Section 5-1
Androscoggin River (Androscoggin River Watershed Council)

Androscoggin River

The Androscoggin River is the third largest river in the state. It has a length of 177 miles and drainage area of 3,450 square miles (2,730 sq. mi. in Maine). The headwaters are Umbagog Lake in Maine/New Hampshire. From there it flows into New Hampshire and then back into Maine through the towns of Gilead and Bethel. It continues flowing through the towns and cities of Rumford, Mexico, Dixfield, Jay, Livermore Falls, Lewiston, Auburn, Lisbon, Lisbon Falls, Durham, Brunswick, and Topsham where it joins the Kennebec River at Merrymeeting Bay.

The Androscoggin River has a long history of industrial and municipal use over the last 200 years.[1] Beginning in the early 1800s, many dams were constructed for mills, primarily in the lower part of the river. By the late 1800s, many textile and lumber mills were in operation, mostly from Lewiston to Brunswick. Pulp and paper mills that are still in operation today were established in the late 1800s in New Hampshire, Rumford, and Jay. Beginning in the late 1920s, Central Maine Power built hydroelectric dams that impounded much of the river from Lewiston to Livermore Falls. Some of these uses continue today. "Along its course to the sea, the river is repeatedly dammed. It receives discharges from industrial and municipal sources, as well as polluted runoff from a variety of sources."[2] Specific problems include mill discharges, combined sewer overflows (CSOs), dam impacts (28 dams exist), and historical sediment toxics.

The Androscoggin River Watershed Council (ARWC) is a nonprofit organization that focuses on the upper part of the Androscoggin River. The mission of the ARWC is "To improve environmental quality and promote healthy and prosperous communities in the Androscoggin River Watershed."[3]

The Androscoggin River is statutory Class B from the Maine/New Hampshire boundary to its confluence with the Ellis River. It is statutory Class C from the confluence with the Ellis River until it joins the Kennebec River at Merrymeeting Bay. In the Upper Androscoggin River, unless otherwise assigned, tributaries of the Androscoggin from the Maine-New Hampshire state border in Gilead to (and including) the Ellis River are Class A.

[1] Maine Rivers Website- Androscoggin River Profile
[2] Androscoggin River Alliance Website-Androscoggin River slideshow
[3] Androscoggin River Watershed Council Website-Bylaws

Monitoring History

• The Maine DEP Biological Monitoring Program has been monitoring the Upper Androscoggin River since 1983. There are established monitoring stations on the mainstem as well as on the major tributaries including the Wild River, Bear River, Sunday River, Ellis River and Swift River. This data is available on DEP's website.

• The Androscoggin River Watershed Council (ARWC) began participating in the New Hampshire Volunteer River Assessment Program (VRAP) in 2007.

• ARWC joined the Maine Volunteer River Monitoring Program (VRMP) in 2012, thus extending sampling locations on the Androscoggin River into Maine.

Methods and Sampling Sites

Androscoggin River Watershed Council has six monitoring sites on the Androscoggin River, one site on the Pleasant River, two sites on the Sunday River and one site on the Ellis River. Not all the sites are monitored every year. One site [Androscoggin River-A1018-ARWC (AR-2)] was discontinued due to new bridge construction. All of the ARWC sampling sites are now VRMP approved sites.

Monitoring is conducted 1-3 times per month from June to August/September. Monitors take measurements of water temperature and dissolved oxygen using a YSI meter. Specific conductance is measured using an Oakton EC Testr 11+/11 pen. Grab samples may be collected for turbidity and analyzed using a New Hampshire Volunteer River Assessment Program turbidity meter.

Table 5-1-1: Androscoggin River Watershed Council Sampling Sites

VRMP Site ID	Organization Site Code	Sample Location	Class
Androscoggin River-A939-VRMP	AR6	Rumford Boat Launch	C
Androscoggin River-A1015-VRMP	AR3	Route 232 Bridge	C
Androscoggin River-A1018-VRMP	AR2	Rumford Point	C
Androscoggin River-A1032-VRMP	AR5	Hanover Boat Launch	B
Androscoggin River-A1087-VRMP	ML1	Moran's Landing	B
Androscoggin River - 1150-VRMP	AR1; BB1	Route 2-Bethel Bridge	B
Androscoggin River-A1189-VRMP	NL1	Newt's Landing	B
Ellis River-AER199-VRMP	ER1	Route 120	A
Pleasant River- APL29-	PR1	Smith Farm Road	A

