2011 Annual Aquifer Monitoring Report
Evergreen Spring
Fryeburg, Maine

Prepared for

Nestle Waters North America Inc.
(Poland Spring)
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by

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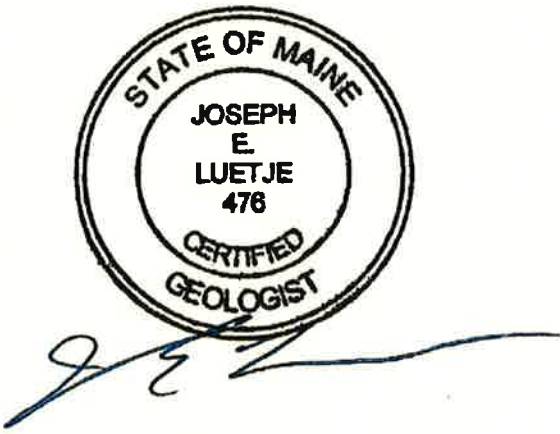

and

McDonald Morrissey Associates, Inc.
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2011 ANNUAL AQUIFER MONITORING REPORT
EVERGREEN SPRING
FRYEBURG, MAINE

Table of Contents

Figures

Tables

Appendices

1.0 INTRODUCTION

Nestle Waters North America Inc. (Poland Spring) purchases its spring water in Fryeburg from the Fryeburg Water Company (FWC). FWC also services other residential, commercial, industrial and public water users in Fryeburg. Poland Spring has contracted with Luetje Geological Services (LGS) of Portland, Maine and McDonald Morrissey Associates, Inc. (MMA) of Concord, New Hampshire, independent hydrogeologic consulting firms, to collect and compile data from the Wards Brook Aquifer. Poland Spring is not required to submit these data to the Town of Fryeburg but started to do so voluntarily with the December 2008 monthly report. Annual reports are compiled after the end of each year summarizing final data and drawing conclusions about hydrologic conditions in the Wards Brook Aquifer.

Hydrogeologic data collection from locations in and around the Wards Brook Aquifer began in 2003 by Woodard & Curran for Pure Mountain Springs Company. LGS assumed responsibility for the monthly monitoring program in July, 2008 and continues to conduct monitoring of the Wards Brook Aquifer on behalf of Poland Spring. The primary role for LGS is monthly data collection and preparation of monthly and annual reports. MMA was contracted to perform data analysis, program review, and general oversight of site monitoring and reporting.

In August 2005, Emery & Garrett Groundwater, Inc. submitted a report (*Groundwater Flow Model, Wards Brook Aquifer, Fryeburg, Maine, 2005)* to the Town of Fryeburg Planning Board. This report was funded by the Fryeburg Aquifer Resource Committee (FARC). To date, this appears to be the most comprehensive investigation and report pertaining to the Wards Brook Aquifer. Emery & Garrett used groundwater and geologic data collected by several entities including:

- Pure Mountain Springs (PMS) and Woodard & Curran (W&C);
- Poland Spring;
- Fryeburg Water Company (FWC);
- WE Corporation (WE);
- SF Corporation, LLC (SF); and
- U.S. Geological Survey (USGS).

As part of its effort, Emery & Garrett created a groundwater model of the Wards Brook Aquifer. To simplify the report and present findings to the public, Emery and Garrett likened the Wards Brook Aquifer to a bank account, with income (groundwater recharge), fixed expenses (FWC needs for its customers other than Pure Mountain Springs and appropriate minimum flow through Wards Brook Drainage), and discretionary expenses (water used for other FWC customers, other water users of the aquifer, and excess flow through Wards Brook drainage). Emery & Garrett concluded that discretionary expenses (withdrawals) from the Wellhead Protection Area as delineated, after all other 'fixed expenses' were met, totaled approximately 293 million gallons per year (equivalent to 804,000 gallons per day over the course of a calendar year) during an average precipitation year. Emery & Garrett then imposed an arbitrary safety factor of 25%, arriving at a conservative 'discretionary expense' value of 220 million gallons per year (equivalent to 603,000 gallons per day over the course of a calendar year). Poland Spring,

on average, purchases well below the 'discretionary expense' value. In 2011, water pumped from Borehole-1 (PBH-1) totaled approximately 73 million gallons, or 33% of discretionary water available.

2.0 AQUIFER MONITORING PROGRAM

This annual report is a compilation of data for the period from January 2011 through December 2011. The entire record of water elevations measured at MW-108 is also included showing recent groundwater trends in the Wards Brook Aquifer and is discussed further in Section 3.0

Data are presented for eleven monitoring wells, four surface water stations, from rain gauges at the PBH-1 load-out facility and the Fryeburg Eastern Slopes Airport (ICAO Station KIZG, Northeast Regional Climate Center), and withdrawal data from PBH-1. Locations of all data collection stations are shown in Figure 1. Table 1 summarizes data collection stations and monitoring frequency.

Table 1: Fryeburg Monitoring Program Plan

Monitoring Station	Frequency
Monitoring Wells	
TW-2 [1]	Monthly
TW-9	Monthly
MW-101 [2]	Monthly
MW-103	Monthly
MW-105	Monthly
MW-107	Monthly
MW-108	Monthly
MW-109	Monthly
MW-110	Monthly
MW-113	Monthly
MW-114	Monthly
Surface Water Stations	
WPMP-1 [3]	Monthly
WPSG-2A [4]	Monthly
SRMP-1 [5]	Monthly
LPSG-1 [6]	Monthly
Precipitation	
RG – On-site Rain Gauge	Continuous
ICAO Station KIZG (Fryeburg Airport)	Continuous
Withdrawal Data	
PBH-1	Continuous

Notes:
1. TW refers to 'test well'.
2. MW refers to 'monitoring well'.
3. WPMP refers to 'Wards Pond Monitoring Point'.
4. WPSG refers to 'Wards Pond Staff Gauge'.
5. SRMP refers to 'Saco River Monitoring Point'.
6. LPSG refers to 'Lovewell Pond Staff Gauge'.

