



Sheepscoot Valley Conservation Association Water Quality Monitoring Program 2010 Season

By David Miller, WQM Technical Advisor

EXECUTIVE SUMMARY

This report is a summary of the 17th sampling season of the Sheepscoot Valley Conservation Association's Water Quality Monitoring Program. This year SVCA monitored the same 9 sites as last year. The sites sampled were:

DY001-E (Dyer River, Sheepscoot)
S007-E (Sheepscoot River, Head Tide)
CHABK001-F (Chamberlain Brook, Kings Mills)
S013-F (Sheepscoot River, Whitefield)
CHBK001-F (Choate Brook, Windsor)
MEBK001-F (Meadow Brook, China)
WB001-F (West Branch, Whitefield)
WB002-F (West Branch, Windsor)
WB005-F (West Branch, China)

Water samples were tested for bacteria and dissolved oxygen. Water temperature at all sites and salinity at one estuarine site were measured. The data continues to be used by the MDEP for water quality assessment.

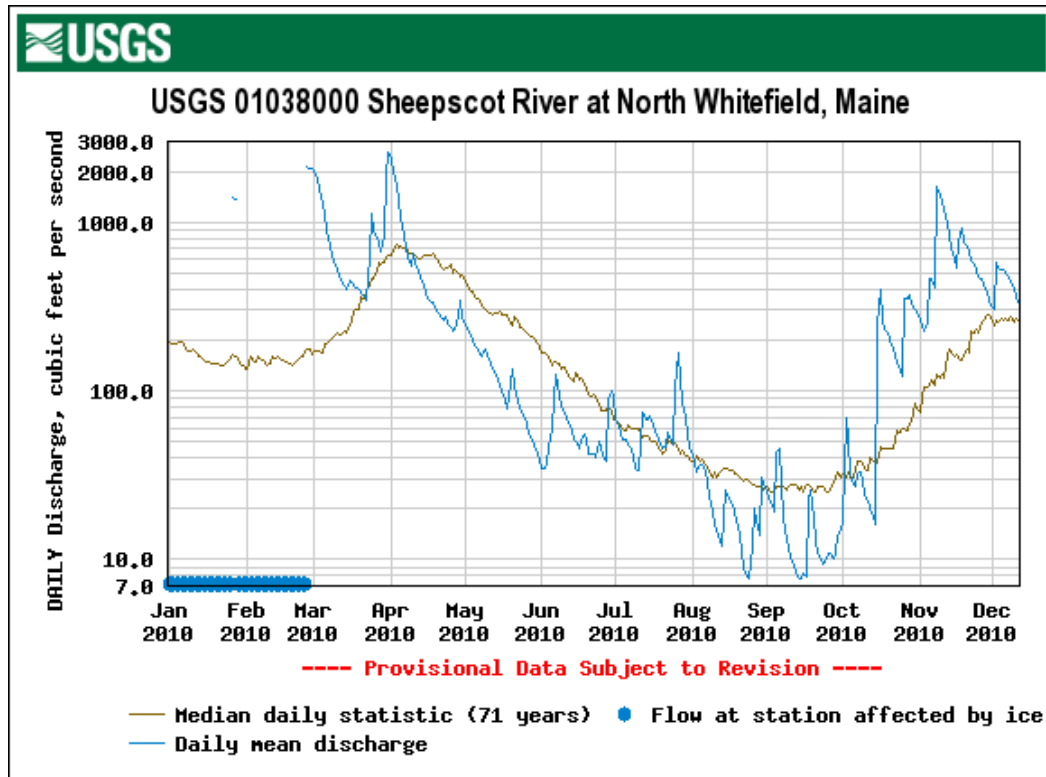
In addition to the standard testing, SVCA received funding from the DEP's 319 grant program to do an in depth survey of the Dyer River. The survey was intended to document current conditions in the watershed of this major tributary of the Sheepscoot, from the confluence with the Sheepscoot north through the head of tide to the base of Dyer Long Pond. The SVCA worked in partnership with the Sheepscoot River Watershed Council and their coordinator, Charlie Baeder, was the primary field person for the project. The survey team recorded conditions that describe the stream and its environs, such as the presence of obstructions to fish passage such as ledges or culverts, the type of substrate and flow conditions, among many other items. In addition, bacteria and dissolved oxygen were recorded. Bacteria samples were taken along the entire 9-mile length of stream during dry and wet conditions to assess the water quality through the length of the stream under identical conditions. While the survey is not yet complete, the survey did turn up several nonpoint sources of pollution as well as several point sources. Next steps are to complete the report, present it to the towns involved and approach the landowners to provide help to remediate the pollution issues identified.

Weather

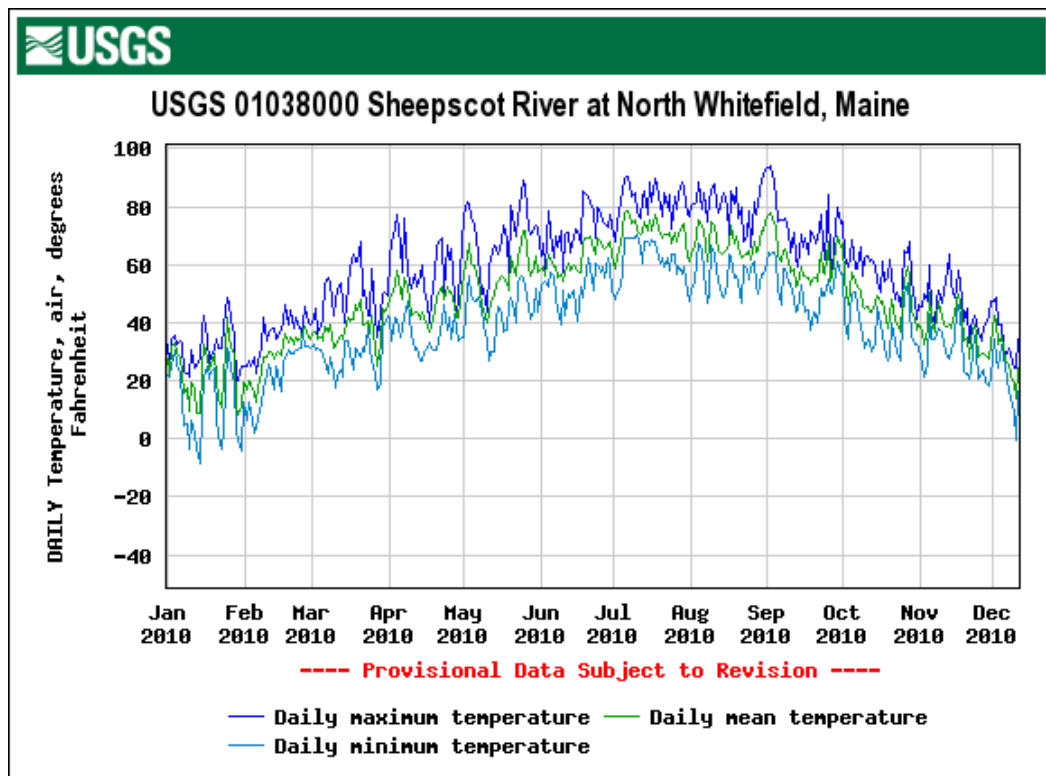
The year 2010 had above normal temperatures every month. According to the National Weather Service's Portland reporting station, 2010 was the warmest year on record (70 years of record). The average temperature was 49.2 F, breaking the old record of 48.5 F (2006). Records were also set for warmest spring and warmest summer.

Precipitation for the year at Portland was over 6.5 inches above normal. Portland set a record for March with 11.24 inches of precipitation. There were notable rain events on July 14 and August 25.