VRMP			
Sunday River- ASY02 - VRMP	SR1	Route 2 Crossing	A
Sunday River- ASY08 - VRMP	SR-2	Off Martin Lane	A

Androscoggin River Sampling Sites
Androscoggin River Watershed Council

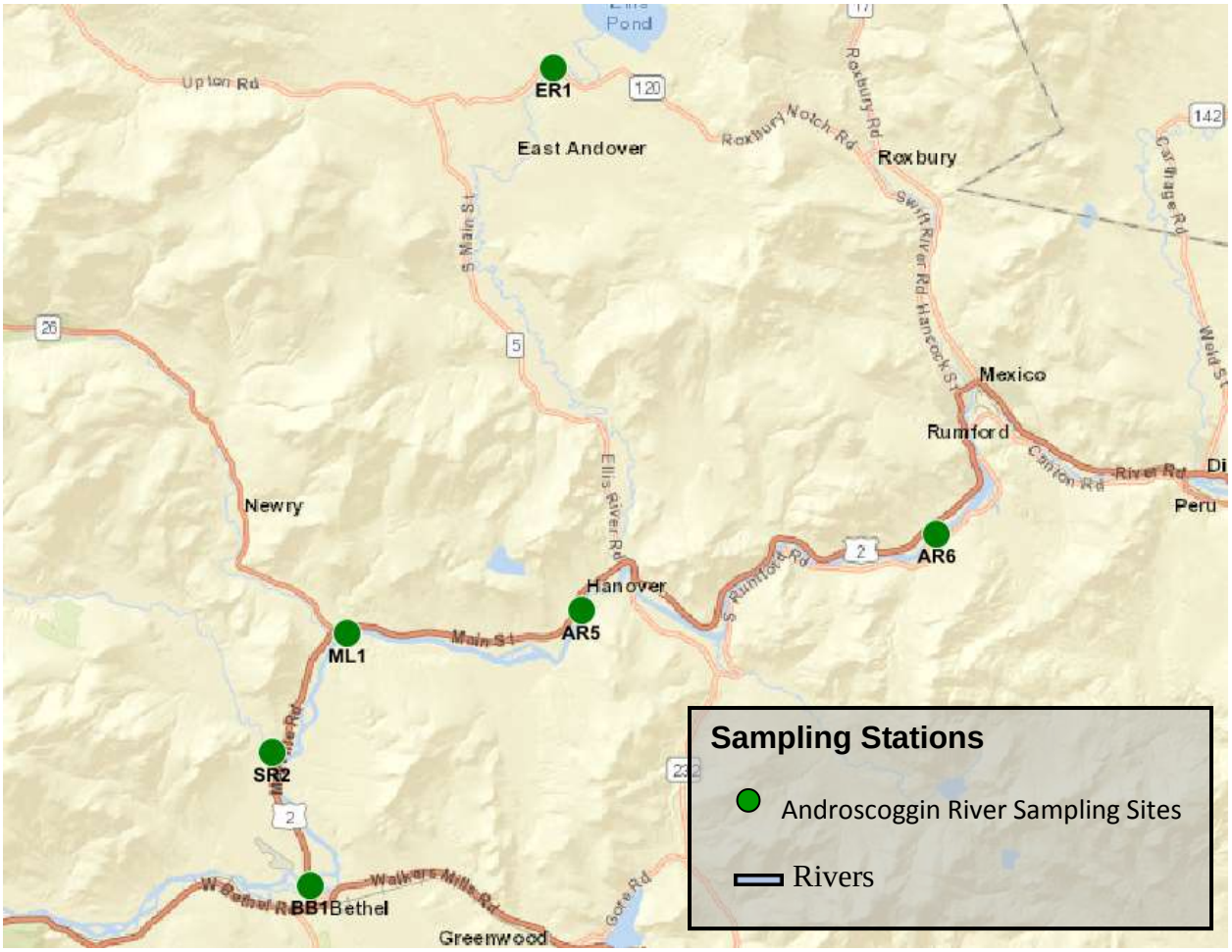


Figure 5-1-1: Map of Androscoggin River Watershed Council sampling sites.

Results

Refer to Appendix A for discussion of individual site data and trends.

Dissolved Oxygen

Dissolved oxygen (DO) levels are generally lowest early in the morning and then increases during the day, peaking mid to late afternoon. Monitors should try to collect some samples early in the morning. Dissolved oxygen is also affected by flow conditions and temperature. During high flow conditions, more oxygen is added to the river from the atmosphere as the water is more turbulent and there is more opportunity for mixing. If flow during the summer months is higher or lower than normal, dissolved oxygen will be affected.