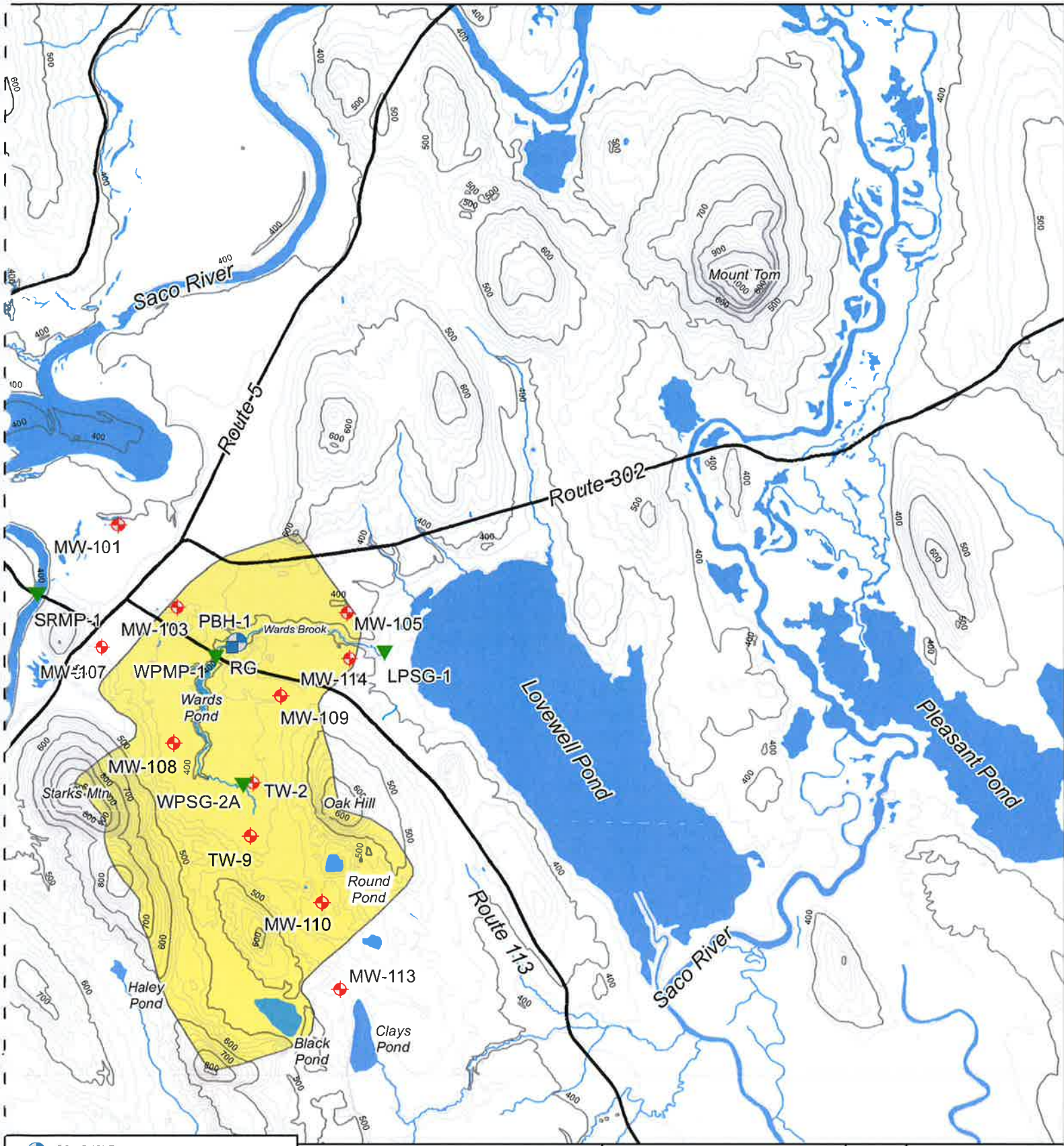

FIGURE 1
VOLUNTARY AQUIFER MONITORING REPORT
FRYEBURG, MAINE

NOTES:
1. ALL GENERAL DATA LAYERS ACQUIRED FROM THE MAINE OFFICE OF GIS.
2. CONTOURS ARE 20' INTERVALS.

DATE: 2/15/2012

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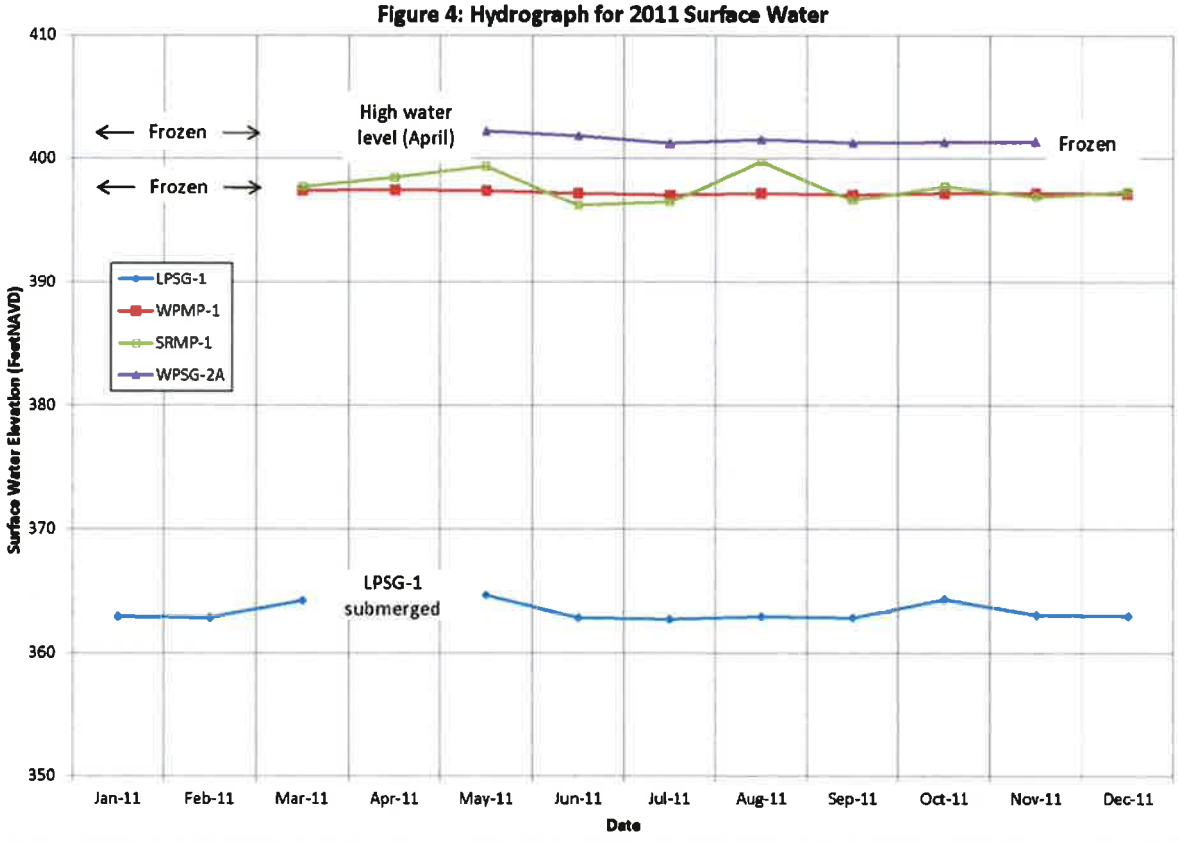
Appendix A includes a photograph (Photograph B) showing a typical staff gage used to measure surface water stage and a view of Lovewell Pond (Photograph BB) facing north from the boat ramp located off Route 113. The Lovewell Pond photograph is taken every month during regular monitoring if access is available. 2011 surface water elevations from surface water stations appear in Figure 4. A data table summarizing surface water elevation data appears in Appendix B.

Examination of Figure 4 shows normal seasonal surface water fluctuations near the site. In general, there is typically a rise in surface water levels during spring melt, a decline through the summer months, another rise in the fall and early winter followed by frozen conditions during winter months. Frozen conditions were observed at WPMP-1, WPSG-2A and SRMP-1 during winter months. LPSG-1 remained unfrozen due to moving water at this station. High surface water conditions did not allow for access to WPSG-2A and LPSG-1 during April 2011 monitoring.

