2007-2008 FORGE POND DRAWDOWN MONITORING REPORT

October 2008




SUBMITTED TO:

Littleton Conservation Commission

Westford Conservation Commission

SUBMITTED BY:

Lake Matawanakee Association *on behalf of*
Littleton Electric Light and Water Department

2007-2008 FORGE POND DRAWDOWN MONITORING REPORT

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1.0 INTRODUCTION

This report is submitted by the Lake Matawanakee Association (LMA) on behalf of the Littleton Electric Light and Water Department (LELWD) to document results of monitoring conducted prior to, during, and following the 2007-2008 Forge Pond lake level drawdown. The monitoring program described in this report was conducted in compliance with the Order of Conditions issued for the winter lake level drawdown by the Conservation Commissions of the Towns of Westford and Littleton.

2.0. WATER LEVEL MONITORING

The Order of Conditions requires for the water level of Forge Pond to be recorded every other day during the drawdown period (initiation through refilling). As required by the Natural Heritage and Endangered Species Program in their letter of November 17, 2006, the water level of Beaver Brook must also be monitored on both sides of Beaver Brook Road every other day during the drawdown period to help document the role of beaver on the water levels. As shown in Figure 1 and Table 1, the LMA recorded lake level measurements and Beaver Brook water level measurements on a daily basis during the drawdown period, which commenced on October 22, 2007 and ended on February 8, 2008.

Prior to the commencement of the 2007-2008 drawdown period, the LMA established readily identifiable and locatable benchmarks in order to conduct these measurements accurately. Benchmarks were located at the following sites:

Benchmark	Description
Forge Pond Dam	Angle iron bolted to concrete headwall on upstream (lake) side of sluiceway outlet.
Dock at 24 Deer Run Road, Littleton	Staff gage bolted to dock.
Beaver Brook culvert, upstream (BB UP)	Angle iron bolted to granite headwall on upstream side of culvert at Beaver Brook Road.
Beaver Brook culvert, downstream (BB DS)	Angle iron bolted to granite headwall on downstream side of culvert at Beaver Brook Road.

Note: Lake level measurements were taken from either at the Forge Pond dam, the staff gage at the 24 Deer Run Road dock, or both.

As shown in Figure 1 ands Table 1, the 2007-2008 drawdown commenced on October 22, 2007 and ended on February 8, 2008. The drawdown was terminated earlier than the permitted completion date of March 1st due to the unusually heavy rainfall that occurred during early February 2008. This rainfall had been preceded by previous periods of significant rainfall/snowmelt and periods of lake refill due to vandalism at the lake outlet sluicegate and temporary cessation of drawdown to allow for repair of private wells. The process of lake drawdown had also been impacted on two occasions when a beaver dam at the Beaver Brook Road inlet culvert was removed by the Town of Westford, resulting in rapid lake refill and a corresponding drop in the upstream water level of Beaver Brook. As a result, the lake level on February 8, 2008 was higher than at the start of the drawdown period. The LMA determined that it was unlikely to achieve any additional drawdown results in the three weeks that remained before the March 1st completion date, and therefore terminated drawdown activities for the 2007-2008 season. Figure 1 presents a timeline of the major events of the 2007-02008 drawdown and Table 1 presents the water level measurements taken during this period.

Figure 1: 2007-2008 Forge Pond Drawdown Timeline

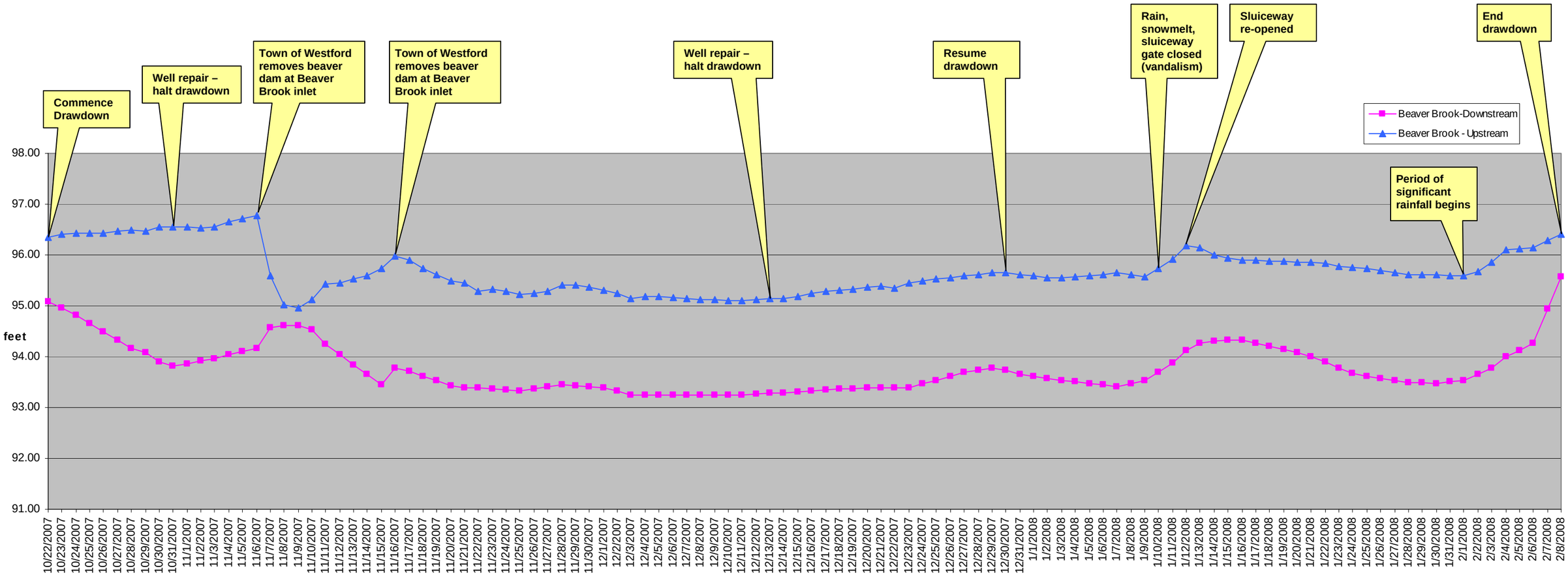

Table 1: 2007/2008 Forge Pond Drawdown - Water Level Log

Station	Elevation	Description (feet)
BM1	100.00	East edge of granite block (at chip in block) above the southernmost culvert on the upstream side.
BB UP	99.81	Angle iron bolted to granite headwall on upstream side of culvert
BB DS	99.70	Angle iron bolted to granite headwall on downstream side of culvert