Class A and Class B criteria for DO are a minimum of 7.0 mg/l (milligrams/liter) or 75% saturation, whichever is higher. Class C criteria for DO are a minimum of 5.0 mg/l or 60% saturation, whichever is higher. To meet water quality criteria, both concentration and saturation standards must be met.

2017 Results

Dissolved oxygen (DO) was measured through the sampling season at four sites on the Androscoggin River main stem (Sites BB1, ML1, AR5 and AR6), one site on Sunday River (SR2) and one site on Ellis River (ER1). Almost all the sites had measurements that were above the Class A and Class B criteria for DO concentration of 7 mg/l and percent saturation of 75%. This includes site AR6, which is Class C. At Site ER1, dissolved oxygen was generally only recorded as % saturation and 5 of 7 samples were slightly below the Class A criterion of 75% saturation. The monitors did a good job overall obtaining some early morning readings. Overall, DO at all the sites except ER1 was excellent. Dissolved oxygen (based on saturation) at site ER1 was good. Water levels at this site were reported as being low due to possible reasons beyond it being a dry summer (i.e. dam levels at upstream lake, beaver dams) which could affect flow and dissolved oxygen.

Table 5-1-2: A summary of minimum, maximum, and mean dissolved oxygen concentration values (mg/l) at Androscoggin River Watershed Council monitoring sites.

Site	Class	# Sample Points	Mean	Minimum	Maximum	Criterion	# Not Meeting Criterion
BB1	B	4	9.1	8.8	9.2	7ppm	0
ML1	B	4	9.6	9.3	10.1	7ppm	0
AR5	B	7	8.1	7.2	9.2	7ppm	0
AR6	C	7	8.2	7.5	9.3	5ppm	0
SR2	A	7	9.0	8.3	9.7	7ppm	0
ER1	A	1	7.7	7.7	7.7	7ppm	0

Table 5-1-3: A summary of minimum, maximum, and mean dissolved oxygen saturation (%) values Androscoggin River Watershed Council monitoring sites.

Site	Class	# Sample Points	Mean	Minimum	Maximum	Criterion	# Not Meeting Criterion
BB1	B	4	102.4	101.6	103.9	75%	0
ML1	B	4	104.3	102.3	105.6	75%	0
AR5	B	7	88.9	79.5	96.9	75%	0
AR6	C	7	89.9	84.2	98.0	60%	0
SR2	A	7	91.5	82.1	96.5	75%	0
ER1	A	8	77.7	68.5	97.5	75%	5

Figure 5-1-2: Graph of dissolved oxygen concentrations (main stem)

