBEP staff collected post-construction tidal stage data between 8/8 - 9/7/2012. Modifications were made to the deployment technique in order to reduce the potential for compromising data quality due to equipment fouling, settling, malfunction, etc. Loggers were deployed using a vertical system/Stilling Well, with the logger inserted into a drilled PVC pipe secured to a fence post hammered into the creek bottom adjacent to the channel wall. Loggers were factory-calibrated by the manufacturer at the recommended interval during the preceding winter, and CBEP staff calibrated conductivity in the lab immediately prior to deployment. Multiple survey measurements of logger elevations were collected to confirm elevations remained constant during the deployment period.





Cross Sectional Area

Pre-construction channel cross sections were surveyed on August 9 at Stations 2, 3, 7, 8, and 10. Generally, cross sectional area decreases moving from south to north.

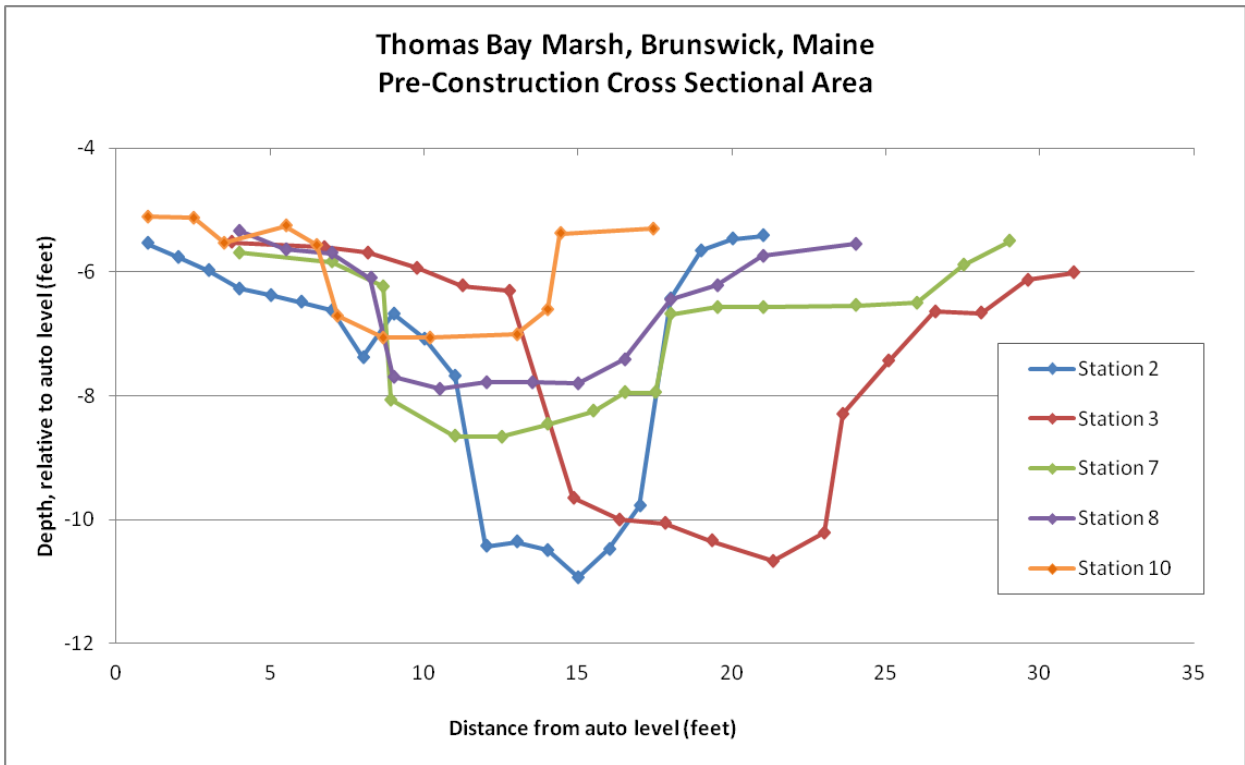


Figure 8. Pre-construction cross-sectional area on 8/9/2011. Note: elevations are relative within a given transect, but not across transects.

Vegetation

Pre-construction vegetation data were collected on August 12 using 1 meter² plots along transects set at each of the ten monitoring stations. Transects started at the edge of the tidal creek and ended at the upland transition. Transects were set on the western side of the creek to simplify access. Photo stations were established with four photos per Station facing north, south, east, and west.