			Lake Elevation*										Beaver Brook (Downstream)				Beaver Brook (Upstream)				
Date	Time	Hours Since Previous Measurement	Dock at 24 Deer Run Road (feet of water depth	Total Change (feet)	Change Since Previous Measurement (inches)	Change Since Previous Measurement (feet)	Dam Benchmark Measurement (inches)	Elevation Conversion (feet AMSL)	Total Change Since Start of Drawdown (feet)	Change Since Previous Measurement (inches)	Rate of Change (in/day)	48-hour Avg. Change	Benchmark Measurement (inches)	Change Since Previous Measurement (inches)	Total Change Since Start of Drawdown (feet)	Elevation Conversion* (feet)	Benchmark Measurement	Change Since Previous Measurement (inches)	Total Change Since Start of Drawdown (feet)	Elevation Conversion* (feet)	Upstream - Downstream Differential (feet)
10/22/07	7:40 AM						64.0	203.74	0.00				55.5		0.00	95.08	41.5		0.00	96.35	1.28
10/23/07	7:45 AM	24.08					64.5	203.70	-0.05	-0.50	-0.50		56.8	-1.30	-0.11	94.97	40.7	0.80	0.07	96.42	1.45
10/24/07	7:45 AM	24.00					66.5	203.53	-0.21	-2.00	-2.00	-1.25	58.5	-1.70	-0.25	94.83	40.5	0.20	0.09	96.44	1.61
10/25/07	7:45 AM	24.00					68.9	203.33	-0.41	-2.40	-2.40	-2.20	60.5	-2.00	-0.42	94.66	40.5	0.00	0.09	96.44	1.78
10/26/07	8:30 AM	24.75					71.1	203.15	-0.60	-2.20	-2.13	-2.27	62.5	-2.00	-0.59	94.49	40.5	0.00	0.09	96.44	1.94
10/27/07	7:45 AM	23.25					72.9	203.00	-0.75	-1.80	-1.86	-2.00	64.4	-1.90	-0.75	94.33	40.2	0.30	0.11	96.46	2.13
10/28/07	12:00 PM	28.25					74.2	202.89	-0.85	-1.30	-1.10	-1.48	66.5	-2.10	-0.92	94.16	39.8	0.40	0.14	96.49	2.34
10/29/07	11:00 AM	23.00					76.0	202.74	-1.00	-1.80	-1.88	-1.49	67.5	-1.00	-1.01	94.08	40.0	-0.20	0.13	96.48	2.40
10/30/07	5:30 PM	30.50					78.2	202.55	-1.19	-2.20	-1.73	-1.80	69.7	-2.20	-1.19	93.89	39.2	0.80	0.19	96.54	2.65
10/31/07	7:30 AM	14.00					79.0	202.49	-1.25	-0.80	-1.37	-1.55	70.5	-0.80	-1.26	93.83	39.2	0.00	0.19	96.54	2.72
11/1/07	7:35 AM	24.08					78.0	202.57	-1.17	1.00	1.00	-0.19	70.2	0.30	-1.23	93.85	39.2	0.00	0.19	96.54	2.69
11/2/07	7:45 AM	24.17					77.8	202.59	-1.15	0.20	0.20	0.60	69.5	0.70	-1.17	93.91	39.3	-0.05	0.19	96.54	2.63
11/3/07	2:00 PM	30.25					77.2	202.64	-1.10	0.60	0.48	0.34	69.0	0.50	-1.13	93.95	39.0	0.25	0.21	96.56	2.61
11/4/07	10:00 AM	20.00					76.4	202.70	-1.04	0.80	0.96	0.72	67.8	1.20	-1.03	94.05	37.9	1.10	0.30	96.65	2.60
11/5/07	7:40 AM	21.67					75.8	202.76	-0.98	0.65	0.72	0.84	67.3	0.55	-0.98	94.10	37.1	0.80	0.37	96.72	2.62
11/6/07	7:40 AM	24.00					75.0	202.82	-0.92	0.75	0.75	0.73	66.5	0.75	-0.92	94.16	36.5	0.60	0.42	96.77	2.61
11/7/07	7:40 AM	24.00					69.8	203.25	-0.49	5.20	5.20	2.98	61.5	5.00	-0.50	94.58	50.5	-14.00	-0.75	95.60	1.03
11/8/07	7:40 AM	24.00					69.0	203.32	-0.42	0.80	0.80	3.00	61.0	0.50	-0.46	94.62	57.5	-7.00	-1.33	95.02	0.40
11/9/07	6:30 AM	22.83					69.5	203.28	-0.46	-0.50	-0.53	0.14	61.0	0.00	-0.46	94.62	58.3	-0.80	-1.40	94.95	0.33
11/10/07	8:00 AM	25.50					70.3	203.21	-0.53	-0.80	-0.75	-0.64	62.0	-1.00	-0.55	94.53	56.3	2.00	-1.23	95.12	0.59
11/11/07	10:45 AM	26.75					73.7	202.93	-0.81	-3.40	-3.05	-1.90	65.5	-3.50	-0.84	94.24	52.6	3.70	-0.92	95.43	1.18
11/12/07	7:10 AM	20.42					76.5	202.70	-1.05	-2.80	-3.29	-3.17	68.0	-2.50	-1.05	94.03	52.4	0.20	-0.91	95.44	1.41
11/13/07	10:00 AM	26.83					79.5	202.45	-1.30	-3.00	-2.68	-2.99	70.3	-2.30	-1.24	93.84	51.3	1.10	-0.81	95.54	1.69
11/14/07	7:45 AM	21.75					81.5	202.28	-1.46	-2.00	-2.21	-2.45	72.5	-2.20	-1.42	93.66	50.6	0.70	-0.76	95.59	1.94
11/15/07	7:45 AM	24.00					89.5	201.61	-2.13	-8.00	-8.00	-5.10	75.0	-2.50	-1.63	93.45	48.8	1.80	-0.61	95.74	2.29
11/16/07	7:45 AM	24.00	0.88				88.2	201.72	-2.02	1.30	1.30	-3.35	71.0	4.00	-1.30	93.78	46.0	2.80	-0.37	95.98	2.19
11/17/07	9:10 AM	25.42	0.83	-0.05	-0.60	-0.05	89.0	201.65	-2.09	-0.80	-0.76	0.27	71.8	-0.80	-1.36	93.72	47.0	-1.00	-0.46	95.89	2.18
11/18/07	10:45 AM	25.58	0.81	-0.07	-0.24	-0.02	90.3	201.55	-2.20	-1.30	-1.22	-0.99	73.1	-1.30	-1.47	93.61	49.0	-2.00	-0.62	95.73	2.12
11/19/07	7:45 AM	21.00	0.70	-0.18	-1.32	-0.11	95.0	201.15	-2.59	-4.70	-5.37	-3.30	74.0	-0.90	-1.55	93.53	50.4	-1.40	-0.74	95.61	2.08
11/20/07	7:45 AM	24.00	0.58	-0.30	-1.44	-0.12	97.6	200.94	-2.80	-2.60	-2.60	-3.99	75.3	-1.30	-1.66	93.43	51.8	-1.40	-0.86	95.49	2.07
11/21/07	7:30 AM	23.75	0.46	-0.42	-1.44	-0.12	100.2	200.72	-3.02	-2.60	-2.63	-2.61	75.8	-0.50	-1.70	93.38	52.4	-0.60	-0.91	95.44	2.06
11/22/07	9:50 AM	26.33	0.38	-0.50	-0.96	-0.08	102.0	200.57	-3.17	-1.80	-1.64	-2.13	75.7	0.10	-1.69	93.39	54.3	-1.90	-1.07	95.29	1.89
11/23/07	11:00 AM	25.17	0.30	-0.58	-0.96	-0.08	103.3	200.46	-3.28	-1.30	-1.24	-1.44	76.0	-0.30	-1.71	93.37	53.7	0.60	-1.01	95.34	1.97
11/24/07	10:00 AM	23.00	0.24	-0.64	-0.72	-0.06	104.8	200.34	-3.40	-1.50	-1.57	-1.40	76.2	-0.20	-1.73	93.35	54.3	-0.60	-1.07	95.29	1.93
11/25/07	3:00 PM	29.00	0.17	-0.71	-0.84	-0.07	106.8	200.17	-3.57	-2.00	-1.66	-1.61	76.5	-0.30	-1.76	93.33	55.0	-0.70	-1.12	95.23	1.90
11/26/07	8:00 AM	17.00	0.17	-0.71	0.00	0.00	106.7	200.18	-3.56	0.10	0.14	-0.76	76.1	0.40	-1.72	93.36	54.7	0.30	-1.10	95.25	1.89
11/27/07	7:30 AM	23.50	0.18	-0.70	0.12	0.01	106.5	200.20	-3.55	0.20	0.20	0.17	75.5	0.60	-1.67	93.41	54.2	0.50	-1.06	95.29	1.89
11/28/07	7:45 AM	24.25	0.18	-0.70	0.00	0.00	106.5	200.20	-3.55	0.00	0.00	0.10	75.0	0.50	-1.63	93.45	52.7	1.50	-0.93	95.42	1.97
11/29/07	7:15 AM	23.50	0.18	-0.70	0.00	0.00	106.5	200.20	-3.55	0.00	0.00	0.00	75.2	-0.20	-1.65	93.43	52.9	-0.20	-0.95	95.40	1.97
11/30/07	7:00 AM	23.75	0.15	-0.73	-0.36	-0.03	106.8	200.17	-3.57	-0.30	-0.30	-0.15	75.5	-0.30	-1.67	93.41	53.3	-0.40	-0.98	95.37	1.96
12/1/07	11:00 AM	28.00	0.12	-0.76	-0.36	-0.03	107.0	200.15	-3.59	-0.20	-0.17	-0.24	75.8	-0.30	-1.70	93.38	54.0	-0.70	-1.04	95.31	1.93
12/2/07	9:00 AM	22.00	0.18	-0.70	0.72	0.06	106.5	200.20	-3.55	0.50	0.55	0.19	76.6	-0.80	-1.76	93.32	54.8	-0.80	-1.11	95.24	1.93
12/3/07	10:00 AM	25.00	0.25	-0.63	0.84	0.07	105.7	200.26	-3.48	0.80	0.77	0.66	77.5	-0.90	-1.84	93.24	56.0	-1.20	-1.21	95.14	1.90
12/4/07	7:45 AM	21.75	0.28	-0.60	0.36	0.03	105.3	200.30	-3.45	0.40	0.44	0.60	77.5	0.00	-1.84	93.24	55.5	0.50	-1.16	95.19	1.94
12/5/07	7:30 AM	23.75	0.30	-0.58	0.24	0.02	105.0	200.32	-3.42	0.30	0.30	0.37	77.5	0.00	-1.84	93.24	55.5	0.00	-1.16	95.19	1.94
12/6/07	10:00 AM	26.50	0.30	-0.58	0.00	0.00							77.5	0.00	-1.84	93.24	55.8	-0.25	-1.19	95.16	1.92
12/7/07	10:00 AM	24.00	0.30	-0.58	0.00	0.00							77.5	0.00	-1.84	93.24	56.0	-0.25	-1.21	95.14	1.90