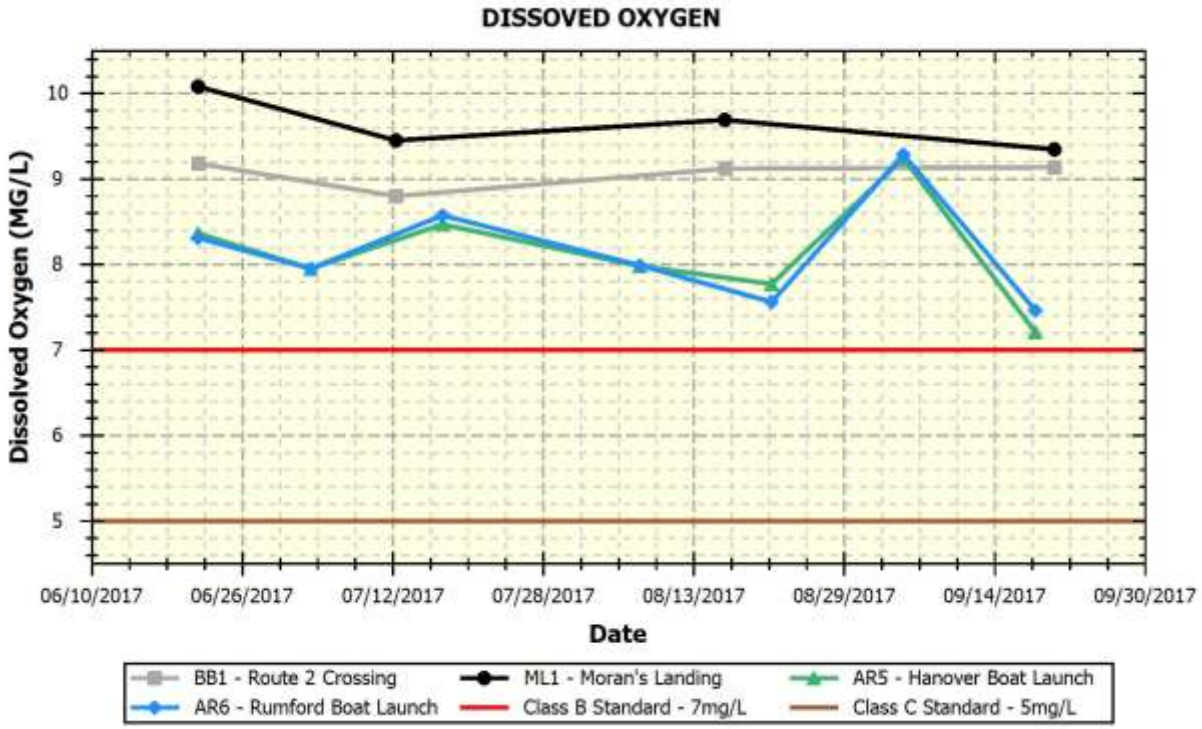


Figure 5-1-3: Graph of dissolved oxygen concentrations (tributaries)

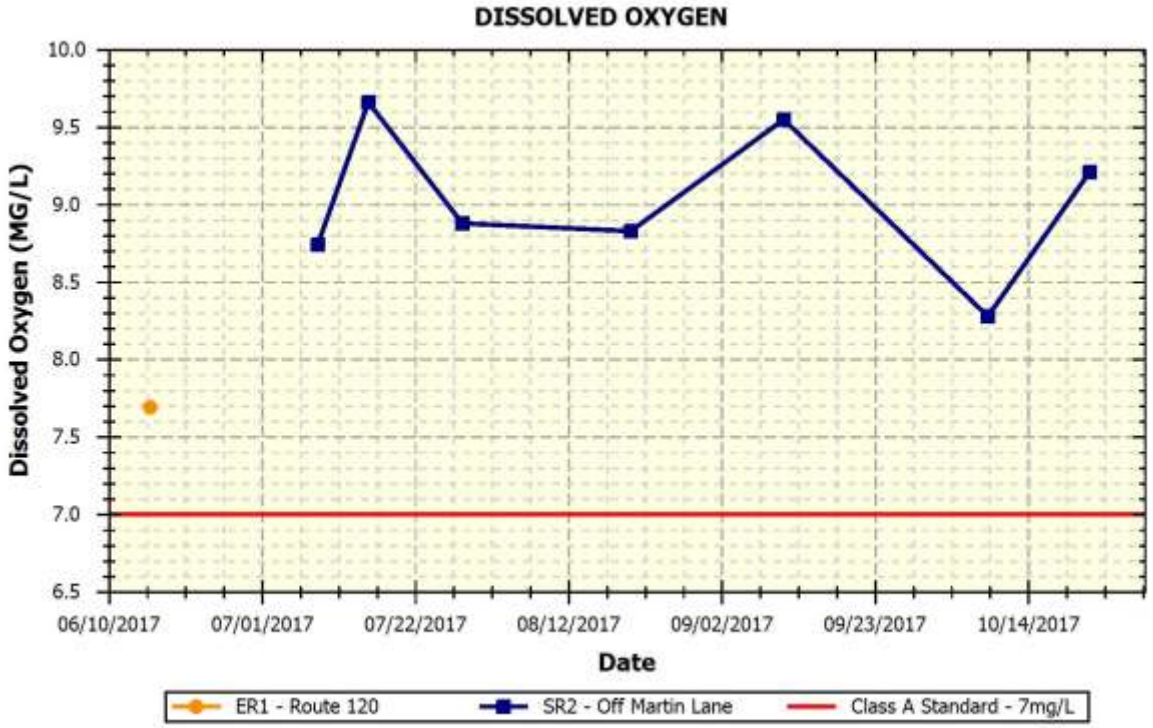


Figure 5-1-4: Graph of dissolved oxygen saturation (main stem)