Summary report tables of the 2011 vegetation data for each station are provided in Attachment A.

Pore Water Salinity

Pore water samples were collected from capped and vented PVC wells. Salinity was measured using handheld refractometers. Measurements were collected and recorded at Stations 2, 3, 7, 7a, and 10. Two pre-construction samples were collected at Stations 2, 3, 7, and 7a, and one pre-construction sample was collected at Station 10. Figure 9 plots pore water salinity measurements. Generally, pore water salinity measurements were observed to decrease moving northward/inland into the marsh system.



Photo 1. Typical cluster of Station wells.

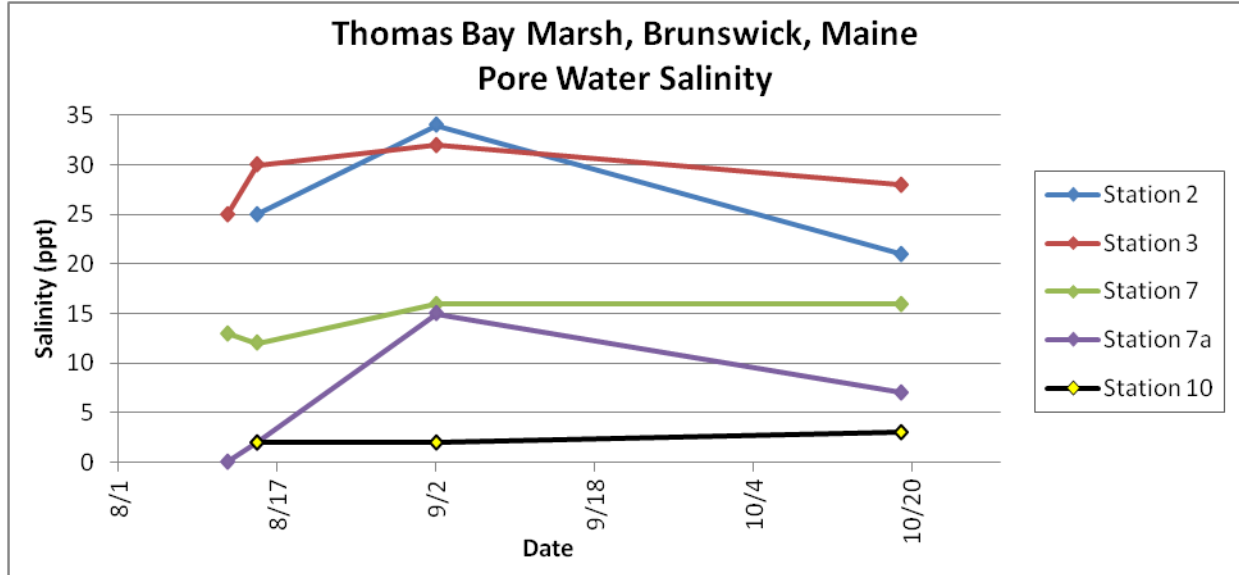


Figure 9. Pore water salinity measurements pre- and post- construction.

Surface water samples were collected at Stations 7, 8, and 10. Surface water samples were not collected at Stations 2 or 3 due to the ability of InSitu loggers to collect salinity data. Surface water salinity at Stations 7, 8, and 10 ranged from 0 ppt at Station 10 to 4 ppt at Station 7. Data are not presented here due to the limited number of samples (twelve).

Groundwater Depth

Groundwater depth from the surface was measured at shallow and deep monitoring wells at Stations 2, 3, 7, 7a, and 10 on. With the exception of Station 10, two measurements were taken at each Station prior to construction. Station 10 had one measurement taken for deep and shallow well groundwater depths pre-construction. Figure 10 plots shallow and deep groundwater depths at each Station.



Photo 2. Installing a deep water monitoring well.