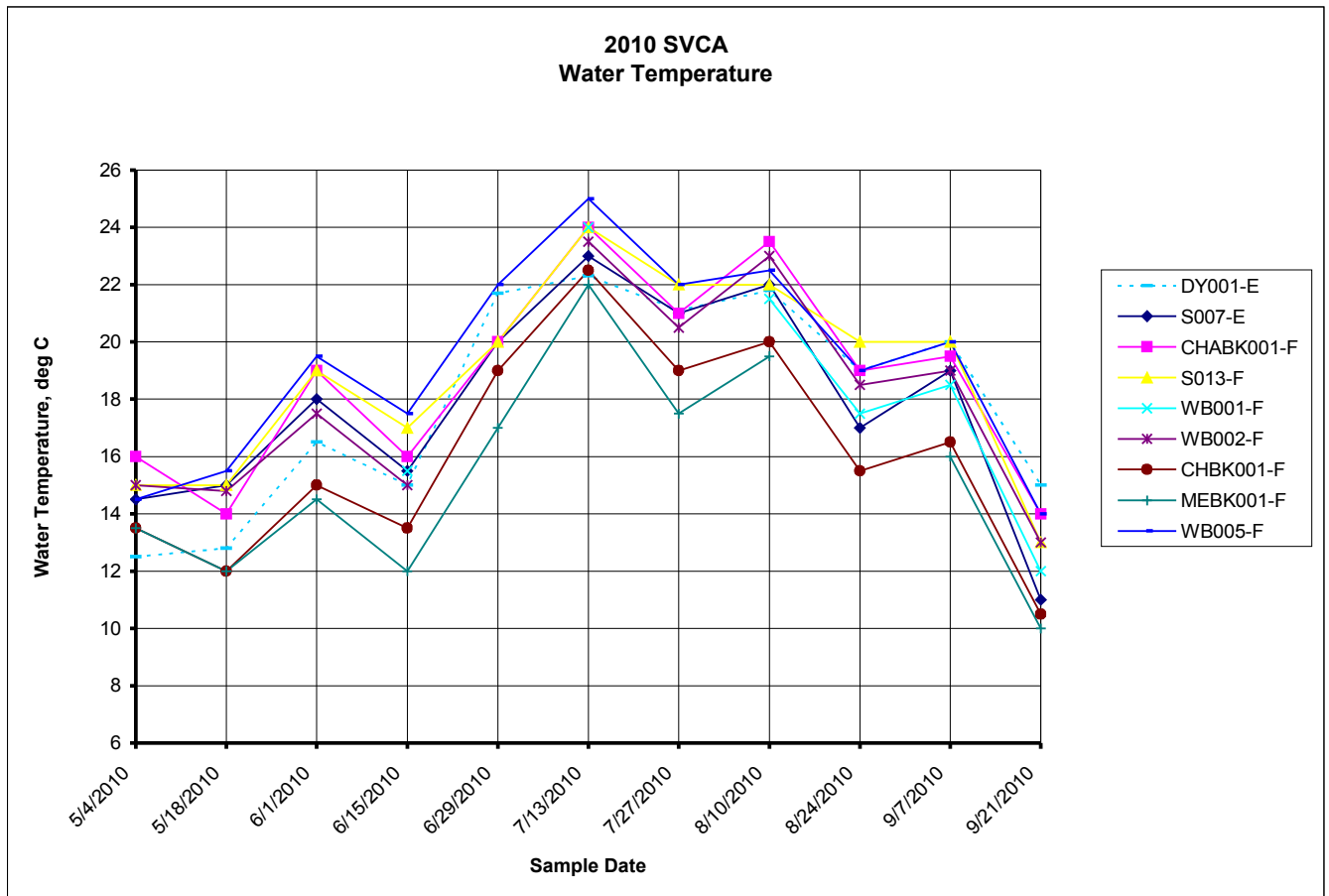
River flow data at the USGS gage station on the Sheepscot River at Whitefield is shown in Graph #1 and air temperature in Graph #2. In general, river flow was at or below median daily flow (71 years of record) during the SVCA sampling season. The water temperatures recorded at the SVCA sampling sites are shown in Graph #3. Peak water temperatures were reached during mid July.



Graph #1: Mean 2010 discharge at the Whitefield Gage station near site S013



Graph #2: Recorded 2010 daily air temperature (in degrees F) at Whitefield gage station near site S013

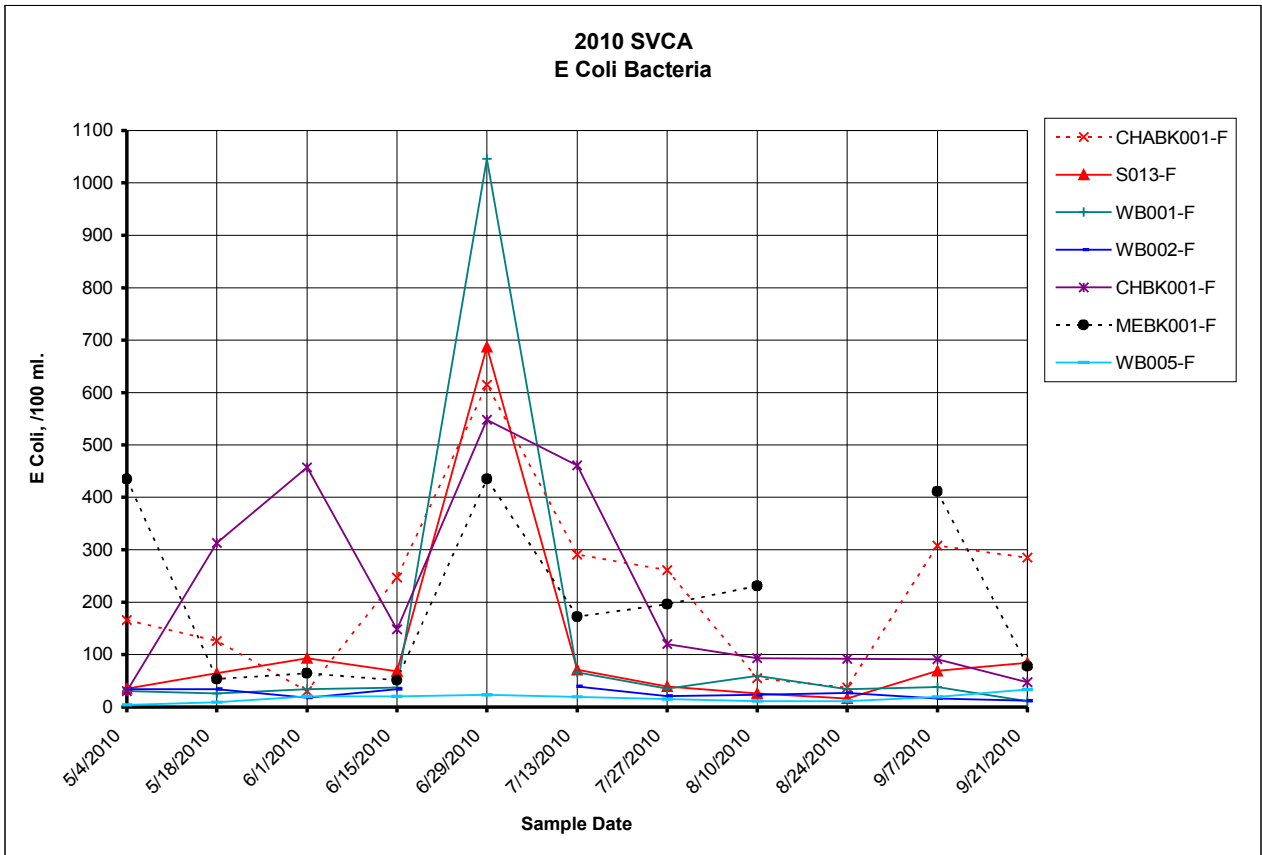


Graph #3: 2010 Summer Water temperature (in degrees Celsius) at SVCA Sample Sites