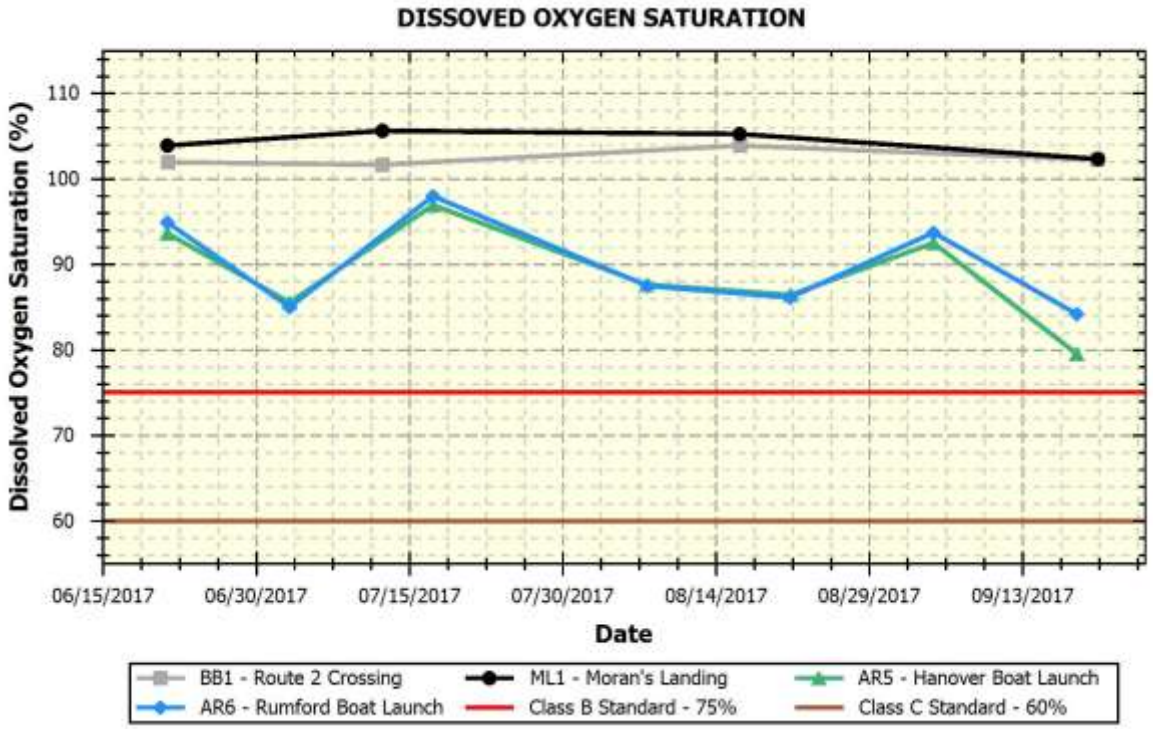
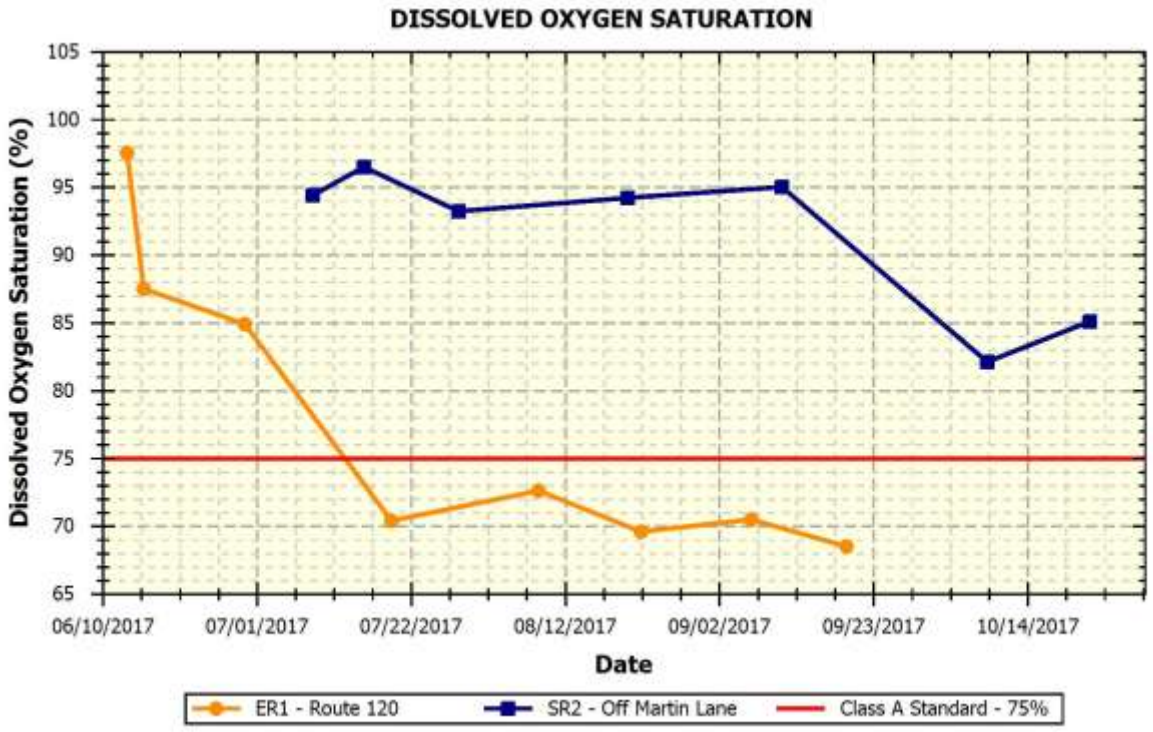