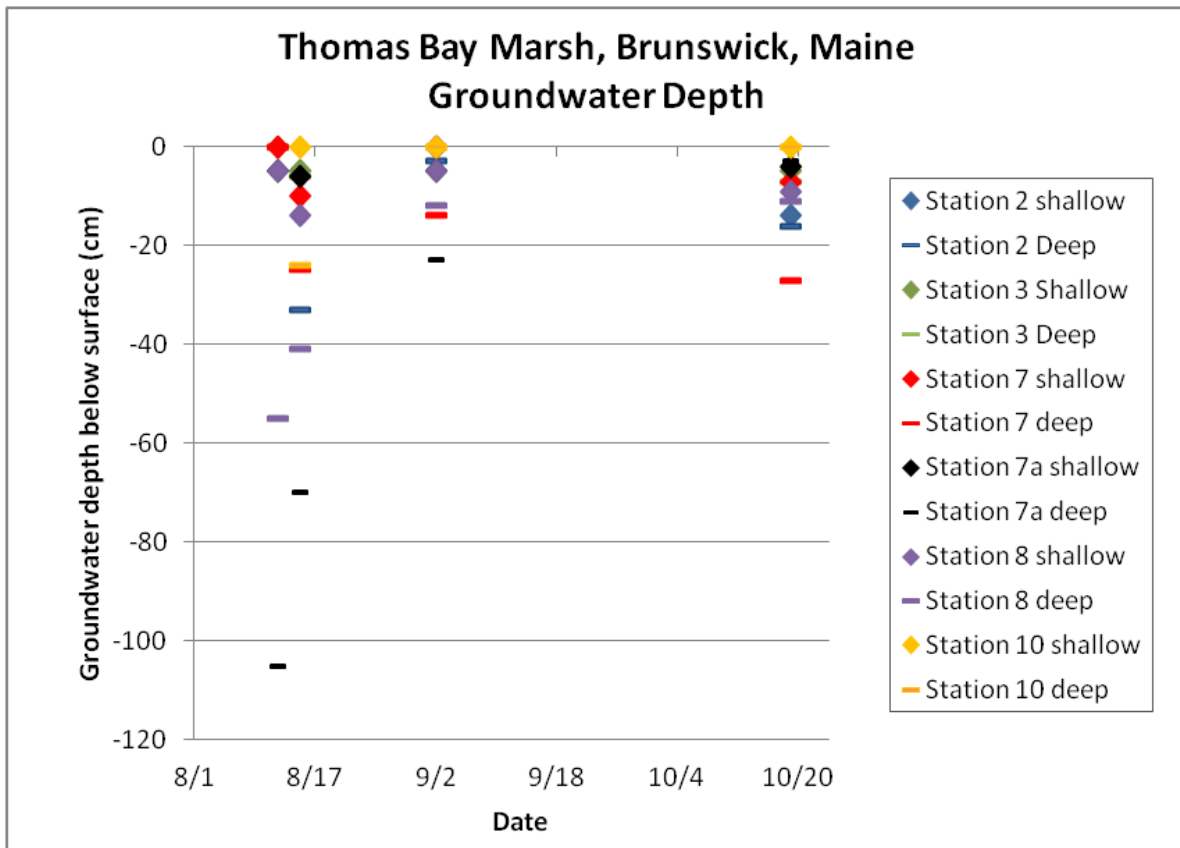


Figure 10. Groundwater depth from surface in shallow and deep monitoring wells.

References

Casco Bay Estuary Partnership 2011. *Monitoring Plan for Tidal Restriction Restoration at Thomas Cove Marsh.*

University of Southern Maine GIS Lab, 2009. RTK-GPS data.

Attachment A – Pre-construction vegetation transect summary reports.

Station	Date	UTM Easting	UTM Northing	Transect Length (m)	Spacing of Plots (m)	Number of Plots	
1	8/11/2011	428474	4860982	128	10	11	
				Number of Plots	Percent of Plots	Avg Percent Cover	Species Richness
SPAL	Spartina	alterniflora		9	82	44	13
SPPA	Spartina	patens		8	73	39	
SCPU	Scoenoplectus	pungens		4	36	28	
AGST	Agrostis	stolonifera		2	18	53	
BOMA	Bolboschoenus	maritimus		2	18	33	
DISP	Distichlis	spicata		2	18	28	
TRMA	Triglochin	maritima		2	18	25	
SAEU	Salicornia	europaea		2	18	1	
ASSP	Aster	spp.		1	9	20	
JUSP	Juncus	sp.		1	9	10	
SPPE	Spartina	pectinata		1	9	5	
JUAR	Juncus	arcticus		1	9	2	
TYLA	Typha	latifolia		1	9	1	
Wrck	Wrack			3	27	32	
OpnW	Open Water			2	18	20	