Figure 4: Hydrograph for 2011 Surface Water



5.0 PRECIPITATION

Precipitation is recorded on-site adjacent to PBH-1 using an Onset Data Logging Rain Gauge (RG). The location of the on-site rain gauge is shown in Figure 1. A photograph showing the on-site rain gauge (Photograph C) appears in Appendix A. The on-site rain gauge has a self-tipping bucket that is activated with every 0.01 inches of precipitation. The gauge is also wrapped with heat tape that melts snowfall and allows measurement of precipitation through the winter months.

Precipitation data are also recorded at the Fryeburg Eastern Slopes Airport (ICAO Station KIZG, Northeast Regional Climate Center) to compare precipitation measurements taken by the on-site rain gauge. The Fryeburg Eastern Slopes Airport is approximately two miles to the south of the on-site rain gauge. Table 2 summarizes 2011 precipitation of data available and used in the monthly reports.

Table 2: 2011 Precipitation Summary

Month	*ON-SITE RAIN GAUGE DATA*	*FRYEBURG EASTERN SLOPES AIRPORT (ICAO STATION KIZG)*
Jan 2011	1.69	2.16
Feb 2011	2.13	3.47
Mar 2011	5.33	5.27
Apr 2011	6.58	6.85
May 2011	4.62	5.45
Jun 2011	2.81	3.27
Jul 2011	2.35	2.43
Aug 2011	7.85	8.34
Sep 2011	4.29	4.49
Oct 2011	5.73	6.17
Nov 2011	4.37	4.39
Dec 2011	3.78	3.87
2011 TOTAL	**51.53**	**56.16**

Examination of Table 2 shows that there is a reasonably close correlation between precipitation data collected at both locations. For the 2011 calendar year, the on-site rain gauge recorded a total of 51.53 inches of precipitation, 5.55 inches more than was recorded in 2010. The Fryeburg Eastern Slopes Airport gauging station recorded 56.16 inches of precipitation, 4.63 inches more than was recorded by the on-site rain gauge.

The Fryeburg area receives an average of approximately 49 inches of precipitation per year. This average was calculated from data collected at two long term National Weather Service Cooperative stations:

- East Hiram NWS Coop Station 173794 (1967 – 2008) (the East Hiram Station was discontinued in July 2009)
- North Conway NWS Coop Station 275995 (1975 – 2010)

6.0 WITHDRAWALS

In accordance with the contract with the Fryeburg Water Company, spring water volume withdrawn from PBH-1 is presented as total gallons recorded as offloaded at bottling facilities. Table 3 summarizes the 2011 monthly withdrawal volumes below. Spring water withdrawals from PBH-1 totaled 73,143,343 gallons for the 2011 calendar year.

Table 3: PBH-1 2011 Withdrawal Summary

Month	Monthly Total (gal)
Jan-10	3,473,029
Feb-10	3,326,540
Mar-10	6,016,110
Apr-10	3,372,208
May-10	5,022,761
Jun-10	8,898,818
Jul-10	12,043,196
Aug-10	13,765,689
Sep-10	11,859,710
Oct-10	1,113,969
Nov-10	2,042,918
Dec-10	2,208,395
2011 Total	**73,143,343**

7.0 BIOLOGICAL MONITORING

To complement the biological investigations conducted by Normandeau Associates in the 2006 and 2008 field seasons, Poland Spring initiated a long-term biological monitoring program of Wards Brook beginning in 2009. Bio-monitoring, conducted every other year, was performed by Stantec in 2011 and appears in Appendix C.

8.0 FINDINGS

This report represents the fourth annual report for Fryeburg, Maine prepared on behalf of Poland Spring and is a summary of hydrologic data collected from the Wards Brook Aquifer through the 2011 calendar year. Poland Spring also provides these data voluntarily to the Town of Fryeburg, Fryeburg Water District and the Fryeburg Water Company on a monthly basis in the

form of a monthly report that began with the December 2008 report. These data provide an on-going comprehensive summary of hydrologic conditions in the Wards Brook Aquifer. Findings for 2011 include the following:

- Spring water withdrawal from PBH-1 for 2011 totaled 73,143,343 gallons;
- 73,143,343 gallons represents approximately 33% of the discretionary water available as determined by Emery & Garrett Groundwater, Inc.;
- Normal seasonal variations of groundwater levels were observed at all monitoring well locations;
- Highest groundwater elevations for 2011 were observed in the spring (April - June) and the lowest groundwater elevations were recorded in February or August;
- Although no long term trends can be determined, groundwater levels in the Wards Brook Aquifer have generally been rising since 2003 as observed at MW-108;
- Surface water levels showed normal seasonal variation in 2011;
- Total precipitation for the 2011 calendar year was 51.53 inches as recorded by the on-site rain gauge, 5.55 inches more than 2010.

9.0 CONCLUSIONS

Based upon all the hydrologic data collected in 2011, there are no adverse impacts to the Wards Brook Aquifer from spring water withdrawal on behalf of Poland Spring.

If you have any questions regarding the data, explanations, or interpretations included in this report, please do not hesitate to contact Ed Luetje (207) 415-9898.

Sincerely,

Luetje Geological Services, LLC

Ed Luetje C.G.

McDonald Morrissey Associates, Inc.

Daniel J. Morrissey

cc: Fryeburg Water District (Mr. Richard Krasker)
Fryeburg Water Company (Mr. Hugh Hastings)
Emery & Garrett Groundwater, Inc. (Mr. Peter Garrett)
Poland Spring (Mr. Mark Dubois)

APPENDIX A

Photographs

Photographs A and AA: Measuring depth to water using a water level indicator at MW-114.

Photograph A

Photograph AA

Photograph B: WBSG-2 – Typical staff gage used for measuring surface water elevation.
Photograph BB: Lovewell Pond from boat ramp off Rt. 113 facing north (6/22/2011.)

Photograph B

Photograph BB

Photograph C: On-site Rain Gage

APPENDIX B

2011 Groundwater and Surface Water Elevation Data
Fryeburg, Maine

Monitoring Wells	MW-101[2]	MW-103	MW-105	MW-107	MW-108	MW-109	MW-110	MW-113	MW-114	TW-2	TW-9
Reference Elevation (feet NAVD88)[1]	408.35	421.58	404.98	431.95	419.89	420.11	461.86	441.13	405.20	404.18	409.24
1/19/2011	398.71	411.31	380.53	424.95	410.9	398.97	417.66	420.88	385.33	frozen	410.13
2/18/2011	398.22	410.65	380.07	423.81	410.42	398.6	417.29	420.73	384.81	frozen	409.74
3/21/2011	400.84	412.18	381.13	426.64	411.58	399.27	417.33	420.91	386.76	404.97	410.02
4/22/2011	400.65	413.63	382.19	428.43	412.56	401.11	419.65	422.34	387.94	406.88	411.71
5/20/2011	400.79	413.98	382.18	428.52	413.18	401.82	421.77	423.57	387.79	407.28	413.1
6/20/2011	399.04	413.27	381.33	427.18	412.22	401.41	422.05	423.59	386.99	408.08	413.2
7/20/2011	398.19	412.52	380.56	425.77	411.12	400.32	421.14	423	384.66	406.84	412.23
8/22/2011	397.96	411.62	380.03	423.99	409.96	399.03	419.86	422.25	383.35	404.56	411.11
9/21/2011	399.43	412.09	380.25	424.58	410.57	398.87	419.15	421.87	384.45	405.49	410.91
10/19/2011	400.04	412.59	380.77	425.63	411.23	399.31	418.86	421.7	385.38	405.37	410.76
11/21/2011	399.61	412.57	380.73	425.97	411.45	399.62	418.99	421.72	385.74	404.67	410.93
12/21/2011	399.58	412.99	381.25	426.75	411.92	400.26	419.69	422.18	386.46	405.52	411.33