12/8/07	9:00 AM	23.00	0.33	-0.55	0.36	0.03							77.5	0.00	-1.84	93.24	56.2	-0.20	-1.22	95.13	1.88
12/9/07	10:00 AM	25.00	0.34	-0.54	0.12	0.01							77.5	0.00	-1.84	93.24	56.2	0.00	-1.22	95.13	1.88
12/10/07	7:45 AM	21.75	0.36	-0.52	0.24	0.02							77.5	0.00	-1.84	93.24	56.5	-0.30	-1.25	95.10	1.86
12/11/07	7:45 AM	24.00	0.37	-0.51	0.12	0.01							77.4	0.15	-1.83	93.25	56.4	0.10	-1.24	95.11	1.86
12/12/07	7:45 AM	24.00	0.39	-0.49	0.24	0.02							77.2	0.15	-1.81	93.27	56.2	0.20	-1.22	95.13	1.86
12/13/07	7:30 AM	23.75	0.40	-0.48	0.12	0.01							77.0	0.20	-1.80	93.28	56.0	0.20	-1.21	95.14	1.86
12/14/07	7:40 AM	24.17	0.40	-0.48	0.00	0.00							77.0	0.00	-1.80	93.28	56.0	0.00	-1.21	95.14	1.86
12/15/07	10:00 AM	26.33	0.44	-0.44	0.48	0.04							76.8	0.20	-1.78	93.30	55.5	0.50	-1.16	95.19	1.89
12/16/07	11:30 AM	25.50	0.50	-0.38	0.72	0.06							76.5	0.30	-1.76	93.33	54.7	0.80	-1.10	95.25	1.93
12/17/07	7:45 AM	20.25	0.55	-0.33	0.60	0.05							76.3	0.20	-1.74	93.34	54.2	0.50	-1.06	95.29	1.95
12/18/07	7:45 AM	24.00	0.60	-0.28	0.60	0.05							76.0	0.30	-1.71	93.37	54.0	0.20	-1.04	95.31	1.94
12/19/07	7:40 AM	23.92	0.60	-0.28	0.00	0.00							76.0	0.00	-1.71	93.37	53.8	0.20	-1.02	95.33	1.96
12/20/07	7:40 AM	24.00	0.65	-0.23	0.60	0.05							75.8	0.20	-1.70	93.38	53.2	0.60	-0.97	95.38	1.99
12/21/07	7:45 AM	24.08	0.70	-0.18	0.60	0.05							75.8	0.00	-1.70	93.38	53.0	0.20	-0.96	95.39	2.01
12/22/07	10:30 AM	26.75	0.70	-0.18	0.00	0.00							75.7	0.10	-1.69	93.39	53.6	-0.60	-1.01	95.34	1.95
12/23/07	9:45 AM	23.25	0.70	-0.18	0.00	0.00							75.7	0.00	-1.69	93.39	52.3	1.30	-0.90	95.45	2.06
12/24/07	7:40 AM	21.92	0.80	-0.08	1.20	0.10							74.8	0.90	-1.61	93.47	51.9	0.40	-0.86	95.49	2.02
12/25/07	7:40 AM	24.00	0.88	0.00	0.96	0.08							74.0	0.80	-1.55	93.53	51.3	0.60	-0.81	95.54	2.00
12/26/07	7:45 AM	24.08	0.90	0.02	0.24	0.02							73.1	0.90	-1.47	93.61	51.0	0.30	-0.79	95.56	1.95
12/27/07	7:45 AM	24.00	0.95	0.07	0.60	0.05							72.0	1.10	-1.38	93.70	50.7	0.30	-0.76	95.59	1.89
12/28/07	7:40 AM	23.92	1.00	0.12	0.60	0.05							71.5	0.50	-1.34	93.74	50.4	0.30	-0.74	95.61	1.87
12/29/07	1:00 PM	29.33	1.10	0.22	1.20	0.10							71.0	0.50	-1.30	93.78	50.0	0.40	-0.71	95.64	1.86
12/30/07	10:00 AM	21.00	1.00	0.12	-1.20	-0.10							71.6	-0.60	-1.35	93.73	50.0	0.00	-0.71	95.64	1.91
12/31/07	7:45 AM	21.75	0.90	0.02	-1.20	-0.10							72.5	-0.90	-1.42	93.66	50.4	-0.40	-0.74	95.61	1.95
1/1/08	7:45 AM	24.00	0.84	-0.04	-0.72	-0.06							73.0	-0.50	-1.46	93.62	50.7	-0.30	-0.76	95.59	1.97
1/2/08	7:30 AM	23.75	0.73	-0.15	-1.32	-0.11							73.6	-0.60	-1.51	93.57	51.0	-0.30	-0.79	95.56	1.99
1/3/08	7:45 AM	24.25	0.65	-0.23	-0.96	-0.08							74.0	-0.40	-1.55	93.53	51.0	0.00	-0.79	95.56	2.03
1/4/08	7:45 AM	24.00	0.65	-0.23	0.00	0.00							74.3	-0.30	-1.57	93.51	50.8	0.20	-0.77	95.58	2.07
1/5/08	10:00 AM	26.25	0.60	-0.28	-0.60	-0.05							74.7	-0.40	-1.60	93.48	50.5	0.30	-0.75	95.60	2.13
1/6/08	9:30 AM	23.50	0.60	-0.28	0.00	0.00							75.1	-0.40	-1.64	93.44	50.3	0.20	-0.73	95.62	2.18
1/7/08	7:45 AM	22.25	0.57	-0.31	-0.36	-0.03							75.5	-0.40	-1.67	93.41	50.0	0.30	-0.71	95.64	2.24
1/8/08	7:45 AM	24.00	0.60	-0.28	0.36	0.03							74.8	0.70	-1.61	93.47	50.3	-0.30	-0.73	95.62	2.15
1/9/08	7:50 AM	24.08	0.63	-0.25	0.36	0.03							74.0	0.80	-1.55	93.53	50.8	-0.50	-0.77	95.58	2.04
1/10/08	7:45 AM	23.92	0.65	-0.23	0.24	0.02							72.0	2.00	-1.38	93.70	49.0	1.80	-0.62	95.73	2.03
1/11/08	7:45 AM	24.00	1.08	0.20	5.16	0.43							69.8	2.20	-1.20	93.88	46.7	2.30	-0.43	95.92	2.04
1/12/08	12:00 PM	28.25	1.59	0.71	6.12	0.51							67.0	2.80	-0.96	94.12	43.5	3.20	-0.16	96.19	2.07
1/13/08	11:00 AM	23.00	1.77	0.89	2.16	0.18	74.0	202.90	-0.84	-74.00	-77.22		65.2	1.80	-0.81	94.27	44.0	-0.50	-0.21	96.14	1.88
1/14/08	7:45 AM	20.75	1.85	0.97	0.96	0.08							64.8	0.40	-0.78	94.30	45.6	-1.60	-0.34	96.01	1.71
1/15/08	7:45 AM	24.00	1.90	1.02	0.60	0.05							64.6	0.20	-0.76	94.32	46.4	-0.80	-0.41	95.94	1.63
1/16/08	7:30 AM	23.75	1.93	1.05	0.36	0.03							64.5	0.10	-0.75	94.33	47.0	-0.60	-0.46	95.89	1.57
1/17/08	7:45 AM	24.25	1.86	0.98	-0.84	-0.07							65.2	-0.70	-0.81	94.27	47.0	0.00	-0.46	95.89	1.63
1/18/08	7:50 AM	24.08	1.80	0.92	-0.72	-0.06							65.9	-0.70	-0.87	94.21	47.2	-0.20	-0.47	95.88	1.67
1/19/08	9:20 AM	25.50	1.76	0.88	-0.48	-0.04							66.7	-0.80	-0.94	94.14	47.3	-0.10	-0.48	95.87	1.73
1/20/08	10:00 AM	24.67	1.72	0.84	-0.48	-0.04							67.5	-0.80	-1.01	94.08	47.5	-0.20	-0.50	95.85	1.78
1/21/08	8:00 AM	22.00	1.68	0.80	-0.48	-0.04							68.3	-0.80	-1.07	94.01	47.5	0.00	-0.50	95.85	1.84
1/22/08	7:45 AM	23.75	1.65	0.77	-0.36	-0.03							69.7	-1.40	-1.19	93.89	47.8	-0.30	-0.52	95.83	1.94
1/23/08	7:40 AM	23.92	1.62	0.74	-0.36	-0.03							71.0	-1.30	-1.30	93.78	48.3	-0.50	-0.56	95.79	2.00
1/24/08	7:45 AM	24.08	1.59	0.71	-0.36	-0.03							72.2	-1.20	-1.40	93.68	48.7	-0.40	-0.60	95.75	2.07
1/25/08	7:45 AM	24.00	1.55	0.67	-0.48	-0.04							73.0	-0.80	-1.46	93.62	49.0	-0.30	-0.62	95.73	2.11
1/26/08	9:10 AM	25.42	1.51	0.63	-0.48	-0.04							73.5	-0.50	-1.51	93.58	49.5	-0.50	-0.66	95.69	2.11
1/27/08	10:30 AM	25.33	1.47	0.59	-0.48	-0.04							74.0	-0.50	-1.55	93.53	49.9	-0.40	-0.70	95.65	2.12
1/28/08	7:45 AM	21.25	1.45	0.57	-0.24	-0.02							74.4	-0.40	-1.58	93.50	50.3	-0.40	-0.73	95.62	2.12
1/29/08	7:30 AM	23.75	1.42	0.54	-0.36	-0.03							74.5	-0.10	-1.59	93.49	50.3	0.00	-0.73	95.62	2.13
1/30/08	7:40 AM	24.17	1.38	0.50	-0.48	-0.04							74.7	-0.20	-1.60	93.48	50.4	-0.10	-0.74	95.61	2.13
1/31/08	7:45 AM	24.08	1.32	0.44	-0.72	-0.06							74.3	0.40	-1.57	93.51	50.5	-0.10	-0.75	95.60	2.09
2/1/08	7:45 AM	24.00	1.30	0.42	-0.24	-0.02							74.0	0.30	-1.55	93.53	50.5	0.00	-0.75	95.60	2.07
2/2/08	9:30 AM	25.75	1.35	0.47	0.60	0.05							72.5	1.50	-1.42	93.66	49.6	0.90	-0.67	95.68	2.02
2/3/08	11:30 AM	26.00	1.42	0.54	0.84	0.07							71.1	1.40	-1.30	93.78	47.4	2.20	-0.49	95.86	2.08
2/4/08	7:45 AM	20.25	1.55	0.67	1.56	0.13							68.5	2.60	-1.09	93.99	44.6	2.80	-0.26	96.09	2.10
2/5/08	7:50 AM	24.08	1.78	0.90	2.76	0.23							66.9	1.60	-0.95	94.13	44.3	0.30	-0.23	96.12	1.99
2/6/08	7:45 AM	23.92	2.05	1.17	3.24	0.27							65.1	1.80	-0.80	94.28	44.0	0.30	-0.21	96.14	1.87
2/7/08	7:40 AM	23.92	2.72	1.84	8.04	0.67							57.1	8.00	-0.14	94.94	42.4	1.60	-0.07	96.28	1.34
2/8/08	7:45 AM	24.08	3.35	2.47	7.56	0.63							49.5	7.60	0.50	95.58	40.7	1.70	0.07	96.42	0.84