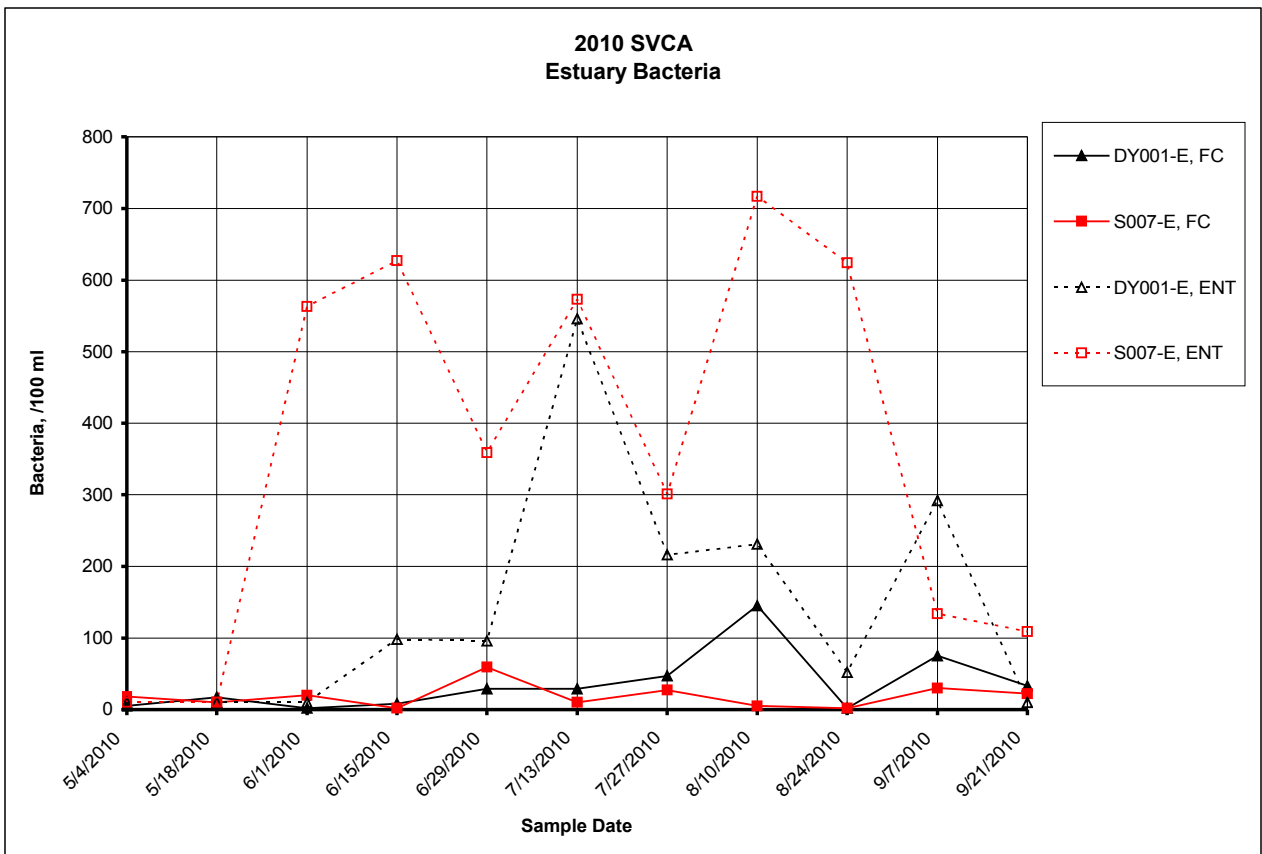
Water Quality Overview

Bacteria

The SVCA bacteria data are presented in the following two graphs. E. coli was sampled at freshwater sites while Enterococcus and Fecal Coliform were sampled at estuary sites. There was a large spike for E. Coli at 5 sites on June 29 (rain for two days prior to this sampling event) and a spike for Enterococcus at DY001 on July 13 (rain on weekend prior to this sampling event). E. Coli bacteria was elevated for much of the summer at sites CHBK001, MEBK001 and CHABK001. Enterococcus levels remained high at S007 for most of the summer. Only two sites (WB002 and WB005) showed attainment of bacteria standards throughout the season. Non-attainment events for bacteria standards for each site are summarized in the 1994-2010 summary tables at the end of this report.