Surface Water Stations	LPSG-1[3]	WPMP-1[4]	SRMP-1[5]	WPSG-2A[6]
Reference Elevation (feet NAVD88)[1]	364.85 364.82[3]	401.27	418.79	404.95 403.97[6]
1/19/2011	362.93	frozen	frozen	frozen
2/18/2011	362.84	frozen	frozen	frozen
3/21/2011	364.18	397.43	397.74	frozen
4/22/2011	submerged	397.48	398.49	inaccessible
5/20/2011	364.63	397.4	399.37	402.2[7]
6/20/2011	362.81	397.19	396.19	401.8
7/20/2011	362.69	397.07	396.46	401.22
8/22/2011	362.9	397.19	399.69	401.51
9/21/2011	362.8	397.07	396.61	401.24
10/19/2011	364.27	397.2	397.75	401.31
11/21/2011	363.05	397.22	396.9	401.33
12/21/2011	362.99	397.17	397.34	frozen

Notes:

1. NAVD88 is the North American Vertical Datum 1988. Elevations are in feet NAVD. Measuring points were re-surveyed in the summer 2009 by Bliss Associates and new reference elevations are are reflected in this chart.
2. MW refers to monitoring well
3. LPSG refers to Lovewell Pond Staff Gauge; new reference elevation (June 2011)
4. WPMP refers to Wards Pond Monitoring Point
5. SRMP refers to Saco River Monitoring Point
6. WPSG refers to Wards Pond Staff Gauge; New reference elevation (June 2011)
7. Temporary measuring point due to high water levels (WPSG-2B); reference elevation of 404.03

APPENDIX C

Evergreen Spring 2011 Biomonitoring Report

Nestle Waters North America Inc.
Evergreen Spring
Fryeburg, Maine

2011 Biological Monitoring Report
March 2012

PREPARED FOR:
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123 Preservation Way
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PREPARED BY:
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Stantec

Table of Contents

List of Figures

List of Appendices

1.0 INTRODUCTION

Nestle Waters North America Inc. (Poland Spring), through its subsidiary Pure Mountain Springs, purchases water from Evergreen Spring, a spring site owned by the Fryeburg Water Company along Wards Brook and Route 113 in Fryeburg, Maine (Figure 1). Poland Spring continues to conduct voluntary monthly monitoring of groundwater levels of the underlying aquifer and the surface water levels of Wards Brook in order to assess potential impacts of the groundwater withdrawal operations on the overall hydrology of the spring site. In 2007, Normandeau Associates, Inc. (Normandeau) conducted a biological characterization of aquatic and wetland resources within Wards Brook and Lovewell Pond to provide a preliminary assessment of potential impacts to wetland and aquatic resources as a result of groundwater withdrawal operations.[1]

To further supplement the ongoing hydrological monitoring of the spring site and to augment the previous biological sampling completed by Normandeau, Stantec Consulting (Stantec) was asked by Poland Spring to initiate an on-site biological monitoring (biomonitoring) program in 2009 to monitor and assess potential impacts to stream habitats as a result of continued groundwater withdrawal operations through benthic macroinvertebrate monitoring on an every-other-year schedule. This biomonitoring program was voluntarily initiated as part of Poland Spring's commitment to maintaining sustainable yields of groundwater withdrawal and avoiding adverse impacts to the associated natural resources. This biomonitoring program is not part of any required conditional compliance associated with permits issued by the Maine Department of Environmental Protection (MDEP) or any other state or federal regulatory agency. This report presents the results of the 2011 biomonitoring.

2.0 2011 STREAM BIOMONITORING METHODOLOGY

To monitor the aquatic habitats within Wards Brook relative to the potential impacts of groundwater withdrawals at Evergreen Spring, Stantec deployed one set of rock bags (i.e., 3 bags) in suitable sampling habitat (e.g., run-riffle habitat) upstream of a snowmobile bridge at the Grist Mill site (RB-1; Figure 2) to sample the macroinvertebrate community within Wards Brook. Macroinvertebrate species vary in their tolerance to organic pollutants and stream habitat alterations. Through sampling and analyses of the macroinvertebrate communities, determinations of overall water quality can be made. Long-term biological sampling of the macroinvertebrate communities can be conducted to document potential changes in the water quality over time. The RB-1 sampling site was similar in stream habitat to the Downstream Station as sampled by Normandeau in 2007 and by Stantec in 2009. Deployment and retrieval of the rock bags was conducted in accordance with *Methods for Biological Sampling and Analysis of Maine's Rivers and Streams.*[2] Rock bags were deployed during the low flow season (i.e., July through September). This biomonitoring methodology is consistent with the approach implemented by Normandeau in 2007 and continued by Stantec in 2009. Each rock bag was located using a Trimble® Pro-XR Global Positioning System receiver. Samples were preserved in the field and submitted to Lotic, Inc. (Lotic) for taxonomic identification and habitat quality analysis using their macroinvertebrate water quality estimation model. MDEP Biological Monitoring Unit Stream Macroinvertebrate Field Data Sheets were completed at the time of rock bag collection and included recording habitat and water quality parameters such as temperature, dissolved oxygen, specific conductivity, and pH.

Lotic's water quality model uses several parameters from the stream macroinvertebrate community, including species diversity and abundance of certain species, to determine the water quality of the stream. Under M.R.S.A. 38, Chapter 465, four categories of water classification have been established. These standards describe the standards of aquatic life (e.g., macroinvertebrates) that shall be attained within Maine streams.

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[1] Normandeau Associates, Inc. December 2007. *Baseline Characterization of Natural Resources of Wards Brook and Lovewell Pond in Support of Assessment of Potential Groundwater Withdrawal Impacts.* Prepared for Town of Fryeburg.

[2] Davies, S. and L. Tsomides. 2002 . *Methods for Biological Sampling and Analysis of Maine's Rivers and Streams.* Maine Department of Environmental Protection. Bureau of Land and Water Quality. Augusta, ME.

The aquatic life standards are as follows:

Class	Biological Standard
AA	Aquatic life as naturally occurs
A	Aquatic life as naturally occurs
B	Water quality sufficient to support all indigenous aquatic species. Only non-detrimental changes to the resident biological community are allowed.
C	Water quality sufficient to support all indigenous fish species. Changes to aquatic life may occur but structure and function of the resident biological community must be maintained.