Drawdown Timeline Notes:

1. Commence Drawdown on 10/22/07.
2. Drawdown halted temporarily on 10/31/2007 during period of repair to private well.
3. Town of Westford removes beaver dam at Beaver Brook Rd. culvert on 11/6/2007, resulting in rapid refill of lake and corresponding drop in water level of Beaver Brook wetlands
3. Town of Westford removes beaver dam at Beaver Brook Rd. culvert on 11/16/2007, resulting in brief period of rapid lake refilll and corresponding drop in water level of Beaver Brook wetlands
4. Drawdown halted on 12/13/2007 during period of repair to private well.
5. Drawdown resumed on 12/31/2007
6. Sluiceway at outlet closed by vandals on 1/10/2008 during period of hevy rain and snowmelt, resulting in period of rapid lake refill.
7. Sluiceway re-opened on 1/12/2008.
8. Period of significant rainfall begins on 2/1/2008.
9. On 2/8/2008, the 2007-2008 drawdown is ended due to heavy February rains, the resulting increase in lake water level and proximity to end of permitted drawdown period.

3.0 VEGETATION MONITORING

3.1 In-Lake Aquatic Vegetation Monitoring

On behalf of the LMA, Bob Hartzel of Littleton conducted aquatic vegetation monitoring at the 32 Forge Pond locations shown on Figure 2. Mr. Hartzel is a Certified Lake Manager (CLM) employed by Geosyntec Consultants in Acton, MA. Aquatic vegetation monitoring was conducted during the summer prior to the first year of drawdown on July 20, 2007. Monitoring was also conducted during the summer following the first drawdown on August 24, 2008.

Aquatic vegetation was sampled from a boat. Plant species were identified at the 32 sampling sites located throughout the lake. Plants were identified by visual inspection and by using an aquatic vegetation grappling hook to sample submerged vegetation. The dominant plant(s) at each station were recorded, as well as estimates of plant growth density and biomass.

As categorized in Table 2, plant growth density is an estimate of aerial coverage when looking down to the lake bottom from the water surface. Plant biomass is an estimate of the amount of plant matter within the water column. For example, a sampling station with dense growth of low-growing plants may have a high density estimate but a relatively low plant biomass estimate. A station with dense growth of a long, ropey plant (e.g. Fanwort or Eurasian milfoil), with stems reaching the water surface, would have both high plant density and high biomass estimates.

Table 2: Key to Aquatic Vegetation Biomass and Density Ratings

Rating	Density	Biomass
0	No plants observed	No plants observed
1	Sparse: 1-25% density	Scattered plant growth or primarily at lake bottom
2	Moderate: 26-50% density	Less abundant growth, or in less than half of the water column
3	Dense: 51-75% density	Substantial growth throughout majority of water column
4	Very Dense: 76-100% density	Abundant growth throughout water column to surface

A summary of the results of the 2007 and 2008 aquatic vegetation monitoring is provided below, followed by Tables 3 and 4 which show the results for each sampling station during the 2007 and 2008 surveys.

2007/2008 Aquatic Vegetation Monitoring Results

General Notes:

- Twenty-six macrophyte species were observed in Forge Pond during the July 20, 2007 survey. Twenty of these species were native plants and six were non-native.

- Twenty-eight macrophyte species were observed during the August 24, 2008 survey, which followed the first year of drawdown. Twenty-four of these species were native plants and four were non-native.

- In 2007, 17 (53%) sampling stations had either dense or very dense plant growth, while the remaining 15 (47%) stations had either sparse or moderate plant growth. In general,

plant growth was most dense in the shallow areas at the eastern end of the pond, the southwestern end of the pond, and the northwestern cove.

- The 2008 plant survey reported a slight decline in overall plant growth density. 15 (47%) of the sampling stations had either dense or very dense plant growth, while the remaining 17 (53%) stations had either sparse or moderate plant growth.

Non-native Species:

- **Fanwort** (*Cabomba caroliniana*) was by far the most abundant plant in Forge Pond during the July 20, 2007 survey. This non-native, invasive plant was present at 26 (81%) of the sampling stations and was a dominant plant at 14 (44%) of the sampling stations. Fanwort was generally most abundant in the western and southwestern portions of the lake.

  The 2008 survey noted a modest decline in both the distribution (22 stations, 69%) and dominance (10 stations, 31%) of Fanwort, although this plant maintained its status as the most dominant plant in Forge Pond.

Fanwort

- **Variable Milfoil** (*Myriophyllum heterophyllum*) was present at 13 (41%) of the sampling stations and was a dominant plant at 3 (9%) stations in 2007. Variable Milfoil was most abundant in the northwest portion of the lake.

  In 2008, Variable Milfoil was present at 11 (34%) of the sampling stations, but was not a dominant plant at any stations.

Variable milfoil

- In 2007, **Eurasian Milfoil** (*Myriophyllum spicatum*) was present at 9 (28%) of the sampling stations, but was not a dominant plant at any of the stations.

  In 2008, Eurasian Milfoil was present at 8 (25%) of the sampling stations and was a dominant plant at one station along the lake's northern shoreline.

Eurasian milfoil

- In 2007, a new infestation of non-native **Water Chestnut** (*Trapa natans*) was observed in the southwestern portion of the lake, near the Gilson Brook inlet (sampling stations 6 and 7). This plant has a "rosette" of floating leaves (see photo) that can densely mat the water surface. The spiny nut of this plant is also a safety hazard. If stepped on, it is hard and sharp enough to pierce foot bones. Once in a water body, this plant seeds prolifically and can spread very rapidly.

  Because this plant is an annual, it can be controlled by aggressive harvesting if an infestation is caught in its early stage. Over the course of the 2007 growing season, approximately sixty plants were removed by hand. A similar number of plants were removed during the summer of 2008 in the same general area (near sampling stations 6 and 7).

Water Chestnut

This plant infestation should be taken seriously. This plant tends to produce seeds in July, so an effort should be made each year to pull out any new plants that emerge before they propagate. Ongoing monitoring (annually at a minimum) will be required to prevent an infestation from getting out of control.


European Naiad

- **European Naiad** *(Najas minor)* was found in small quantities at two sampling stations in the northeastern part of the lake during the 2007 survey. This was the first confirmed observation of European Naiad in Forge Pond. European Naiad was not observed at any sampling stations during the 2008 survey.

  This invasive plant should be monitored closely. This plant tends to be relatively low-growing, but can form dense monoculture stands and outcompete beneficial native plant species.


Curlyleaf Pondweed

- **Curlyleaf Pondweed** (*Potamogeton crispus*) was observed in trace amounts at one sampling station in the southwestern portion of the lake. Curlyleaf Pondweed was not observed at any sampling stations during the 2008 survey. This plant tends to reach the peak of its growth in June.