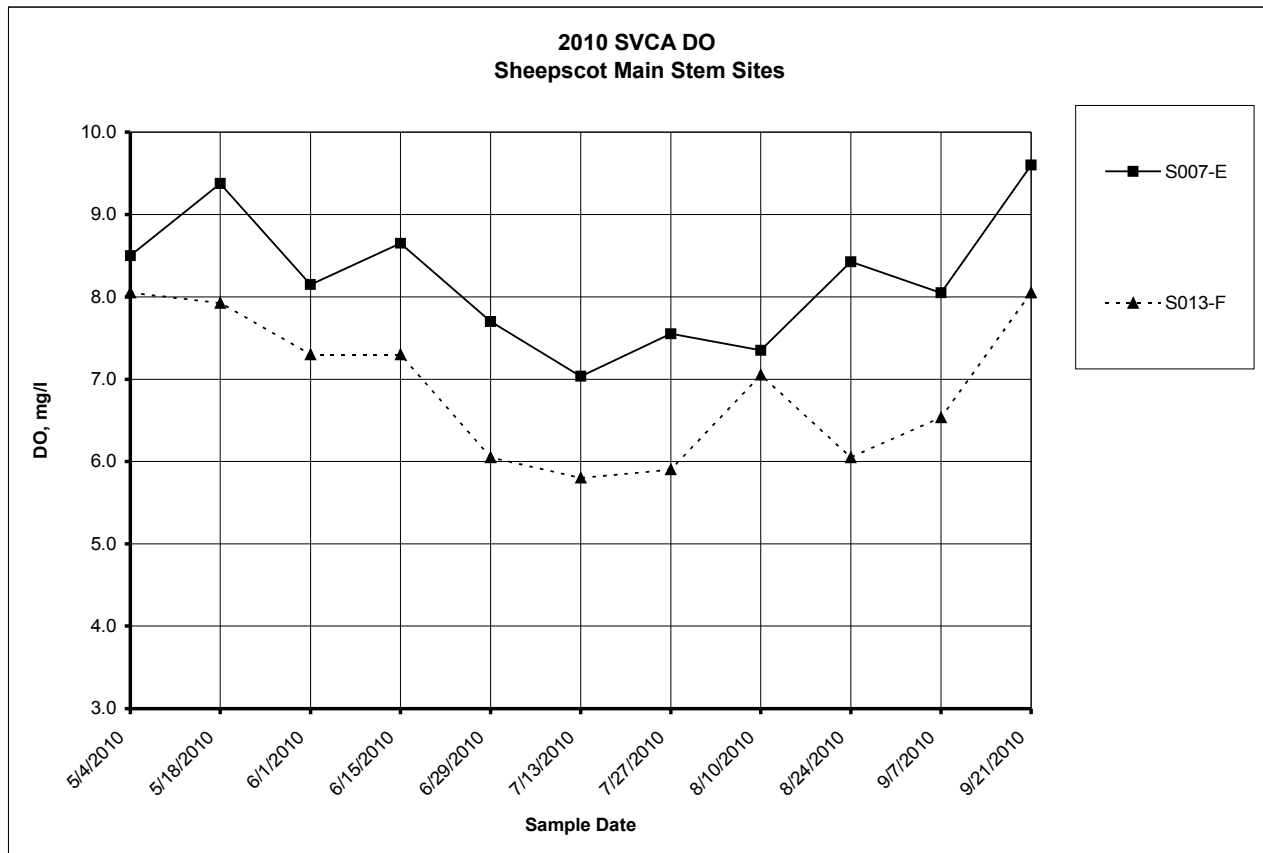
Graph #4: 2010 E Coli Bacteria



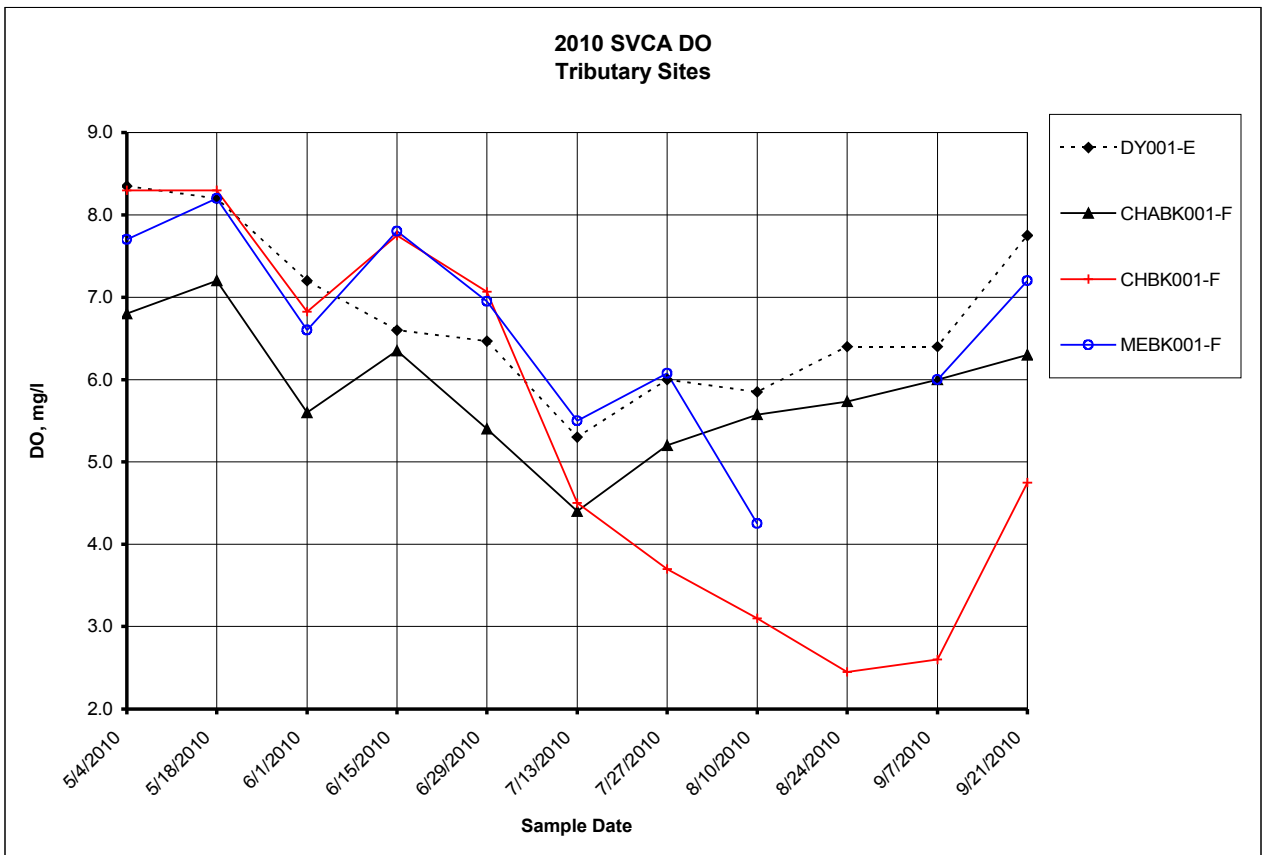
Graph #5: 2010 Estuary Bacteria

Dissolved Oxygen

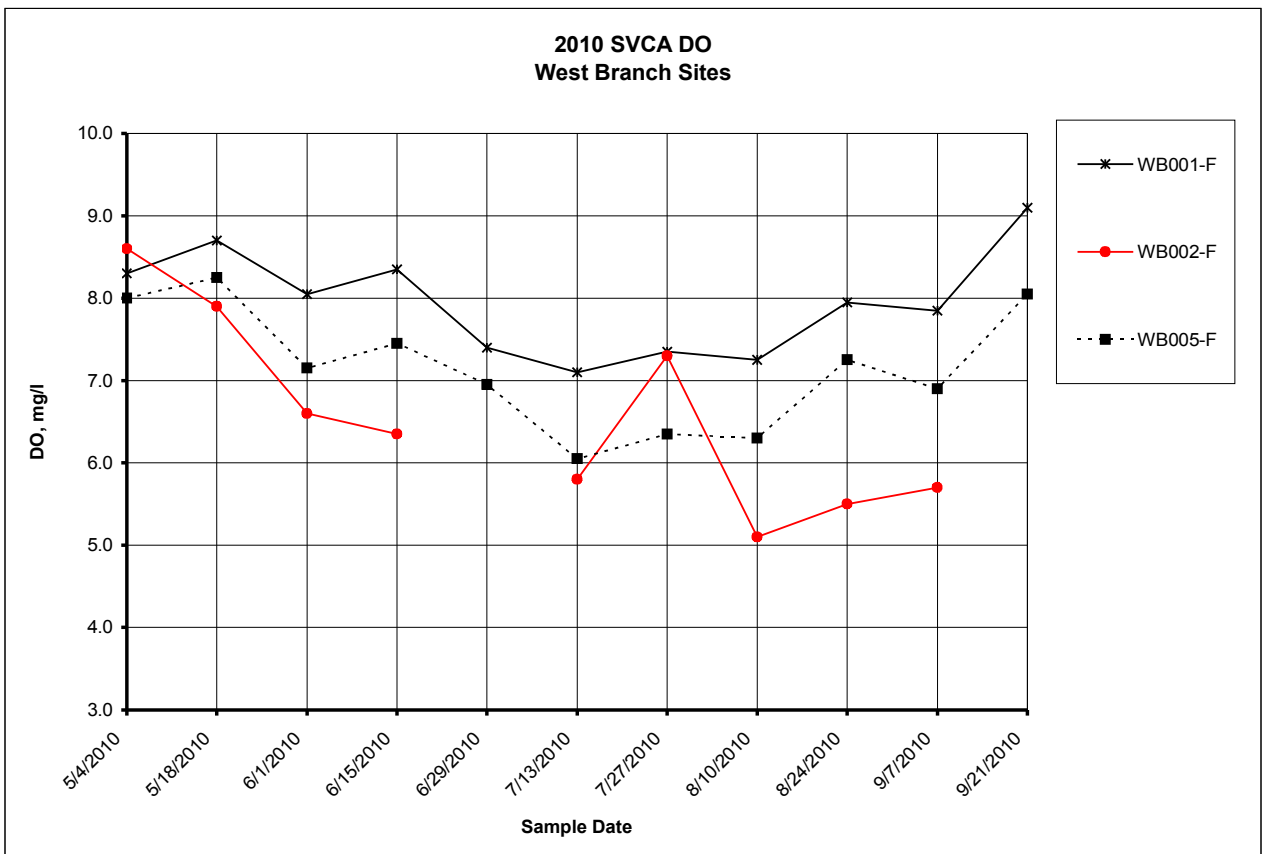
The SVCA dissolved oxygen (DO) data are presented in the following three graphs and two tables. The 2010 SVCA data showed DO values below 7 mg/l (the class A and B standard) for most fresh water sites by mid June to early July. Values recovered, for most of these sites, to above 7 mg/l by mid to late September. Sites S007 and WB001 remained above 7 mg/l for the entire sampling season. River flow was below median flow for much of the summer, so lower DO would be expected. The tables present the percent DO saturation values for the estuarine sites. These two sites are class SB which has a DO standard of a minimum of 85% saturation. Site S007 was above the DO standard for most of the sampling season but site DY001 was below the DO standard for most of this time period. Descriptions of the DO standards and a table of non-attainment are given in the 1994-2010 summary at the end of this report.