Through systematic sampling of various stream habitats throughout Maine, the MDEP compiled a baseline database of representative macroinvertebrate communities from pristine, unimpaired streams to highly altered streams. A water classification was subsequently adopted for the streams by the Maine Legislature. This baseline database provides a reference point to which successive samples can be compared in order to determine stream classification and water quality. Lotic's report in Appendix 1 further elaborates on the baseline data compilation and the relevant macroinvertebrate community parameters used in evaluating the water quality.

3.0 2011 STREAM BIOMONITORING RESULTS

Stantec deployed rock bags on August 17, 2011, and retrieved the rock bags on September 16, 2011. Rock bags were deployed in a shallow run-riffle habitat with a sand-gravel substrate. Stantec collected the macroinvertebrate species from each rock bag and provided the samples to Lotic. Lotic identified and enumerated each macroinvertebrate species from the rock bag samples. The data were analyzed by Lotic using their water quality model to determine the water quality of the stream. Based on the macroinvertebrate water quality estimation model, Lotic determined that the benthic community at the RB-1 station in Wards Brook best represents a Class A stream. Lotic noted the high richness of mayflies, stoneflies, and caddisflies (i.e., EPT species) and low percent dominance of organisms supported the Class A determination. The Class A water quality attainment of Wards Brook is better than the statutory Class C classification,[3] as well as the Class B determination from the 2009 sampling. Appendix 1 contains the results of Lotic's analyses. Appendix 2 contains representative stream habitat photographs.

4.0 DISCUSSION

The macroinvertebrate community sampled in 2011 demonstrates an improvement in water quality compared to the stream sampling conducted in 2007 and 2009. In 2011, a higher proportion of EPT species (i.e., species with generally low biological tolerances and found) and a lower proportion of bloodworm midges (Chironomid) species (i.e., species with higher biological tolerance values) were present in the stream samples. Both mayflies (Ephemeroptera) and stoneflies (Plecoptera) are species that are characteristic of higher quality waters with minimal disturbances.

A comparison of the macroinvertebrate communities sampled between 2007 and 2011 is presented in Appendix 3. Table 1 below compares various metrics relative to the macroinvertebrate communities collected between 2007 and 2011 in Wards Brook.

[3] Wards Brook is classified as Class C surface water. Title 38, Section 467-12(B)(2).

Table 1: Comparison of Rock Bag Data

Category	2007	2009	2011
Plecoptera mean abundance	24	37	48.7
Relative Plecoptera abundance	0.07	0.06	0.12
Ephemeroptera mean abundance	45.3	80.3	95
Relative Ephemeroptera abundance	0.12	0.13	0.24
Tricoptera mean abundance	147.3	99.3	105.3
Relative Trichoptera abundance	0.40	0.16	0.27
Chironomid abundance	65.7	78.7	39.7
Relative Chironomid abundance	0.18	0.12	0.1
Number of taxa with tolerance values between 0 and 2*	8	14	15
Number of taxa with tolerance values between 3 and 5*	13	16	15
Number of taxa with tolerance values between 6 and 8*	9	11	14
Number of taxa with tolerance values above 8*	1	1	0

**Tolerance values obtained from Bode et al. 1996. Quality Assurance Work Plan for Biological Stream Monitoring in New York State. NYS Department of Environmental Conservation, Albany, NY. 89p.; Mandaville, S.M. 2002. Benthic Macroinvertebrates in Freshwaters- Taxa Tolerance Values, Metrics, and Protocols. Soil and Water Conservation Society of Metro Halifax, Nova Scotia, Canada*

The improvement in the water quality of Ward's Brook is attributed to natural variation of macroinvertebrate species as a result of environmental factors. As Wards Brook is located in a suburban landscape, surrounded by residential developments and major roadways such as Route 113 and Route 302, the stream has been and continues to be affected by anthropogenic activities in the watershed such as surface water runoff from impervious surfaces, including roadways and parking lots. Sedimentation, nutrient inputs such as phosphorus, and stream temperature increases from surface water runoff are expected to contribute (under normal conditions) to a macroinvertebrate community in Wards Brook that includes species that are more tolerant of anthropogenic disturbances such as black flies, bloodworm midges, other true flies (Diptera), or net-spinning caddisflies (*Hydropsyche* spp. and *Cheumatopsyche* spp.). The lower proportion of Diptera species relative to mayflies, stoneflies, and caddisflies may not represent "normal" low-flow conditions as high flows and floods as a result of Hurricane Irene in late August occurred during the sampling period. These flood events may have "flushed" the stream channel and affected the macroinvertebrate species composition. In general, Diptera species and other species with higher tolerance values are typically more prevalent in slower flowing streams. In contrast, mayflies and stone flies are often specifically adapted for high energy streams. Therefore, the floods associated with Hurricane Irene may have flushed many macroinvertebrate species that are not adapted to high energy streams, thereby resulting in a higher proportion of mayflies and stoneflies, as well as other species characteristic of high energy streams, in the rock bag samples.

Regardless, the data collected in 2011 indicate that natural environmental factors and adjacent land uses affect the water quality of Wards Brook. The continued abundance of EPT taxa, as well as species with higher tolerance values, is characteristic of streams in wooded suburban environments. The data indicate that water withdrawals have not adversely affected the water quality of Wards Brook