Figure 5-1-5: Graph of dissolved oxygen saturation (tributaries)



Water Temperature

Maine's Regulations Relating to Temperature (06-096 CMR Chapter 582) require that discharge of pollutants not raise the temperature of any river and stream above the EPA criteria for indigenous species (23 °C maximum and 19 °C weekly average) or 0.3 °C (0.5 °F) above the temperature that would naturally occur outside a mixing zone established by the Board of Environmental Protection. Pollutant is defined in statute as many things including dirt and heat. For tidal waters, discharge of pollutants may not raise the temperature more than 4 °F (2.2 °C) or more than 1.5 °F (0.8 °C) from June 1 to September 1, and may not cause the temperature of any tidal waters to exceed 85 °F (29 °C) at any point outside a mixing zone established by the Board of Environmental Protection.

2017 Results

Temperature was measured through the sampling season at four sites on the Androscoggin River main stem (sites BB1, ML1, AR5 and AR6), one site on Sunday River (SR2) and one site on Ellis River (ER1). Temperatures at the main stem sites are similar with the exception of site ML1 which is generally 1-2 °C lower. For the tributaries, site SR2 which had a maximum temperature of 19.6 °C and a mean temperature of 15.9 °C is cooler than ER1 (max temp 22.4 °C and mean temp 20.2 °C). Ellis River originates from a pond so higher temperatures are at least somewhat related to that. Overall, temperatures on the main stem are good and what is expected for a large open river. Temperature at site SR1 is excellent and at site ER1 is good.

Table 5-1-4: A summary of minimum, maximum, and mean water temperature (°C) values at Androscoggin River Watershed Council monitoring sites.

Site	Class	# Sample Points	Mean	Minimum	Maximum	Criterion	# Exceeding Criterion
BB1	B	4	20.6	19.5	21.9	n/a	n/a
ML1	B	4	18.4	16.0	19.9	n/a	n/a
AR5	B	7	19.7	15.4	22.1	n/a	n/a
AR6	C	7	20.1	16.1	21.7	n/a	n/a
SR2	A	7	16.4	12.2	19.6	n/a	n/a
ER1	A	8	20.2	16.0	22.4	n/a	n/a

Figure 5-1-6: Graph of water temperature (main stem)