Graph #6: 2010 Main Stem DO



Graph #7: 2010 Tributary DO



Graph #8: 2010 West Branch DO

DY001-E

Sample Date	Temp C	Salinity ppt	ave. DO ppm	DO Sat %
5/4/2010	12.5	15.1	8.35	86%
5/18/2010	12.8	18.1	8.2	87%
6/1/2010	16.5	20.7	7.2	84%
6/15/2010	15.0	17.4	6.6	73%
6/29/2010	21.7	11.8	6.5	79%
7/13/2010	22.3	17.7	5.3	68%
7/27/2010	21.1	5.6	6.0	70%
8/10/2010	21.8	16.1	5.85	73%
8/24/2010	19.0	18.7	6.4	77%
9/7/2010	20.0	12.3	6.4	76%
9/21/2010	15.0	12.2	7.75	83%

S007-E

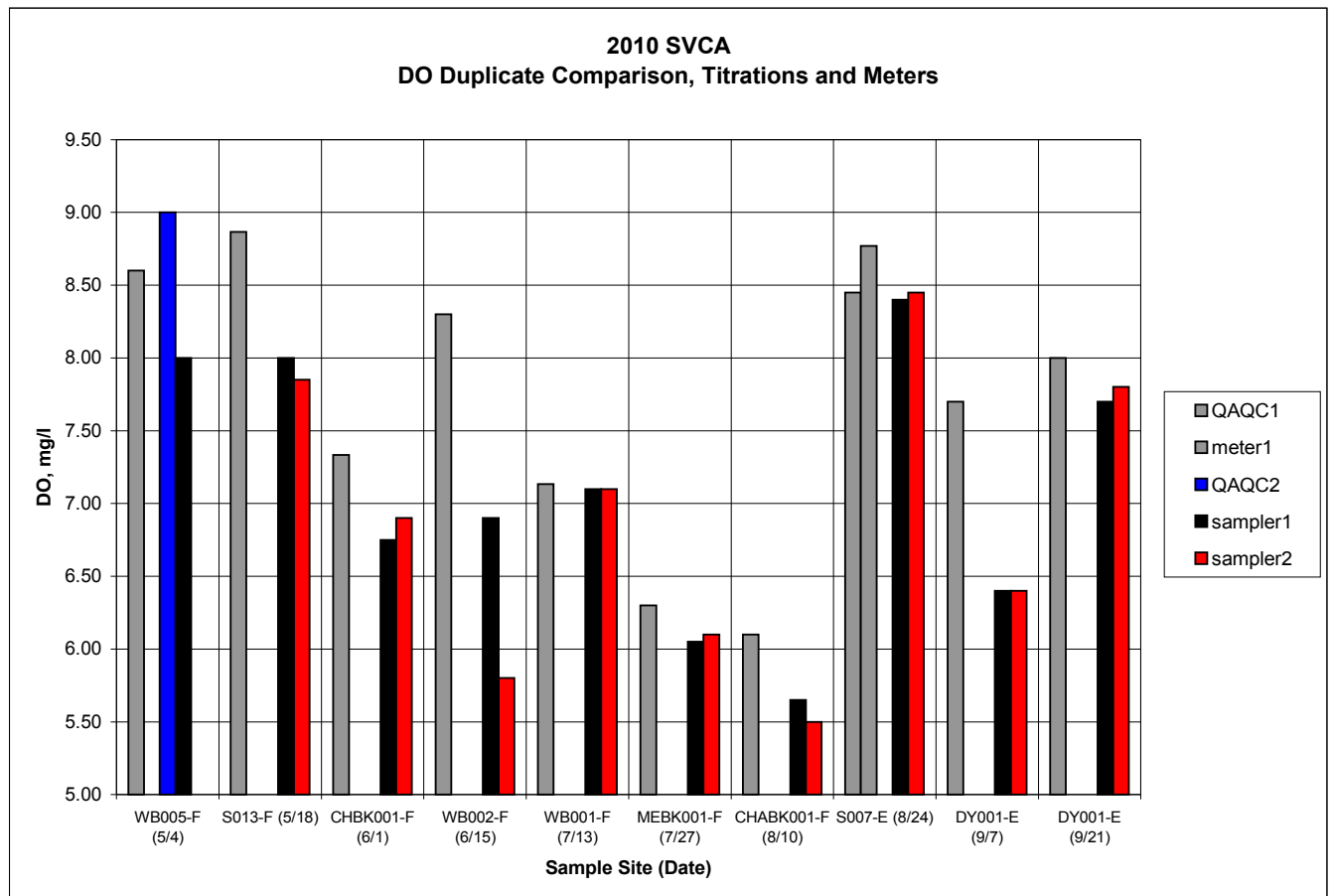
Sample Date	Temp C	Salinity ppt	DO ppm	DO Sat %
5/4/2010	14.5	0	8.5	83%
5/18/2010	15.0	0	9.4	93%
6/1/2010	18.0	0	8.15	86%
6/15/2010	15.5	0	8.65	87%
6/29/2010	20.0	0	7.7	85%
7/13/2010	23.0	0	7.0	82%
7/27/2010	21.0	0	7.55	85%
8/10/2010	22.0	0	7.35	84%
8/24/2010	17.0	0	8.4	87%
9/7/2010	19.0	0	8.05	87%
9/21/2010	11.0	0	9.6	87%

The report for the Dyer River survey is not yet complete as of the preparation of this document. Results from the testing will be summarized in the SVCA's 2011 WQM report.