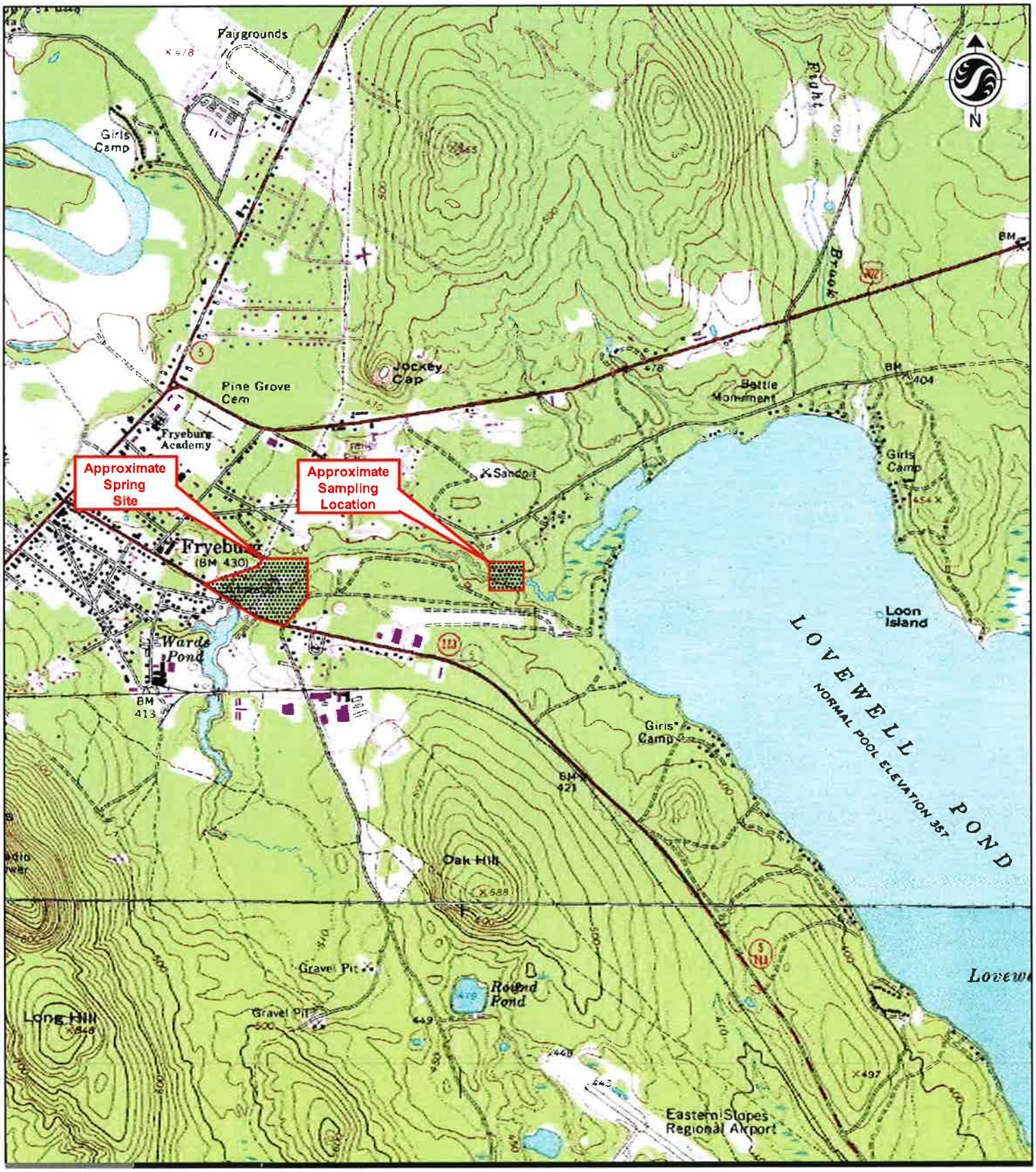
5.0 CONCLUSIONS AND RECOMMENDATIONS

The biomonitoring program in Wards Brook that was initiated by Normandeau in 2007 and continued by Stantec at Evergreen Spring will allow for reasonable conclusions to be made relative to the potential impacts water withdrawal may have on the benthic stream communities and habitats. This will be achieved by comparing future macroinvertebrate data with past results.

The data collected in 2007 through 2011 indicate that Wards Brook maintains a community of macroinvertebrates that are consistent in small woodland stream communities in a suburban watershed. Data collected in 2011 indicate natural variation in macroinvertebrate communities as a result of environmental factors. While Wards Brook achieved Class A water quality standards in 2011, the high flows of Hurricane Irene may have flushed portions of the "normal" macroinvertebrate community from the stream thereby leaving behind a macroinvertebrate community that is more indicative of high energy streams. The data collected in 2011 indicate that water withdrawal operations have not had an adverse effect of the water quality of Wards Brook.

To continue to monitor Wards Brook for potential effects of groundwater withdrawal operations, Stantec recommends continuing stream biomonitoring on an every-other year schedule (i.e., 2013, 2015 and beyond).

Figure 1
Site Location Map



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Feet

Client/Project 195600489
Nestle Waters North America Inc.
Evergreen Spring
Fryeburg, Maine

Figure No.
1

Title
Site Location Map

February 3, 2010

Figure 2
Biomonitoring Location Map

NOTE:

1. Coordinates projected in NAD 83 State Plane ME west FIPS 1802 feet.
2. THREE rock baskets were deployed at monitoring location.
3. 2009 National Agriculture Imagery Program (NAIP) aerial orthoimagery provided by Natural Resource Conservation Service and the Farm Service Agency.

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Legend

- ROCK BASKET MONITORING LOCATION
- APPROXIMATE BOREHOLE LOCATION

Client/Project 195600717

Nestle Waters North America Inc.

Evergreen Spring
Fryeburg, Maine

Figure No.
2

Title
2011 Biomonitoring Locations

00717_002BioMon.dwg

February 21, 2012

Appendix 1
Macroinvertebrate Data

Maine Department of Environmental Protection
Logsheet for Benthic Macroinvertebrates Identified
Please see the Read Me worksheet

Taxonomist: Lotic Inc.

Sample Log No.:	
Station No.:	RB-1
Waterbody Name:	Evergreen Stream
Town Name:	Fryeburg
Date of Collection:	9/16/2011
Time of Collection:	
Collected By:	Stantec
Subsample Factor:	1
Sampler Type:	RBG-Rock Bag

Chironomidae Subsample (SS) Effort			
Level of SS Effort	none	none	none
No. Chir SSed			
No. Chir in SS			
Misc. Chir not SSed			
TChir	0	0	0

				Retrieval Depth Unit	Depth 1	Depth 2	Depth 3
	Taxon				No. identified from sample		
Maine Code	Taxon Name	Stage	Comment		Rep 1	Rep 2	Rep 3
09020601001	Dolophilodes				12	1	6
09020604014	Diplectrona				9	9	31
09020604016	Hydropsyche				5	4	12
09020604	Hydropsychidae				11	7	12
09020605019	Rhyacophila				21	15	78
09020702004	Sialis				1		
09021113069	Promoresia				20	1	7
09021113	Elmidae				1		
09020206025	Tallaperla				3	20	2
03010101	Planariidae				1	1	4
09020611064	Lepidostoma				12	29	38
09020202014	Taeniopteryx				14	7	6
09020204020	Leuctra				7	3	26
09021012047	simulium				96	91	28
09020203	Capniidae				3	1	2
09020207	Perlodidae				21	4	11
09020207026	Isoperla				6	1	9
09021113064	Dubiraphia	A			3		1
08020202009	Nais				1		4
09021001002	Tipula					2	2
10020201	Sphaeriidae					5	
09020610062	Neophylax					1	
09020607023	Palaeagapetus					1	
09020608039	Oligostomis						1
09020301004012	Boyeria vinosa						1
09020604013	Parapsyche						1
08020101	Lumbriculidae					4	3
09021011041075	Eukiefferiella claripennis group				22	29	11
09021011065114	Tvetenia paucunca				13	6	9
09021011062	Thienemanniella				2	1	2
09021011041073	Eukiefferiella brehmi group				1		
09021011041083	Eukiefferiella devonica group				5		
09021011036	Corynoneura				5	1	1
09021011053	Parametriocnemus				1	1	1
09021011102181	Polypedilum aviceps					1	
09021011009	Larsia						3
09021011105	Stenochironomus						1
09021011078	Pseudochironomus						3
09020402015	Maccaffertium				3		6
09020402015051	Maccaffertium modestum				2	4	6
09020410035105	Ephemerella dorothea				6	2	1
09020410035	Ephemerella				49	19	32
09020406026	Paraleptophlebia				27	21	63
09020401	Baetidae				6	1	4
09021001005	Dicranota				2	1	5
09021016064	Neoplasta				1	1	2
09021001008	Hexatoma					3	2
09021001	Tipulidae					1	1
09020401007001	Acerpenna macdunnoughi					1	1
09021010043	Bezzia/Palpomyia					2	3
09021010037	Culicoides					1	
09030105001	Lebertia						2

Total Benthos	**392**	**303**	**444**
Total OTUs	**34**	**38**	**43**
Total spp.			