Coontail

Native Species:

A summary of notable native species found in Forge Pond is as follows:

- **Coontail** (*Ceratophyllum demersum*) was among the most well distributed plants in Forge Pond during both the 2007 (24 stations, 75%) and 2008 surveys (25 stations, 78%). This plant was dominant at 3 stations in 2007 and 4 stations in 2008.


Wild celery

- **White Water Lily** *(Nymphaea odorata)* was found at more stations in 2007 (22 stations, 69%) than 2008 (19 stations, 59%). However, this plant increased in dominance from 3 stations to 7 stations during this period.

- **Wild Celery** (*Vallisneria americana*) was found at 21 stations (66%) in 2007 and 17 stations (53%) in 2008. This plant was dominant at 6 stations (19%) during each of the surveys, at locations scattered around the lake.


Robbin's Pondweed

- Two **Bladderwort species** were commonly found in Forge Pond during the 2007 and 2008 surveys. Common Bladderwort (*Utricularia vulgaris*) and Little Floating Bladderwort (*Utricularia radiata*) were typically present in the undercanopy in shallow areas with mucky sediments. These species were found at 25 stations (78%) in 2007 and 17 stations (53%) in 2008.

- **Robbins Pondweed** (*Potamogeton robbinsii*) was found at 15 stations (47%) in 2007 and 12 stations (38%) in 2008. This fern-like undercanopy species provides excellent forage and protective cover for fish.

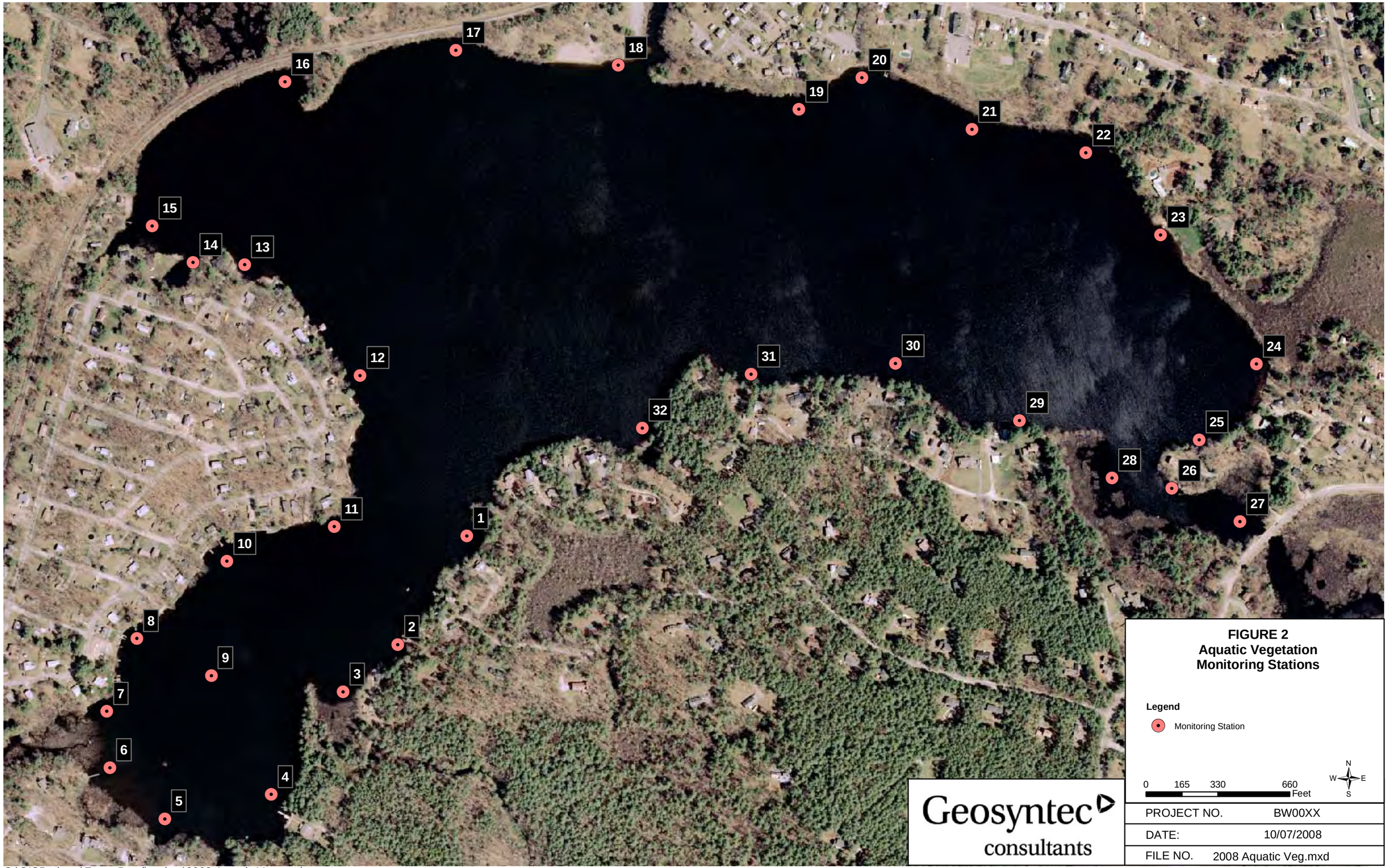

FIGURE 2
Aquatic Vegetation
Monitoring Stations

Legend

Monitoring Station

0 165 330 660 Feet

N W E S

Geosyntec consultants

PROJECT NO.	BW00XX
DATE:	10/07/2008
FILE NO.	2008 Aquatic Veg.mxd

Q:\GISProjects\Forge Pond\project\2008 Aquatic Veg.mxd

Table 3: 2007 Aquatic Vegetation Survey Tally Sheet

Location: Forge Pond (Westford/Littleton, MA)

Date: 7/20/07 **Surveyed by:** Bob Hartzel

● species present at monitoring station

● species dominant at monitoring station

Plant Species	# stations present (%)	# stations dominant (%)	Monitoring Locations																														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Fanwort *(Cabomba caroliniana)* *	26 (81%)	14 (44%)	●	●	●	●	●	●	●	●		●			●	●	●	●	●	●	●	●	●		●	●	●			●	●	●	●	●
Bladderwort(s) *(Utricularia vulgaris, U. radiata)*	25 (78%)	1 (3%)	●		●	●	●	●	●	●		●	●		●	●	●	●	●	●	●	●			●	●	●		●		●	●	●	●
Coontail (*Ceratophyllum demersum)*	24 (75%)	3 (9%)	●		●	●	●	●	●	●				●		●	●	●	●	●		●	●	●	●	●		●	●	●	●		●	●
White Water Lily *(Nymphaea odorata)*	22 (69%)	3 (9%)		●	●	●	●	●	●	●		●	●		●	●	●				●	●	●		●	●	●	●		●			●	●
Wild Celery *(Valisneria americana)*	21 (66%)	6 (19%)	●	●	●	●						●		●	●				●	●	●	●	●	●	●	●		●		●	●	●	●	●
Pickerelweed *(Pontederia cordata)*	16 (50%)	0		●	●	●	●		●	●					●	●	●	●	●					●	●	●	●		●				
Robbin's pondweed (*Potamogeton robbinsii*)	15 (47%)	5 (16%)	●	●	●	●								●	●	●	●	●	●	●	●	●	●				●							
Duckweed(s) *(Lemna minor, Spirodela polyrhiza)*	14 (44%)	0	●	●			●	●	●						●	●	●	●	●								●	●	●	●				
Variable milfoil *(Myriophyllum heterophyllum)* *	13 (41%)	3 (9%)							●								●	●	●		●		●	●	●		●				●	●	●	●
Yellow Water Lily *(Nuphar spp.)*	12 (38%)	2 (6%)					●						●		●	●	●	●	●									●		●	●		●	●
Eurasian milfoil *(Myriophyllum spicatum)* *	9 (28%)	0	●		●									●	●			●			●	●		●		●					●		●	
Water Willow *(Decodon verticillatus)*	7 (22%)	0					●	●	●						●	●	●	●																
Watermeal *(Wolffia sp.)*	6 (19%)	2 (6%)																●	●								●	●	●	●				
Watershield *(Brasenia shreberi)*	5 (16%)	0			●		●		●			●					●																
Arrow Arum *(Peltandra virginica)*	5 (16%)	0																●	●								●		●	●				
Waterweed (*Elodea nuttallii*)	4 (13%)	0												●											●	●			●					
Cattail, Narrow-leaved *(Typha angustifolia)*	4 (13%)	0																			●	●			●		●							
Musk grass *(Chara vulgaris)*	3 (9%)	0		●	●																					●								
Bushy pondweed *(Najas flexilis)*	3 (9%)	0																						●	●	●								
Water Chestnut (*Trapa natans*)*	2 (6%)	0						●	●																									
European Naiad *(Najas minor)* *	2 (6%)	0																						●		●								
Spike Rush *(Eleocharis robbinsii)*	2 (6%)	0																●	●															
Curly Leaf Pondweed *(Potamogeton crispus)* *	1 (3%)	0			●																													
Ribbonleaf Pondweed *(Potamogeton epihydrus var. epihydrus)*	1 (3%)	1 (3%)																								●								
White-stemmed pondweed *(Potamogeton praelongus)*	1 (3%)	0											●																					
Stonewort *(Nitella sp.)*	1 (3%)	0										●																						
Plant Density Rating			2	3	4	2	4	4	3	1	0	1	1	1	3	4	4	4	2	2	3	2	2	3	2	3	4	4	3	4	4	2	1	2
Plant Biomass Rating			2	1	4	2	3	4	3	1	0	1	1	1	3	4	4	4	2	2	2	2	2	3	2	3	4	3	2	3	3	2	1	1