QAQC/Duplicates

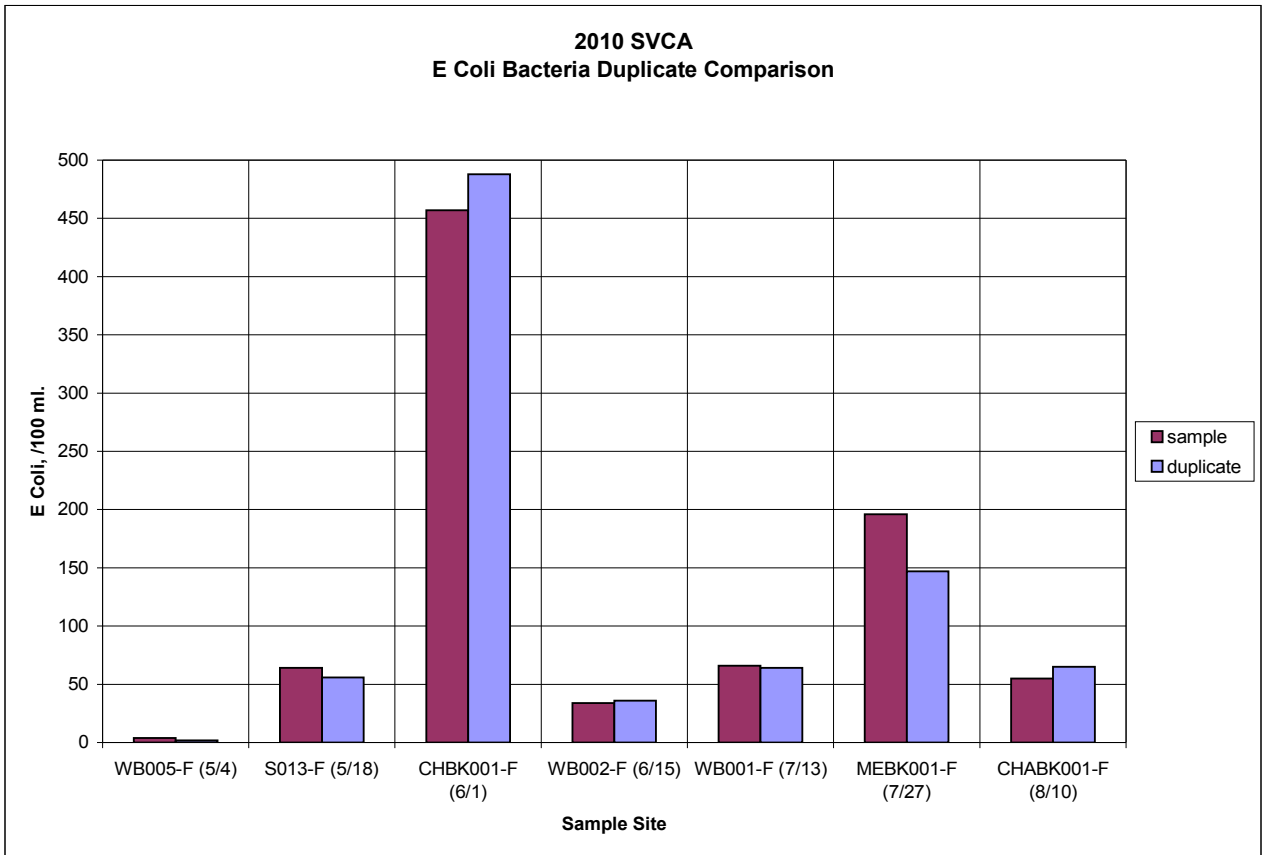
As a part of its monitoring program, SVCA includes at least one duplicate sampling per site during a sampling season. The following graphs show the comparison of duplicate sampling for dissolved oxygen and bacteria.

Graph 9 shows a comparison of DO reading duplicates using the titration method. The black values are the basic readings performed by the regular samplers. The red values are the duplicates performed by the regular samplers and the gray values are those performed by the QAQC team. On one occasion a second (blue) QAQC reading was made by a second member of the QAQC team. Also on one occasion a meter reading was taken (gray hatched value). Only half of the QAQC checks met the 0.5 mg/l target.

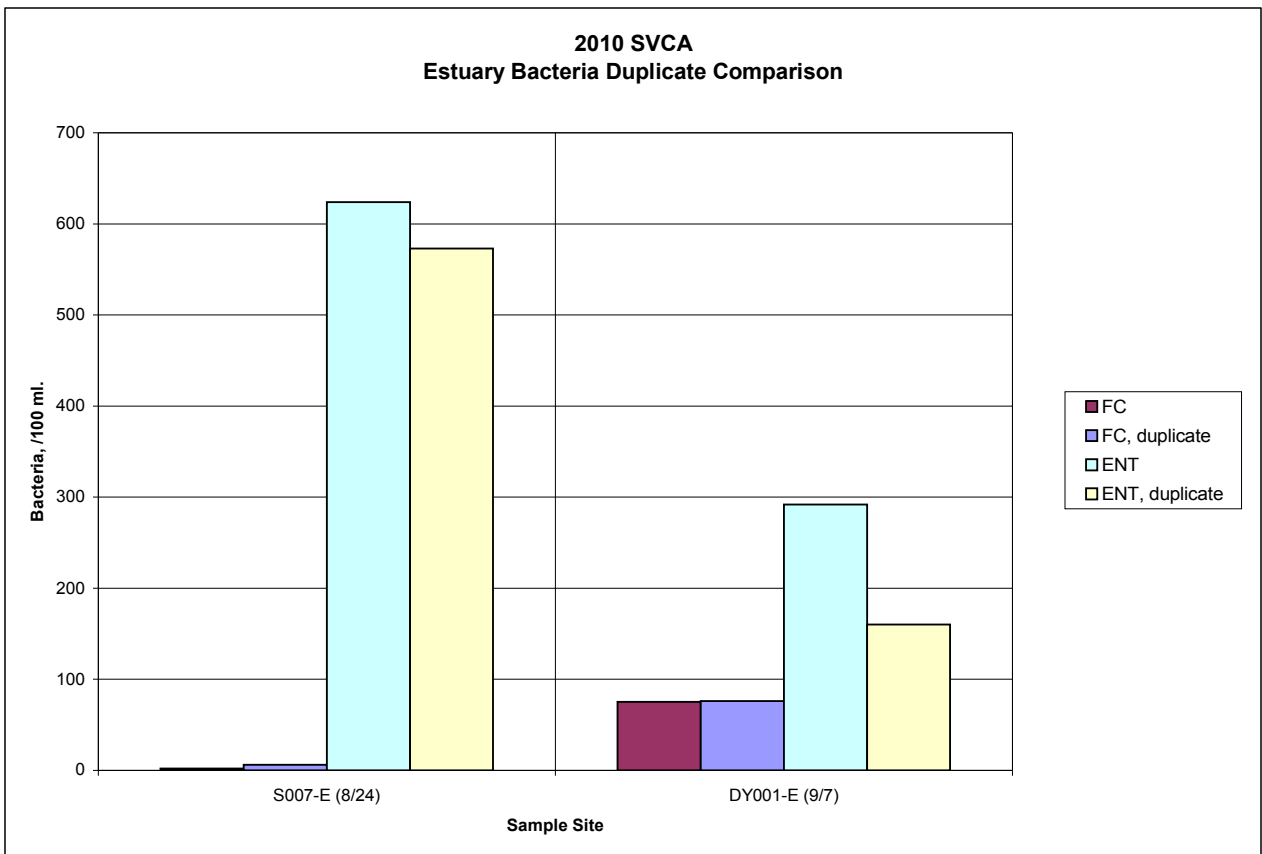


Graph #9: 2010 DO Duplicate Comparisons

Graphs 10 and 11 show comparisons of the bacteria duplicates. With one exception (DY001-E, enterococcus) the results show good agreement of bacteria values.



Graph #10: 2010 E Coli Duplicate Comparisons



Graph #11: 2010 Estuary Bacteria Duplicate Comparisons

Conclusion

2010 was a low flow year (below median at the USGS gauge site) and all sites except two reported non attainment of DO standards. Only two sites (WB002 and WB005) showed attainment of bacteria standards throughout the season. We need to improve on our dissolved oxygen QAQC results. It is suggested to make use of the April training date to perform a formal QAQC among all the samplers. It is planned to continue with the nine 2010 sites for the 2011 season.

We experienced problems with our thermometers during the 2010 season. We plan to buy new upgraded thermometers for 2011. Also, the temperature reading from the salinity meter did not always agree with the other thermometers during warmer weather. It helped to warm up the meter for 30+ minutes before using. As a precaution, hydrometer readings were taken in addition to the meter readings for salinity (only one site has measurable salinity).

The web site for MDEP Bureau of Land and Water Quality also has many interesting links, including documents using our data. You can find them at: <http://www.maine.gov/dep/blwq>

Thank you

To all of the dedicated volunteers who have made the past 17 years of sampling possible. We thank Kristin Pennock for office help.

Water Quality Monitoring Committee

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Alex Pugh, Technical Advisor
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Kristin Pennock	Alex Pugh
Gabby Rigaud	

Couriers

Lee Murch
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Back up monitors

Maureen Hoffman	Dede Heath
Karin Swanson	Lili Pugh

Drop Off Sites

Alna Store
Tobey's Store

Appendix

Sheepscot River Water Quality Data 1994-2010

The following data has been summarized but not yet thoroughly analyzed. It should be considered as preliminary results until further analysis has been completed. Only the sites sampled in 2009 and 2010 are shown. The number of sampling dates for a particular year for each site is listed in parentheses.