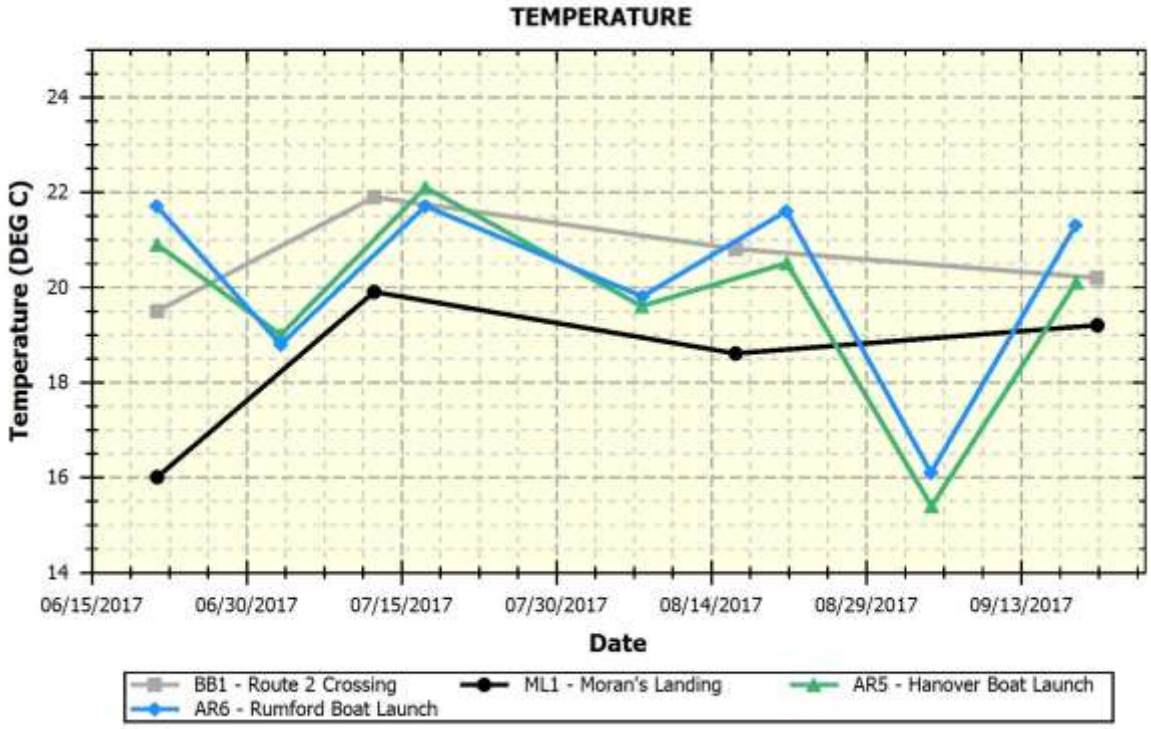
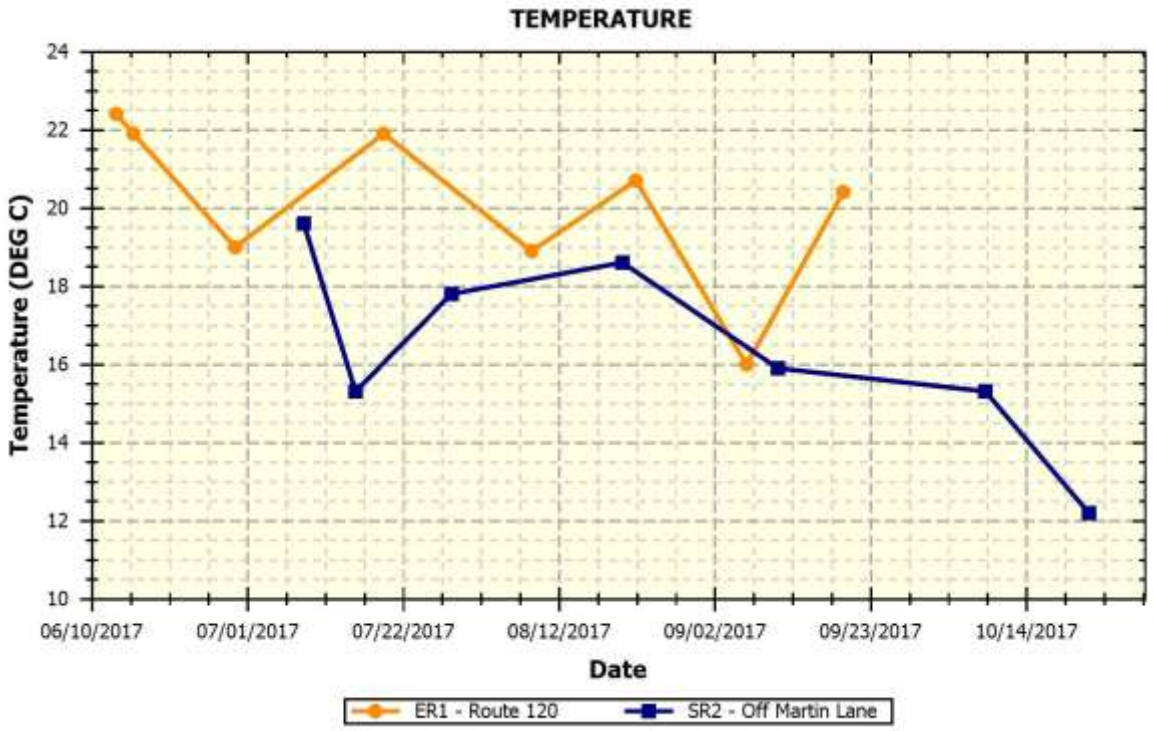


Figure 5-1-7: Graph of water temperature (tributaries)



Specific Conductance

Specific conductance is related to the amount of dissolved materials in the water. While there are no numerical standards, a relationship exists between conductivity and chloride which has numerical criteria. In general, streams located in urban areas tend to have high specific conductance due to polluted urban stormwater runoff. This may also, in large part, be due to salt buildup in surface and groundwater from road maintenance practices. In addition, discharges from pulp and paper mills upstream can increase the conductivity of the river.