Tribes and Genus Groups included in Chironomidae 09021011 basket counts

Report to Stantec Inc. on the Benthic Macroinvertebrate Community Collected from Wards Brook in Fryeburg, Maine 2011.

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February 14, 2012

Introduction

Stantec, Inc. sampled the benthic macroinvertebrate community in Wards Brook in Fryeburg following Maine Department on Environmental Protection procedures. Three rock-bags were deployed on August 17, 2011 and were recovered on September 16, 2011.

Lotic, Inc. was retained by Stantec, Inc. to provide sample processing and organism identification, and to provide a water quality estimation using Lotic's macroinvertebrate model. The following report details the procedures that Lotic used for sample sorting, macroinvertebrate identification and water quality estimation.

Executive Summary

The sampling of benthic macroinvertebrates in all locations followed established MEDEP protocols. The collected organisms from the samples were enumerated, identified, and then evaluated using Lotic's water quality estimation model.

The results of the water quality determinations are as follows:

Wards Brook	Class A

Methods

Three rock bags were deployed in Wards Brook on August 17, 2011 and retrieved on September 16, 2011 by Stantec personnel. All three rock bags were collected and preserved with 70% ethyl alcohol (ETOH) in the field. Preserved samples were shipped to Lotic for sample sorting, organism identification and enumeration.

Each sample was poured into a standard 40-mesh sieve and rinsed. Large debris was removed after inspection for clinging organisms. If found they were removed and the debris discarded. Benthic organisms were sorted from fine sample debris and placed in a labeled vial containing 70% ETOH. Sample debris was discarded.

Organisms were then identified to the lowest practical taxonomic level with the aid of a stereo microscope. While every attempt was made to identify the organisms to species level, identifications could be impeded by the age of the organism (early instars may not have developed the characteristics used in the identification process), condition of organism (some organisms are damaged i.e. missing gills, cerci, or legs in the collecting/sorting process), or categorical (in many groups species are known from adults only, larval keys are either non-existent or incomplete). Organisms in the groups Chironomidae (midges) and Oligochaeta (worms) were slide mounted and identified using a compound microscope.

These data were then evaluated using Lotic's water quality estimation model.

Background

Lotic's macroinvertebrate model estimates water quality by comparing the resident biological community at a collection site to macroinvertebrate communities collected from a range of previously established water qualities (Class A, B, C, and NA). Identified community metrics are tabulated and compared to the baseline information. Estimations of water quality are made using weight of evidence from the comparative template. Based on years of evaluations, the agreement between Lotic's model and the MEDEP water quality evaluation model is greater than 90%. The comparative template and a detailed explanation of metrics are included in this report along with the macroinvertebrate data sheet.

Results

The results of the comparative evaluation suggest that the resident macroinvertebrate community at Wards Brook best represents a community residing in Class A waters. The comparative template category scores were Class A (8), Class B (5) and Class C (1). The high EPT richness, high Plecoptera richness, and low percent dominance lend weight to the Class A estimation.

Wards Stream, Fryeburg, Maine 2011

Site value	Community Parameter	WATER CLASS A	B	C	NA
	Plecoptera Richness				
	mean	2.5	1.9	0.3	0
6	mode	3	1	0	0
	range	1-4	1-4	0-1	0
		X			
	Taxa Ratio (E/T) · (P)				
	mean	2.7	1.7	0.3	0
5.25	range	0.5-8.0	0.4-3.7	0.0-1.0	0
		X			
	Indicator Taxa				
	mean	3.7	2.0	0.5	0
3, 8.8	range	1-7	0-4	0-1	0
	mean abundance when present	24.0	2.0	0.5	0
		X			
	EPT Richness				
	mean	16.8	19.5	10.3	3.2
21	range	13-24	11-27	7-13	0-11
		X	X		
	Total Richness				
	mean	36.8	47.3	26.8	17.6
50	range	20-48	25-63	20-33	4-27
			X		
	Dominance (% of sites)				
	Ephemeroptera, Plecoptera taxa	60%	0%	0%	0%
	Trichoptera taxa	35%	70%	50%	10%
Diptera, 5.3%					
	Diptera taxa	5%	20%	50%	40%
	Non-insect taxa	0%	10%	0%	50%
	Dominant organism greater than 45%	5%	20%	40%	90%
		X	X		

Photo 1. RB-1 Stream Sampling Station looking upstream.
Stantec Consulting. August 17, 2011.

Photo 2. RB-1 Stream Sampling Station looking downstream.
Stantec Consulting. August 17, 2011.

Photo 3. RB-1 Stream Sampling Station looking upstream. Stantec Consulting. September 16, 2011.

Photo 4. RB-1 Stream Sampling Station looking downstream. Stantec Consulting. September 16, 2011.