All **violations** of State of Maine Water Quality Standards for the Sheepscot Drainage in the data collected are in **BOLD**. *Violations are based on standards (or surrogates) in effect during the specific sample year and may not reflect current standards (see water quality classifications of the Sheepscot below).*

The Sheepscot Main Stem from Route 17 to tidewater and the West Branch are Class AA:

There are no specified numerical standards for AA waters. Class AA is the highest classification and sections of river that have this designation are "...outstanding natural resources and which should be preserved because of their ecological, social, scenic or recreational importance." For comparison purposes the following standards had been created (Note: with change in B standards, AA surrogate standards had been changed for 2007-2008). Maine's Statewide Bacteria TMDL was approved in 2009. The TMDL specifies the use of GPA standards for 'as naturally occurs' (table 4.1, pg 25 <http://www.maine.gov/dep/blwq/docmonitoring/TMDL/2009/report.pdf>).

Dissolved Oxygen:	7.0 mg/l or 75% saturation (class A standard)
E Coli (1994-2006):	64 geometric mean 214 instantaneous
E Coli (2007-08, B standard):	64 geometric mean 236 instantaneous
E Coli (2007-08, 1/2 B standard):	32 geometric mean 118 instantaneous
E Coli (2009-10, GPA)	29 geometric mean 194 instantaneous

The Mainstem of the Sheepscot River from its headwaters to Sheepscot Lake and the tributaries Trout Brook, Choate Brook, Weaver Brook, Ben Brook, Finn Brook, Hewitt Brook, Dearborn Brook, and Culvert Pond Brook were upgraded in 2003 to Class A:

There are no specified numerical bacterial standards for A waters. Bacterial levels are to be as naturally occurs. For comparison purposes standards for these waters are the same as those used for Class AA waters above.

The Mainstem of the Sheepscot River from Sheepscot Lake to the Route 17 bridge in Whitefield and all tributaries not otherwise designated are Class B. The standards for Class B changed in 2005 (implemented in 2006). The standards are as follows:

Dissolved Oxygen:	7.0 mg/l or 75% O ₂ Sat., whichever is higher.
E Coli (1994-2005):	64 geometric mean 427 instantaneous
E Coli (2006-2010):	64 geometric mean 236 instantaneous

Estuarine waters of the Sheepscot are Class SB. The standards for SB waters are as follows:

Dissolved Oxygen (1994-2008)	7.0 mg/l or 85% O ₂ Sat., whichever is higher*
Enterococci:	8 geometric mean 54 instantaneous
Dissolved Oxygen 2009-2010	85% O ₂ Sat.
Fecal coliform** 2009-2010	14 geometric mean 31 90 th percentile

*standard was/is actually 85% saturation, 7.0 mg/l was used for comparative purposes

**for approved shellfish harvesting waters

Estuary and Tributaries

DY001-E

Dyer River. At mouth, below bridge in Sheepscot Village. Class SB

<i>YEAR</i>	<i>FECAL COLIFORM GEO MEAN</i>	<i>FECAL COLIFORM 90th %</i>	<i>ENTEROCOCCI GEO MEAN</i>	<i>ENTEROCOCCI DAYS IN VIOLATION</i>	<i>D.O. DAYS IN VIOLATION</i>	<i>AVERAGE WATER TEMP (°C)</i>
1994					9 (9)	
1995	18.4				4 (8)	
1996	48.3		36.0	4 (11)	8 (11)	
1997	9.9		3.5	0 (10)	5 (12)	
1998	22.3		20.6	4 (11)	4 (11)	
1999	20.6		19.2	2 (12)	4 (12)	
2000	42.0		115.5	8 (10)	0 (10)	
2001	14.9		27.4	3 (11)	3 (12)	
2002	19.0		25.4	4 (11)	1 (11)	16.1
2003	34.2		32.6	5 (11)	6 (11)	16.7
2004	56.6		22.7	2 (11)	3 (11)	17.6
2005	20.5		42.6	2 (12)	3 (12)	14.2
2006	96.0		118.1	8 (12)	6 (11)	18.3
2007	11.6		12.3	2 (11)	2 (10)	16.7
2008	54.6		28.8	3 (10)	3 (11)	17.8
2009	24.6		25.2	3 (11)	8 (11)*	16.2
2010	17.2	75	53.2	6(11)	9(11)*	18.0

*85% standard

S007-E

Sheepscot River. Downriver from Head Tide Road Bridge; behind SVCA Office; river left. Class SB

<i>YEAR</i>	<i>FECAL COLIFORM GEO MEAN</i>	<i>FECAL COLIFORM 90th %</i>	<i>ENTEROCOCCI GEO MEAN</i>	<i>ENTEROCOCCI DAYS IN VIOLATION</i>	<i>E Coli Geo mean</i>	<i>D.O. DAYS IN VIOLATION</i>	<i>AVERAGE WATER TEMP (°C)</i>
1994	80.1					1 (10)	
1995	32.3					2 (12)	
1996	21.5		88.7	7 (12)		0 (12)	
1997	26.0		138.8	9 (12)		0 (12)	
1998	58.2		337.1	9 (12)		1 (12)	
1999	111		359	8 (11)	59 (6)	0 (7)	
2000	113.8		564	8 (9)		0 (12)	
2001	406.2		82.5	1 (2)	86.2 (10)	1 (12)	
2002	68.2		241.6	9 (11)	--	0 (12)	13.8
2003	201.4		19.1	1 (11)	--	0 (11)	17.0
2004	75.8		237.9	7 (10)	--	0 (10)	17.1
2005	22.1		45.6	4(12)		0(10)	18.0
2006	44.1		222.4	8 (12)		0 (9)	17.5
2007	35.7		17.0	2 (11)		0 (11)	14.8
2008	71.7		82.8	6 (11)		0 (11)	17.0
2009	88.2		127.8	8 (11)		5 (11)*	16.5
2010	12.0	30	181.7	9(11)		3(11)*	17.8

*85% standard

Sheepscot Main Stem and Tributaries

CHABK001-F

Chamberlain Brook, King's Mills. Below route 194 Bridge. Class B

<i>YEAR</i>	<i>E COLI GEOMEAN</i>	<i>E COLI DAYS IN VIOLATION</i>	<i>D.O. DAYS IN VIOLATION</i>	<i>AVERAGE WATER TEMP (°C)</i>
1997	85.3	2 (8)		
1998	157.5	3 (12)	11 (12)	
1999	165	5 (12)	10 (12)	
2000	113.2	1 (9)	6 (8)	
2001	84.6	1 (12)	11(12)	
2002	49.1	1 (12)	9 (12)	16.5
2003	40.2	1 (9)	6 (9)	17.0
2004	96.6	1(11)	0 (11)	
2005	80.5	0 (12)	6 (10)	15.4
2006	133.3	0 (11)	8 (11)	17.0
2007	70.8	2 (11)	8 (11)	14.8
2008	63.0	3 (11)	4 (11)	16.6
2009	103.5	2 (11)	8 (10)	15.1
2010	155.6	6(11)	11(11)*	18.7