* Listed as a non-native plant by the Massachusetts Biodiversity Initiative

Rating	Density	Biomass
1	Sparse: 0-25% density	Scattered plant growth; or primarily at lake bottom
2	Moderate: 26-50% density	Less abundant growth, or in less than half of the water column
3	Dense: 51-75% density	Substantial growth through majority of water column
4	Very Dense: 76-100% density	Abundant growth throughout water column to surface

Table 4: 2008 Aquatic Vegetation Survey Tally Sheet
Location: Forge Pond (Westford/Littleton, MA)
Date: 8/23/08 **Surveyed by:** Bob Hartzel

● species present at monitoring station
● species dominant at monitoring station

Plant Species	# stations present (%)	# stations dominant (%)	Monitoring Locations 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Coontail (*Ceratophyllum demersum*)	25 (78%)	4 (13%)	●	●	●	●	●	●	●	●	●	●		●			●	●	●	●		●		●	●	●	●	●	●	●	●		●	
Fanwort (*Cabomba caroliniana*) *	22 (69%)	10 (31%)	●	●	●	●	●	●	●	●		●	●	●		●	●	●	●	●	●	●		●		●	●				●			
White Water Lily (*Nymphaea odorata*)	19 (59%)	7 (22%)	●	●	●	●	●	●	●	●			●	●		●	●	●							●		●	●	●	●			●	
Bladderwort(s) (*Utricularia vulgaris, U. radiata*)	17 (53%)	1 (3%)	●	●		●	●	●		●				●		●	●	●				●					●	●	●	●	●		●	
Wild Celery (*Valisneria americana*)	17 (53%)	6 (19%)								●		●	●		●				●	●	●	●	●	●	●	●	●				●	●	●	●
Duckweed(s) (*Lemna minor, Spirodela polyrhiza*)	16 (50%)	0			●			●	●					●		●	●	●			●	●		●	●		●	●	●	●			●	
Robbin's pondweed (*Potamogeton robbinsii*)	12 (38%)	3 (9%)	●		●	●						●	●	●	●	●						●		●		●					●			
Variable milfoil (*Myriophyllum heterophyllum*) *	11 (34%)	0	●	●	●	●			●								●	●	●		●	●			●									
Yellow Water Lily (*Nuphar spp.*)	10 (31%)	4 (13%)		●	●	●		●	●			●	●	●				●												●				
Eurasian milfoil (*Myriophyllum spicatum*) *	8 (25%)	1 (3%)												●		●	●				●		●								●		●	●
Pickerelweed (*Pontederia cordata*)	8 (25%)	0			●		●		●									●									●	●	●	●				
Water Willow (*Decodon verticillatus*)	7 (22%)	0			●			●	●					●			●											●	●					
Watermeal (*Wolffia sp.*)	6 (19%)	1 (3%)																					●	●			●	●	●	●				
Ribbonleaf Pondweed (*Potamogeton epihydrus var. epihydrus*)	5 (16%)	1 (3%)												●	●					●		●			●									
Watershield (*Brasenia shreberi*)	5 (16%)	0			●		●									●		●											●					
Cattail, Narrow-leaved (*Typha angustifolia*)	4 (13%)	0																				●			●			●	●					
Bur-reed (*Sparganium sp.*)	4 (13%)	0												●									●	●						●				
Bushy pondweed (*Najas flexilis*)	3 (9%)	1 (3%)																		●			●	●										
Sago pondweed (*Potamogeton pectinatus*)	3 (9%)	0																										●	●	●				
Low Water Milfoil (*Myriophyllum humile*)	2 (6%)	1 (3%)																●																●
Thin-leaf pondweed (*Potamogeton pusillis*)	2 (6%)	0															●															●	
Arrow Arum (*Peltandra virginica*)	2 (6%)	0							●																			●						
Water Chestnut (*Trapa natans*) *	2 (6%)	0						●																						●				
Smartweed (*Polygonum sp.*)	2 (6%)	0						●		●																								
Waterweed (*Elodea nuttallii*)	1 (3%)	0												●																				
Musk grass (*Chara vulgaris*)	1 (3%)	0																						●										
Yellow-eyed Grass (*Xyris sp.*)	1 (3%)	0											●																					
Spike Rush (*Eleocharis robbinsii*)	1 (3%)	0												●																				
Plant Density Rating			3	2	3	3	3	4	4	1	1	2	1	3	1	3	4	4	2	2	1	3	1	1	2	4	4	4	2	4	2	1	2	2
Plant Biomass Rating			2	2	2	2	2	4	3	1	1	2	1	3	1	3	4	4	1	1	1	1	1	1	2	2	4	4	2	4	2	1	2	1

* Listed as a non-native plant by the Massachusetts Biodiversity Initiative

Rating	Density	Biomass
1	Sparse: 0-25% density	Scattered plant growth; or primarily at lake bottom
2	Moderate: 26-50% density	Less abundant growth, or in less than half of the water column
3	Dense: 51-75% density	Substantial growth through majority of water column
4	Very Dense: 76-100% density	Abundant growth throughout water column to surface

3.2 Wetland Monitoring

The LMA established three wetland vegetation monitoring plots in the following wetland areas associated with Forge Pond and Beaver Brook:

- **Wetland Plot #1:** Shrub wetland located off east end of Forge Pond, bordering Beaver Brook Road and Concord Road. Monitoring plot is located approximately 250 feet to the southeast of the Forge Pond shoreline.

- **Wetland Plot #2:** Extensive shrub wetland with some emergent wetland vegetation and areas of open water, located approximately 200 feet northeast of Beaver Brook and approximately 60 feet to the east of Beaver Brook Road (as measured from the speed limit sign across from 26 Beaver Brook Road).

- **Wetland Plot #3:** Emergent wetland east of Beaver Brook, north of wooden bridge to the west of Buckingham Drive and north of the power line right-of-way.

The monitoring areas listed above were field-located with a GPS unit and marked in the field with a wooden stake and pink flagging tape for future reference. Each monitoring plot is a circular area with a 20-foot radius measured from the wooden stake. Monitoring was conducted prior to the commencement of the 2007-2008 drawdown on September 25, 2007. Monitoring was also conducted on September 29, 2008. The goal of the wetland monitoring is to identify any significant changes in the plant community that may occur over time.

On the 2007 and 2008 monitoring dates, the plant communities and dominant species observed at each of the three wetland monitoring plots were essentially the same. As noted below, the water table was higher on the 2008 sampling date at each monitoring plot. A listing of common species observed at each monitoring plot is provided below, followed by representative photos of each monitoring plot:

Wetland Plot #1: On September 25, 2007 and September 29, 2008, the plant community of Wetland Monitoring Plot #1 was comprised predominantly of the following species:

Plant Species	Notes
Cattail (*Typha latifolia*)	Abundant
Purple Loosestrife (*Lythrum salicaria)*	Abundant
Sensitive Fern *(Onoclea sensibilis)*	Common
Button Bush (*Cephalanthus occidentalis*)	Common
Sweet Gale (*Myrica gale*)	Common
Bittersweet Nightshade (*Solanum dulcamara)*	Scattered
Arrow Arum (*Peltandra virginica*)	Scattered
Red maple (*Acer rubrum*)	One 1.5" diameter red maple within monitoring plot;
Notes: 1. Soil saturated at monitoring plot on 09/25/2007 2. 6" of standing water at monitoring plot on 09/29/2008	

Wetland Plot #2: On September 25, 2007 and September 29, 2008, the plant community of Wetland Monitoring Plot #2 was comprised predominantly of the following species:

Plant Species	Notes
Cattail (*Typha latifolia*)	Dominant, covers approximately 70% of monitoring plot
Purple Loosestrife (*Lythrum salicaria)*	Common
Bittersweet Nightshade (*Solanum dulcamara)*	Common
Sensitive Fern *(Onoclea sensibilis)*	Common
Jewelweed (*Impatiens canadensis*)	Scattered
Japanese Knotweed *(Polygonum cuspidatum)*	Dominant at margin of upland area at southern edge of monitoring plot