Appendix 3
Macroinvertebrate Community Comparison

Wards Brook Macroinvertebrate Comparison*

Order	Taxon	Tolerance Value**	2007			2009			2011		
			Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3	Rep 1	Rep 2	Rep 3
Amphipoda	Gammarus sp.		2	0	0	0	0	0	0	0	0
Coleoptera	Elmidae	4	0	0	0	3	0	0	0	0	0
Coleoptera	Dubiraphia		0	0	0	0	0	0	3	0	1
Coleoptera	Promoresia	2	0	4	16	38	12	1	20	1	7
Coleoptera	Promoresia (adult)		0	0	0	0	0	3	0	0	0
Coleoptera	Stenelmis	5	0	4	0	3	0	1	0	0	0
Diptera	Antocha	3	0	4	0	0	0	0	0	0	0
Diptera	Bezzia / Palpomyia	6	0	0	0	2	4	2	0	2	3
Diptera	Culicoides	6	0	0	0	0	0	0	0	1	0
Diptera	Dicranota	3	0	0	0	4	2	0	2	1	5
Diptera	Empididae	6	0	0	0	5	4	0	1	0	0
Diptera	Hemerodromia		2	0	4	0	0	0	0	0	0
Diptera	Hexatoma		0	0	0	2	4	1	0	3	2
Diptera	Neoplasta		0	0	0	0	0	0	1	1	2
Diptera	Oreogeton		0	4	0	0	0	0	0	0	0
Diptera	Simuliidae	6	0	0	0	68	139	2	0	0	0
Diptera	Simulium	5	14	40	64	212	395	11	96	91	28
Diptera	Tipulidae	6	0	0	0	0	0	0	0	1	1
Diptera	Tipula	6	0	0	0	2	2	0	0	2	2
Diptera (Chironomidae)	Brillia	5	4	0	0	0	0	0	0	0	0
Diptera (Chironomidae)	Cardiocladius	5	0	0	0	3	4	0	0	0	0
Diptera (Chironomidae)	Corynoneura	4	0	0	0	5	2	1	5	1	1
Diptera (Chironomidae)	Eukiefferiella	8	0	20	0	17	14	0	0	0	0
Diptera (Chironomidae)	Eukiefferiella claripennis group	8	0	0	0	0	0	0	22	29	11
Diptera (Chironomidae)	Eukiefferiella brehmi group	8	0	0	0	0	0	0	1	0	0
Diptera (Chironomidae)	Eukiefferiella devonica group	8	0	0	0	0	0	0	5	0	0
Diptera (Chironomidae)	Larsia	7	0	0	0	0	0	0	0	0	3
Diptera (Chironomidae)	Micropsectra	7	0	0	0	2	2	0	0	0	0
Diptera (Chironomidae)	Nanocladius	7	0	0	0	0	1	0	0	0	0
Diptera (Chironomidae)	Parametriocnemus	5	6	8	24	11	20	3	1	1	1
Diptera (Chironomidae)	Polypedilum aviceps	4	0	0	0	2	4	0	0	1	0
Diptera (Chironomidae)	Polypedilum fallax	6	0	4	16	0	0	0	0	0	0
Diptera (Chironomidae)	Polypedilum flavum		1	20	0	0	0	0	0	0	0
Diptera (Chironomidae)	Polypedilum illinoense group		0	0	0	0	0	1	0	0	0
Diptera (Chironomidae)	Polypedilum sp.	6	0	0	12	0	0	0	0	0	0
Diptera (Chironomidae)	Procladius	9	0	0	0	0	0	1	0	0	0
Diptera (Chironomidae)	Pseudochironomus	6	0	0	0	0	0	0	0	0	3
Diptera (Chironomidae)	Rheocricotopus robacki	5	4	0	0	9	13	0	0	0	0
Diptera (Chironomidae)	Rheotanytarsus	6	0	0	0	1	0	0	0	0	0
Diptera (Chironomidae)	Stenochironomus	5	0	0	0	0	0	1	0	0	1
Diptera (Chironomidae)	Tanypodinae		0	0	0	0	2	3	0	0	0
Diptera (Chironomidae)	Tanytarsus	6	8	16	28	0	0	0	0	0	0
Diptera (Chironomidae)	Thienemanniella	6	6	0	4	0	9	0	2	1	2
Diptera (Chironomidae)	Trissopelopia		0	4	0	0	0	0	0	0	0
Diptera (Chironomidae)	Tvetenia bavarica	4	4	0	8	0	0	0	0	0	0
Diptera (Chironomidae)	Tvetenia paucunca		0	0	0	44	59	2	13	6	9
Ephemeroptera	Acerpenna macdunnoughi	5	0	0	0	0	0	0	0	1	1
Ephemeroptera	Baetidae	4	0	0	0	3	9	0	6	1	4
Ephemeroptera	Baetis	6	6	0	4	0	0	0	0	0	0
Ephemeroptera	Ephemerella	1	0	0	0	40	27	1	49	19	63
Ephemeroptera	Ephemerella dorothea	1	0	0	0	0	0	0	6	2	1
Ephemeroptera	Maccaffertium	4	0	0	0	2	1	0	3	0	6
Ephemeroptera	Maccaffertium modestum	4	0	0	0	0	0	0	2	4	6
Ephemeroptera	Paraleptophlebia	1	8	44	24	99	57	2	27	21	63
Ephemeroptera	Serratella	2	6	32	12	0	0	0	0	0	0
Gordiodea	Gordius		0	0	0	1	1	0	0	0	0
Haplotaxida (Oligochaeta)	Lumbricidae	5	0	4	4	0	0	0	0	4	3
Haplotaxida (Oligochaeta)	Naididae		0	0	4	7	1	0	0	0	0
Haplotaxida (Oligochaeta)	Nais sp.	8	2	20	24	0	0	0	1	0	4
Haplotaxida (Oligochaeta)	Tubificidae (Naididae)	10	2	4	16	0	0	0	0	0	0
Megaloptera	Sialis sp.	4	0	4	4	0	0	0	1	0	0
Odonata	Boyeria vinosa	2	0	0	0	0	2	0	0	0	1
Plecoptera	Capniidae	2	0	0	0	0	0	0	3	1	2
Plecoptera	Isoperla	2	4	28	8	1	0	0	6	1	9
Plecoptera	Leuctra	0	6	4	0	21	15	0	7	3	26
Plecoptera	Peltoperla		0	0	12	0	0	0	0	0	0
Plecoptera	Perlodidae	2	0	0	0	7	16	2	21	4	11
Plecoptera	Plecoptera		0	0	0	0	5	0	0	0	0
Plecoptera	Tallaperla	0	2	8	0	12	26	6	3	20	2
Plecoptera	Taeniopteryx	2	0	0	0	0	0	0	14	7	6
Trichoptera	Cheumatopsyche	5	4	0	0	0	0	0	0	0	0
Trichoptera	Chimarra	4	0	0	0	1	1	0	0	0	0
Trichoptera	Diplectrona	5	6	12	20	7	5	0	9	9	31
Trichoptera	Dolophilodes	0	80	104	184	125	101	0	12	1	6
Trichoptera	Glossosoma	0	0	0	0	1	0	0	0	0	0
Trichoptera	Hydropsyche	4	0	0	0	3	6	3	5	4	12
Trichoptera	Hydropsyche betteni	6	2	0	0	0	0	0	0	0	0
Trichoptera	Hydropsyche sparna	6	0	4	0	0	0	0	0	0	0
Trichoptera	Hydropsychidae	4	0	0	0	2	11	1	11	7	12
Trichoptera	Lepidostoma	1	0	0	0	9	6	0	12	29	38
Trichoptera	Limnephilidae	4	0	4	0	0	0	0	0	0	0
Trichoptera	Neophylax		0	0	0	0	0	0	0	1	0
Trichoptera	Oligostomis		0	0	0	0	0	0	0	0	1
Trichoptera	Palaeagapetus		0	0	0	0	0	0	0	1	0
Trichoptera	Parapsyche	0	0	0	0	1	2	0	0	0	1
Trichoptera	Philopotamidae	3	0	0	0	6	7	0	0	0	0
Trichoptera	Ptilostomis	5	0	0	4	0	0	0	0	0	0
Trichoptera	Rhyacophila	1	2	16	0	0	0	0	21	15	78
Trichoptera	Rhyacophila carolina	1	0	0	0	32	8	0	0	0	0
Trichoptera	Rhyacophila fuscula	0	0	0	0	17	25	1	0	0	0
Trombidiformes	Lebertia		0	0	0	0	1	0	0	0	2
Turbellaria	Planariidae	6	0	0	0	4	1	1	1	1	4
Veneroida	Sphaeriidae	8	0	0	0	2	1	1	0	5	0

* 2007 data sampled by Normaneau Associates, Inc.; 2009 and 2011 data sampled by Stantec Consulting.

** Tolerance values obtained from Bode *et al.* 1996. Quality Assurance Work Plan for Biological Stream Monitoring in New York State. NYS Department of Environmental Conservation, Albany, NY. 89p.; Mandaville, S.M. 2002. Benthic Macroinvertebrates in Freshwaters- Taxa Tolerance Values, Metrics, and Protocols. Soil and Water Conservation Society of Metro Halifax, Nova Scotia, Canada