Station	Date	UTM Easting	UTM Northing	Transect Length (m)	Spacing of Plots (m)	Number of Plots	
2	8/9/2011	438505	4861196	71	6	11	
				Number of Plots	Percent of Plots	Avg Percent Cover	Species Richness
SPPA	Spartina	patens		6	55	68	11
BOMA	Bolboschoenus	maritimus		4	36	34	
AGST	Agrostis	stolonifera		3	27	23	
FERU	Festuca	rubra		3	27	13	
SPAL	Spartina	alterniflora		2	18	54	
CAPA	Carex	paleacea		2	18	23	
JUSP	Juncus	sp.		2	18	11	
DISP	Distichlis	spicata		2	18	4	
SPPE	Spartina	pectinata		1	9	40	
TYLA	Typha	latifolia		1	9	15	
TRMA	Triglochin	maritima		1	9	0	
Wrck	Wrack			3	27	53	

Station	Date	UTM Easting	UTM Northing	Transect Length (m)	Spacing of Plots (m)	Number of Plots	
3	8/9/2011	428537	4861390	77	7	11	
				Number of Plots	Percent of Plots	Avg Percent Cover	Species Richness
SPPA	Spartina	patens		9	82	85	11
AGST	Agrostis	stolonifera		3	27	3	
SPPE	Spartina	pectinata		2	18	28	
SCPU	Scoenoplectus	pungens		2	18	27	
LYTE	Lysimachia	terrestris		2	18	13	
SPAL	Spartina	alterniflora		2	18	10	
CASP	Carex	sp.		1	9	40	
FERU	Festuca	rubra		1	9	20	
COSP	Convolvulus	sp.		1	9	10	
ASSP	Aster	spp.		1	9	5	
JUSP	Juncus	sp.		1	9	0	
Wrck	Wrack			5	46	14	
Bare	Bare	Ground		1	9	40	

Station	Date	UTM Easting	UTM Northing	Transect Length (m)	Spacing of Plots (m)	Number of Plots	
4	8/12/2011	428620	4861443	31	3	10	
				Number of Plots	Percent of Plots	Avg Percent Cover	Species Richness
SCPU	Scoenoplectus	pungens		8	80	47	12
ASSP	Aster	spp.		8	80	8	
AGST	Agrostis	stolonifera		7	70	16	
SPPA	Spartina	patens		7	70	15	
BOMA	Bolboschoenus	maritimus		3	30	62	
TRMA	Triglochin	maritima		3	30	20	
SPPE	Spartina	pectinata		3	30	12	
JUAR	Juncus	arcticus		1	10	30	
SPAL	Spartina	alterniflora		1	10	15	
ANPO	Anserina	potentilla		1	10	5	
ATTR	Atriplex	triangularis		1	10	3	
PESA	Persicaria	sagittata		1	10	0	
OpnW	Open Water			1	10	10	

Station	Date	UTM Easting	UTM Northing	Transect Length (m)	Spacing of Plots (m)	Number of Plots	
5	8/12/2011	428401	4861529	21	2	10	
				Number of Plots	Percent of Plots	Avg Percent Cover	Species Richness
CAUT	Carex	utriculata		10	100	35	11
ASSP	Aster	spp.		10	100	19	
AGST	Agrostis	stolonifera		9	90	40	
COSP	Convolvulus	sp.		6	60	6	
SCPU	Scoenoplectus	pungens		5	50	10	
CACA	Calamagrostis	canadaensis		4	40	30	
SPPE	Spartina	pectinata		4	40	14	
JUSP	Juncus	sp.		2	20	13	
SOSE	Solidago	sempervirens		2	20	9	
SPPA	Spartina	patens		1	10	35	
ELPY	Elymus	pycnanthus		1	10	5	

Station	Date	UTM Easting	UTM Northing	Transect Length (m)	Spacing of Plots (m)	Number of Plots	
6	8/12/2011	428542	4861563	45	4	11	
				Number of Plots	Percent of Plots	Avg Percent Cover	Species Richness
DISP	Distichlis	spicata		7	64	20	16
SCPU	Scoenoplectus	pungens		6	55	29	
JUGE	Juncus	gerardii		5	46	58	
JUSP	Juncus	sp.		5	46	32	
AGST	Agrostis	stolonifera		4	36	33	
SPPE	Spartina	pectinata		4	36	6	
SPPA	Spartina	patens		3	27	41	
ASSP	Aster	spp.		3	27	6	
ANPO	Anserina	potentilla		3	27	4	
COSP	Convolvulus	sp.		2	18	21	
GLMA	Glaux	maritima		2	18	14	
BOMA	Bolboschoenus	maritimus		2	18	10	
TRMA	Triglochin	maritima		2	18	8	
SPAL	Spartina	alterniflora		2	18	5	
JUAR	Juncus	arcticus		1	9	25	
FERU	Festuca	rubra		1	9	10	
Wrck	Wrack			1	9	40	