Wetland Plot #3: On September 25, 2007 and September 29, 2008, the plant community of Wetland Monitoring Plot #3 was comprised predominantly of the following species:

Plant Species	Notes
Red maple (*Acer rubrum*)	Abundant; dominant canopy species
Arrow Arum (*Peltandra virginica*)	Abundant
Sweet Pepperbush *(Clethra alnifolia)*	Abundant; dominant undercanopy shrub
Button Bush (*Cephalanthus occidentalis*)	Common
Sweet Gale (*Myrica gale*)	Common
Sphagnum Moss, Bog Moss	Common
Highbush Blueberry *(Vaccinium corymbosum)*	Scattered
Common Winterberry *(Ilex verticillata)*	Scattered
Notes: 1. Soil saturated at monitoring plot on 09/25/2007 2. 3"-7" of standing water at monitoring plot on 09/29/2008	

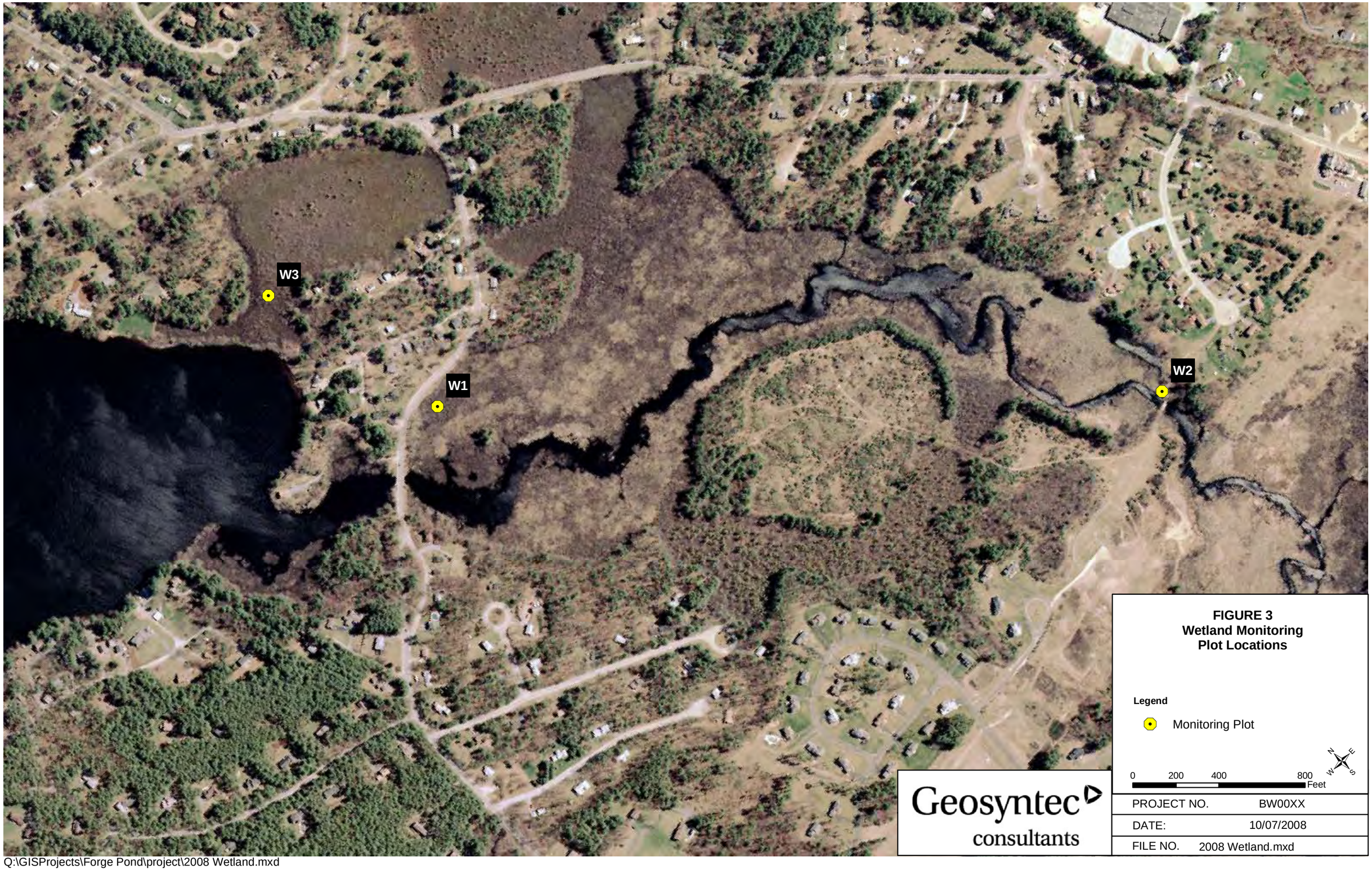

FIGURE 3
Wetland Monitoring
Plot Locations

Legend

Monitoring Plot

0 200 400 800 Feet

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PROJECT NO.	BW00XX
DATE:	10/07/2008
FILE NO.	2008 Wetland.mxd

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Representative Wetland Monitoring Plot Photos, 09/25/2007
Wetland Monitoring Plot #1

Cattails(*Typha latifolia*) and Sensitive Fern (*Onoclea sensibilis*) growing near the center stake of Monitoring Plot #1 on 09/25/2007.

View north towards Monitoring Plot #1 on 09/25/2007 (pink flagging on center stake visible in bottom center of photo).

Representative Wetland Monitoring Plot Photos, 09/25/2007
Wetland Monitoring Plot #2

Wetland Monitoring Plot #2 on 09/25/2007. A majority of the monitoring plot is heavily dominated by Cattails.

Cattails and Jewelweed (*Impatiens canadensis*) growing in Monitoring Plot #2 on 09/25/2007.

Representative Wetland Monitoring Plot Photos, 09/25/2007
Wetland Monitoring Plot #3

Arrow Arum (*Peltandra virginica*) and mosses growing in the vicinity of Monitoring Plot #3 center stake on 09/25/2007.

Sweet Gale (*Myrica gale*) was a common understory shrub within Monitoring Plot #3 on 09/25/2007.

Representative Wetland Monitoring Plot Photos, 09/29/2008
Wetland Monitoring Plot #1

View towards Wetland Monitoring Plot #1 on 09/29/2008.

Sensitive Fern (left photo) and Buttonbush (right photo) in Wetland Monitoring Plot #1 on 09/29/2008

Representative Wetland Monitoring Plot Photos, 09/29/2008
Wetland Monitoring Plot #2

View towards Wetland Monitoring Plot #2 on 09/29/2008 from wooden bridge just west of Buckingham Road.

Wetland Monitoring Plot #2 on 09/29/2008. A majority of the monitoring plot is heavily dominated by Cattails (*Typha latifolia*).

Representative Wetland Monitoring Plot Photos, 09/29/2008
Wetland Monitoring Plot #3

Sweet Pepperbush and Sweet Gale in Wetland Monitoring Plot #3 on 09/29/2008.

Common Winterberry (left photo), Sphagnum Moss and Arrow Arum (right photo) in Wetland Monitoring Plot #3 on 09/29/2008.

4.0 WATER QUALITY MONITORING

The LMA conducted water quality monitoring as follows:

- Sampling was conducted during the 2007-2008 drawdown period on 01/15/08. The inlets and outlet of the pond were sampled for Total Phosphorous, Nitrate Nitrogen and Ammonia Nitrogen.
- To represent the lake in its normal capacity (non-drawdown) condition, the inlets and outlet of the pond were sampled on 10/2/08 for Total Phosphorous, Nitrate Nitrogen and Ammonia Nitrogen.

All samples were submitted to Thorstensen Laboratory in Westford, MA for constituent analysis. Results of the water quality monitoring are listed below in Tables 5 and 6:

Table 5: Water Quality Monitoring Results, 01/15/2008

Sampling Location	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)
Gilson Brook (inlet)	0.02	0.10	0.06
Beaver Brook (inlet)	0.03	0.37	0.08
Stoney Brook (outlet)	0.02	0.27	0.04

Table 6: Water Quality Monitoring Results, 10/02/2008

Sampling Location	Total Phosphorus (mg/L)	Nitrate Nitrogen (mg/L)	Ammonia Nitrogen (mg/L)
Gilson Brook (inlet)	0.02	0.07	0.06
Beaver Brook (inlet)	0.02	0.02	<0.03
Stoney Brook (outlet)	0.02	0.04	<0.03

5.0 BIOLOGICAL MONITORING

5.1 Freshwater Mussels

The LMA established five mussel monitoring transects along the perimeter of Forge Pond, as shown in Figure 4. Each of the transects are 30 meters in length, are located at a water depth of approximately 2 feet, and run parallel to the shoreline in the direction noted below. The location of the beginning points of the five transects were field-located with a GPS unit and also located by reference to a specific permanent nearby feature along the shore, as follows:

Transect #1: Transect starts at the southern end of the Woodlands Association beach, approximately 12-15 feet from the shoreline, and extends 30 meters to the northeast.