*1(11) non-attainment of 75% standard only

S013-F

Sheepscot River. North Whitefield. Below Route 126. River right. Class AA

<i>YEAR</i>	<i>E COLI GEOMEAN</i>	<i>E COLI DAYS IN VIOLATION (1/2 B STD)</i>	<i>E COLI DAYS IN VIOLATION (B STANDARD)</i>	<i>E COLI DAYS IN VIOLATION (GPA)</i>	<i>D.O. DAYS IN VIOLATION</i>	<i>AVERAGE WATER TEMP (°C)</i>
1994	28.5	0 (9)			3 (9)	
1995	33.5	1 (11)			0 (12)	
1996	49.5	1 (5)				
1997	41.9	1 (10)			2 (8)	
1998	29.5	0 (8)			3 (8)	
1999	85.1	1 (11)			0 (5)	
2000	54.5	1 (12)				
2001	33.0	0 (11)			4 (11)	
2002	44.0	0 (11)			2 (12)	17.8
2003	34.5	0 (11)			2 (11)	18.4
2004	94.0	1 (9)			1 (9)	18.6
2005	55.3	1 (11)			1 (1)	18.1
2006	95.7	2 (12)			2 (11)	18.0
2007	42.9	1 (11)	1 (11)		2 (11)	16.3
2008	55.0	2 (11)	0 (11)		2 (11)	16.8
2009	70.7			1 (11)	2 (11)	16.5
2010	63.3			1(11)	5(11)	18.8

West Branch and Tributaries

WB001-F

West Branch Sheepscot River. Below Howe Road Bridge, Whitefield. Class AA

<i>YEAR</i>	<i>E COLI GEOMEAN</i>	<i>E COLI DAYS IN VIOLATION (1/2B STD)</i>	<i>E COLI DAYS IN VIOLATION (B STANDARD)</i>	<i>E COLI DAYS IN VIOLATION (GPA)</i>	<i>D.O. DAYS IN VIOLATION</i>	<i>AVERAGE WATER TEMP (°C)</i>
1994	19.9	0 (7)			0 (7)	
1995	17.7	0 (12)			1 (12)	
1996	36.2	0 (12)			4 (12)	
1997	23.0	0 (10)			0 (10)	
1998	50.3	1 (10)			0 (10)	
1999	30.3	1 (12)			0 (12)	
2000	28.9	1 (12)			0 (12)	
2001	16.2	0 (10)			0 (10)	
2002	23.2	0 (12)			0 (12)	15.5
2003	17.6	0 (10)			0 (10)	16.4
2004	43.6	1 (10)			0 (5)	17.6
2005	27.6	1 (11)			0 (10)	18.1
2006	76.6	1 (8)			3 (10)	17.9
2007	43.0	1 (8)	1 (8)		0 (10)	17.3
2008	63.5	2 (9)	1 (9)		1 (10)	16.1
2009	48.5			1 (10)	2 (10)	15.5
2010	46.1			1(11)	0(11)	18.2

WB002-F

West Branch Sheepsfoot River. Above Route 105 Bridge, Whitefield. Class AA

<i>YEAR</i>	<i>E COLI GEOMEAN</i>	<i>E COLI DAYS IN VIOLATION (1/2B STD)</i>	<i>E COLI DAYS IN VIOLATION (B STANDARD)</i>	<i>E COLI DAYS IN VIOLATION (GPA)</i>	<i>D.O. DAYS IN VIOLATION</i>	<i>AVERAGE WATER TEMP (°C)</i>
1994	48.9	0 (8)			8 (10)	
1995	30.8	1 (11)			5 (10)	
1996	40.4	1 (12)			5 (12)	
1997	19.9	0 (12)			No data	
1998	40.3	1 (12)			7 (12)	
1999	49.9	1 (12)			8 (12)	
2000	64.8	0 (12)			4 (12)	
2001	51.7	1 (12)			5 (12)	
2002	33.0	0 (12)			7 (12)	17.2
2003	32.3	0 (12)			7 (11)	18.1
2004	79.3	1 (11)			3 (11)	17.8
2005	42.7	1 (13)			4(11)	20.3
2006	94.6	1 (12)			5 (9)	16.3
2007	36.6	1 (11)	1 (11)		2 (11)	16.7
2008	52.5	2 (11)	0 (11)		6 (11)	17.3
2009	55.2			0 (11)	4 (11)	16.2
2010	24.2			0(10)	6(9)	18.0

CHBK001-F

Choate Brook. Above Sampson Road bridge just north of Route 105, Windsor. Class A (1997-2003)
Class AA (2004+)

<i>YEAR</i>	<i>E COLI GEOMEAN</i>	<i>E COLI DAYS IN VIOLATION (1/2B STD)</i>	<i>E COLI DAYS IN VIOLATION (B STANDARD)</i>	<i>E COLI DAYS IN VIOLATION (GPA)</i>	<i>D.O. DAYS IN VIOLATION</i>	<i>AVERAGE WATER TEMP (°C)</i>
1997	42.1		0 (12)		7 (12)	
1998	131.6		0 (11)		2 (4)	
1999	108.9		1 (9)		4 (8)	
2000	63.3		1 (12)		7 (12)	
2001	104.2		1 (12)		11 (12)	
2002	91.0		2 (11)		8 (12)	15.0
2003	192.9		6 (11)		8 (11)	15.9
2004	135.7	1 (11)			7 (11)	16.3
2005	32.2	1 (12)			7 (12)	16.5
2006	103.5	1 (11)			6 (11)	17.1
2007	96.1	4 (11)	3 (11)		4 (11)	14.8
2008	73.0	3 (11)	3 (11)		5 (11)	15.6
2009	35.2			0 (11)	4 (11)	15.8
2010	147.2			4(11)	8(11)*	16.1

*1(11) non-attainment of 75% standard only

MEBK001-F

Meadow Brook, below old railroad grade on Oliver Dairy Farm, Weeks Mills. Class B

<i>YEAR</i>	<i>E COLI GEOMEAN</i>	<i>E COLI DAYS IN VIOLATION</i>	<i>D.O. DAYS IN VIOLATION</i>	<i>AVERAGE WATER TEMP (°C)</i>
1997	104.2	3 (12)	6 (12)	
1998	279.0	2 (9)	2 (2)	
1999	64.8	1 (12)	7 (10)	
2000	147.3	3 (12)	0 (12)	
2001	173.0	3 (11)	7 (10)	
2002	61.0	2 (12)	6 (11)	15.5
2003	63.4	0 (11)	7 (11)	14.9
2004	623.5	6 (9)	6 (9)	15.0
2005	86.3	0 (13)	5 (12)	16.4
2006	160.9	2 (13)	4 (10)	15.8
2007	179.5	4 (9)	3 (9)	12.7
2008	129.0	3 (11)	3 (11)	14.6
2009	94.6	1 (11)	2 (11)	14.9
2010	155.3	3(10)	9(10)*	15.4

*4(11) non-attainment of 75% standard only

WB005-F

West Branch Sheepscot River. Below Foot Bridge off of Water Street, Palermo. Class AA

<i>YEAR</i>	<i>E COLI GEOMEAN</i>	<i>E COLI DAYS IN VIOLATION (1/2B STD)</i>	<i>E COLI DAYS IN VIOLATION (B STANDARD)</i>	<i>E COLI DAYS IN VIOLATION (GPA)</i>	<i>D.O. DAYS IN VIOLATION</i>	<i>AVERAGE WATER TEMP (°C)</i>
1995	23.4	0 (10)			8 (12)	
1996	7.7	0 (12)			2 (12)	
1997	21.5	0 (10)			8 (12)	
1998	71.1	1 (11)			4 (11)	
1999	55.6	1 (12)			2 (12)	
2000	51.7	1 (11)			5 (11)	
2001	71.7	0 (12)			7 (12)	
2002	32.0	0 (12)			6 (12)	17.3
2003	12.5	0 (11)			4 (11)	17.9
2004	13.2	0 (8)			3 (8)	18.8
2005	8.2	0 (11)			0 (11)	19.4
2006	8.7	0 (12)			1 (7)	20.3
2007	13.3	0 (11)	0 (11)		5 (10)	18.6
2008	14.1	0 (11)	0 (11)		2 (10)	18.8
2009	5.8			0 (9)	3 (11)	18.2
2010	14.7			0(11)	4(11)*	19.2

*1(11) non-attainment of 7.0 mg/l standard only