Station	Date	UTM Easting	UTM Northing	Transect Length (m)	Spacing of Plots (m)	Number of Plots	
7	8/12/2011	428620	4861725	23	2.5	10	
				Number of Plots	Percent of Plots	Avg Percent Cover	Species Richness
SPPA	Spartina	patens		7	70	74	13
AGST	Agrostis	stolonifera		6	60	22	
JUGE	Juncus	gerardii		5	50	20	
SCPU	Scoenoplectus	pungens		4	40	34	
FERU	Festuca	rubra		3	30	5	
SPAL	Spartina	alterniflora		2	20	9	
CACA	Calamagrostis	canadaensis		2	20	5	
SPPE	Spartina	pectinata		2	20	4	
JUAR	Juncus	arcticus		1	10	15	
DISP	Distichlis	spicata		1	10	15	
CAOV	Carex	ovales		1	10	10	
ANPO	Anserina	potentilla		1	10	0	
COSP	Convolvulus	sp.		1	10	0	

Station	Date	UTM Easting	UTM Northing	Transect Length (m)	Spacing of Plots (m)	Number of Plots	
8	8/12/2011	428603	4862012	38	3.5	10	
				Number of Plots	Percent of Plots	Avg Percent Cover	Species Richness
SCAC	Schoenoplectus	acutus		10	100	36	11
JUSP	Juncus	sp.		9	90	20	
FERU	Festuca	rubra		8	80	23	
COSP	Convolvulus	sp.		8	80	9	
CACA	Calamagrostis	canadaensis		5	50	15	
SPPE	Spartina	pectinata		5	50	10	
AGST	Agrostis	stolonifera		4	40	18	
ASSP	Aster	spp.		4	40	4	
TYLA	Typha	latifolia		2	20	23	
CAUT	Carex	utriculata		2	20	13	
THPA	Thelypteris	palustris		1	10	35	

Station	Date	UTM Easting	UTM Northing	Transect Length (m)	Spacing of Plots (m)	Number of Plots	
9	8/12/2011	428530	4862138	25	2.5	10	
				Number of Plots	Percent of Plots	Avg Percent Cover	Species Richness
CAUT	Carex	utriculata		10	100	50	15
GASp	Galium	Sp.		7	70	4	
CALA	Carex	lacustris		5	50	26	
JUSP	Juncus	sp.		5	50	11	
TYLA	Typha	latifolia		4	40	14	
SPLA	Spirea	latifolia		3	30	35	
SCAC	Schoenoplectus	acutus		3	30	3	
HYMU	Hypericum	mutulum		3	30	2	
CACA	Calamagrostis	canadaensis		2	20	25	
SPSp	Sphagnum	Sp.		2	20	17	
LYTE	Lysimachia	terrestris		2	20	0	
ALSp	Alnus	Sp.		1	10	15	
COSP	Convolvulus	sp.		1	10	5	
IMCA	Impatiens	capensis		1	10	5	
THPA	Thelypteris	palustris		1	10	0	

Station	Date	UTM Easting	UTM Northing	Transect Length (m)	Spacing of Plots (m)	Number of Plots	
10	8/12/2011	428548	4862257	15	2	7	
				Number of Plots	Percent of Plots	Avg Percent Cover	Species Richness
CACA	Calamagrostis	canadaensis		7	100	25	13
TYLA	Typha	latifolia		7	100	21	
SPLA	Spirea	latifolia		6	86	32	
CAUT	Carex	utriculata		4	57	39	
GASp	Galium	Sp.		4	57	3	
IMCA	Impatiens	capensis		3	43	7	
Unkn	Unknown	Sp.		2	29	8	
POSp	Polygonum	Sp.		2	29	2	
LYTE	Lysimachia	terrestris		1	14	10	
ANPO	Anserina	potentilla		1	14	2	
POHA	Polygonum	hasatum		1	14	1	
THPA	Thelypteris	palustris		1	14	1	
HYMU	Hypericum	mutulum		1	14	0	