Transect #2: Transect starts at the tip of the point of land shown on Figure 4 and extends 30 meters to the north.

Transect #3: Transect starts at western edge of gravel access path located approximately 200 feet to the west of the Westford Town Beach and extends for 30 meters from to west.

Transect #4: Transect starts at concrete footing (footing has inscription 10/13/68) located approximately 800 feet to the east of the beginning of the lake outlet channel. The transect extends 30 meters to the west of the concrete footing.

Transect #5: Transect starts in line with the northern side of the tan house located at eastern tip of the lake. Transect extends 30 meters to the north.

The number of mussels within each transect was counted by genera. Over the 30 meter transect, a clam rake was used collect mussels to a depth of 10cm over a 0.5 meter wide swath.

Clam rake used for mussel surveys

During both the 2007 (08/18/2007) and 2008 (08/23/2008) mussel surveys, all of the mussel specimens collected were determined to be Eastern Elliptio (*Elliptio complanata*). This is not unusual for inland Massachusetts lakes, as the Eastern Elliptio is by far the most abundant and widespread mussel in Massachusetts and in northeastern North America.

As shown in the table below, the number of Eastern Elliptio collected from the five monitoring transects declined significantly from 2007 (183 specimens) to 2008 (48 specimens).

Table 7: 2007 and 2008 Mussel Sampling Results

	8/18/2007 Results	8/23/2008 Results
Mussel Transect #	**# Eastern Elliptio** *(Elliptio complanata)*	**# Eastern Elliptio** *(Elliptio complanata)*
1	**17**	**7**
2	**16**	**4**
3	**38**	**10**
4	**22**	**19**
5	**90**	**8**
Total	**183**	**48**

5.2 Other Invertebrates

The LMA performed monitoring to assess the presence of macroinvertebrates at the 15 monitoring locations shown on Figure 4. Monitoring was conducted by using a kick net to conduct the following:

- 15-20 sweeps through both vegetated and unvegetated areas, at both the pond surface and along the surface of the pond bottom;

- 15-20 kick samples into the bottom sediments.

Results of the monitoring conducted on August 20, 2007 and August 25, 2008 are provided below in Tables 8 and 9. The total number of macroinvertebrate specimens increased by 32% from 2007 (366 specimens) to 2008 (484 specimens).

Table 8:
Macroinvertebrate Monitoring Results, 08/20/2007

	Macroinvertebrate Monitoring Stations															
Order	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Total**
Amphipoda (scuds)	5	2		4	10	4	3	1	5	10	6	7	12	5	9	**83**
Coleoptera (beetles)	30		8	4								3	2			**47**
Ephemeroptera (mayflies)			8		5		10		5		9	5	2		3	**47**
Diptera (two-winged or true flies)			8				7	4			6	3	4	4	2	**38**
Odonata (dragonflies, damselflies)		1	2	2			3		2	7	1	2	2	3	3	**28**
Oligochaeta (aquatic worms)	3		10	4			4						3			**24**
Isopoda (sowbugs)	7		1	2		2			2	3					2	**19**
Tricoptera (caddisflies)		8	2				2	1				2	1		2	**18**
Basommatophora (freshwater snails)					6	1		3		2	4		1			**17**
Hydracarina (water mites)	8			6												**14**
Hirudinea (leeches)	2	4	3											2	1	**12**
Plecoptera (stoneflies)		12														**12**
Hemiptera (true bugs)	3	2						1		1						**7**
															Total:	**366**

Table 9:
Macroinvertebrate Monitoring Results, 08/25/2008

	Macroinvertebrate Monitoring Stations															
Order	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**Total**
Amphipoda (scuds)	7	5		14	12	17	4	5	5	13	3	22	16	8	15	**146**
Diptera (two-winged or true flies)	5	6	6	7	8		6	9	6		5		3	5	18	**84**
Ephemeroptera (mayflies)	3	5	5	8	4		12	3	3	4	8	9	7	2	8	**81**
Odonata (dragonflies, damselflies)	4	4	3	6	1	3	2	3	2	3			2	1	1	**35**
Isopoda (sowbugs)			5	1			4	2		7		7	4	2		**32**
Plecoptera (stoneflies)	3	4	3	6						2		4			2	**24**
Oligochaeta (aquatic worms)			14	2		2	1									**19**
Basommatophora (freshwater snails)	12			3									3			**18**
Hirudinea (leeches)	3	2	1			1		1		2	4			1		**15**
Coleoptera (beetles)	2	3		3				2					1		1	**12**
Turbellaria (flatworms)				4	1		1	2			1					**9**
Megaloptera (alderflies, dobsonflies)			4													**4**
Unionoida (freshwater mussels)							3									**3**
Tricoptera (caddisflies)															2	**2**
															Total:	**484**

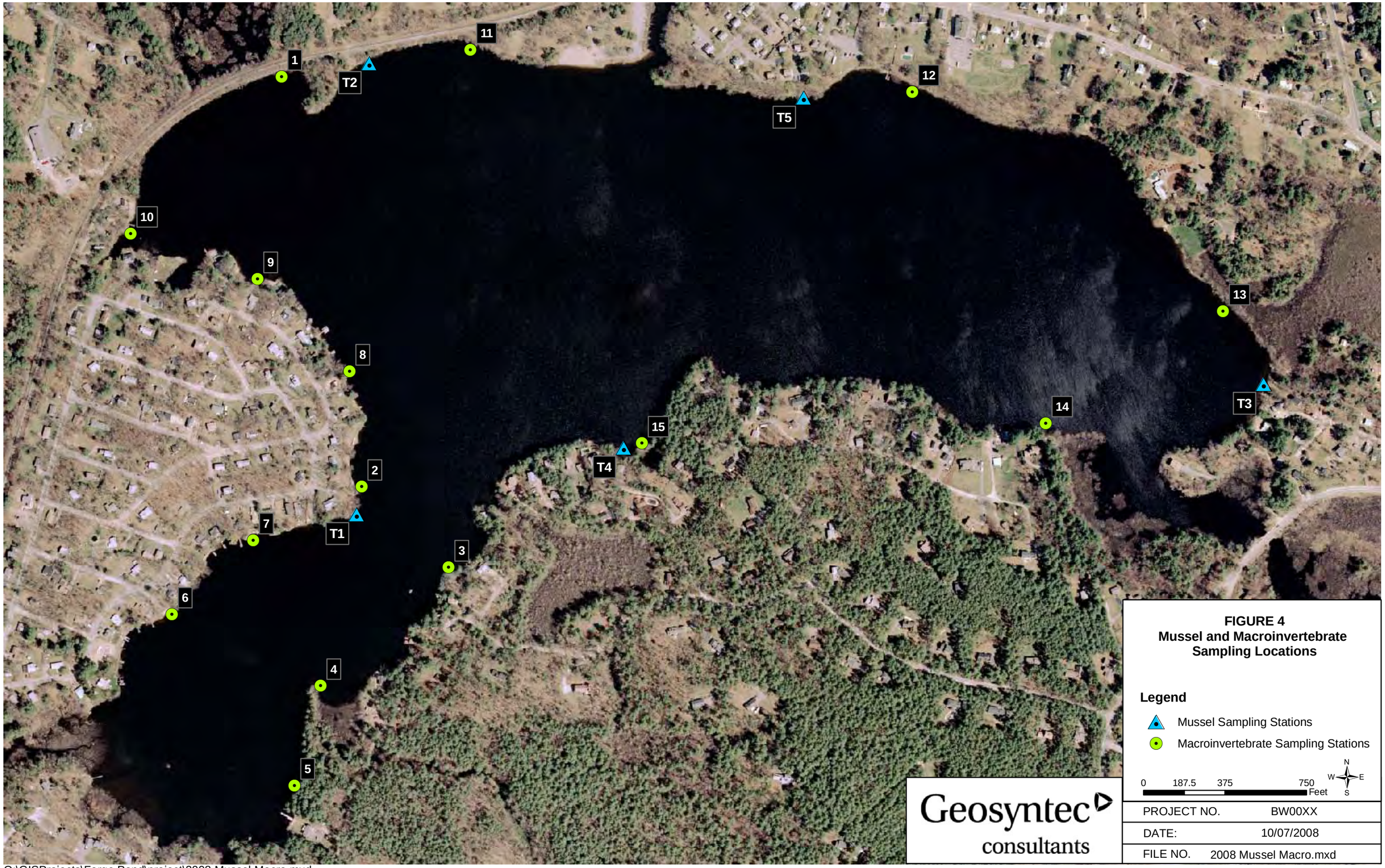

FIGURE 4
Mussel and Macroinvertebrate Sampling Locations

Legend

- Mussel Sampling Stations
- Macroinvertebrate Sampling Stations

0 187.5 375 750 Feet

N W E S

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PROJECT NO.	BW00XX
DATE:	10/07/2008
FILE NO.	2008 Mussel Macro.mxd

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