2017 Results

Specific conductance was measured throughout the sampling season at four sites on the Androscoggin River main stem (sites BB1, ML1, AR5 and AR6), one site on Sunday River (SR2) and one site on Ellis River (ER1). Specific conductance at all sites ranged from 22-50 µS/cm. These are all very low values.

Table 5-1-5: A summary of minimum, maximum, and mean specific conductance values (micro-ohms/cm, µS/cm) at Androscoggin River Watershed Council monitoring sites.

Site	Class	# Sample Points	Mean	Minimum	Maximum	Criterion	# Exceeding Criterion
BB1	B	4	33	30	35	n/a	n/a
ML1	B	4	36	30	43	n/a	n/a
AR5	B	7	32	25	37	n/a	n/a
AR6	C	7	32	22	38	n/a	n/a
SR2	A	7	40	30	50	n/a	n/a
ER1	A	8	34	30	50	n/a	n/a

Figure 5-1-8: Graph of specific conductance (main stem)

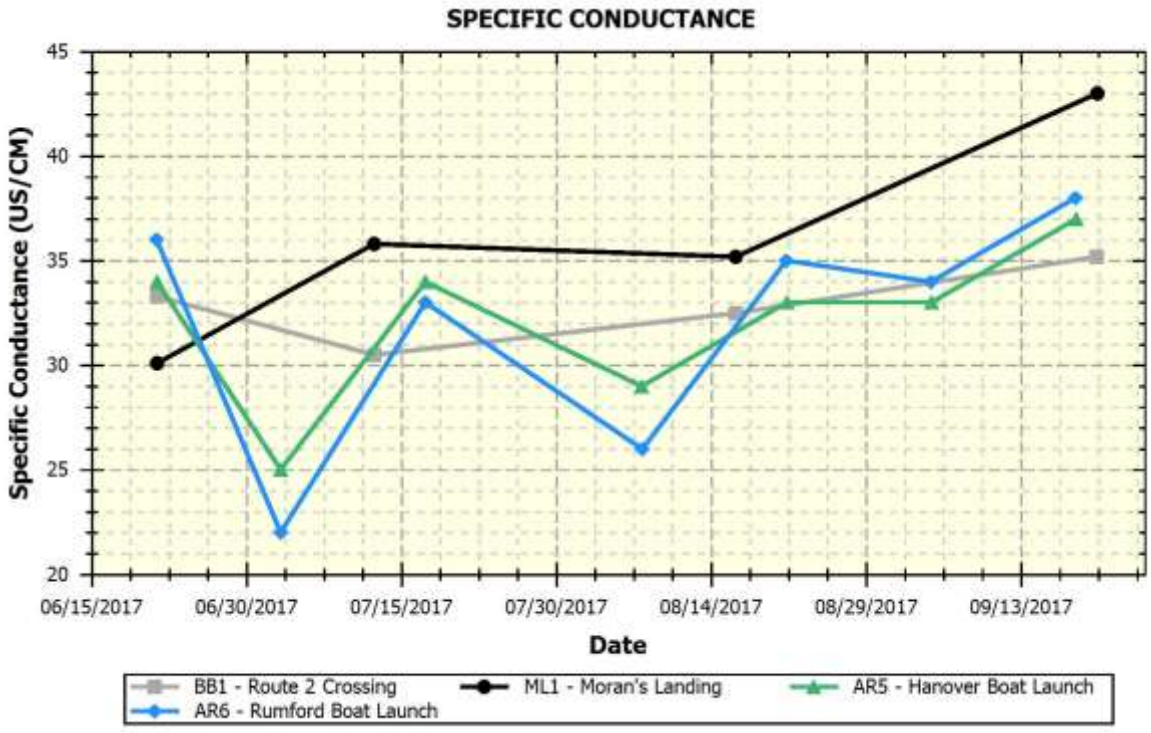
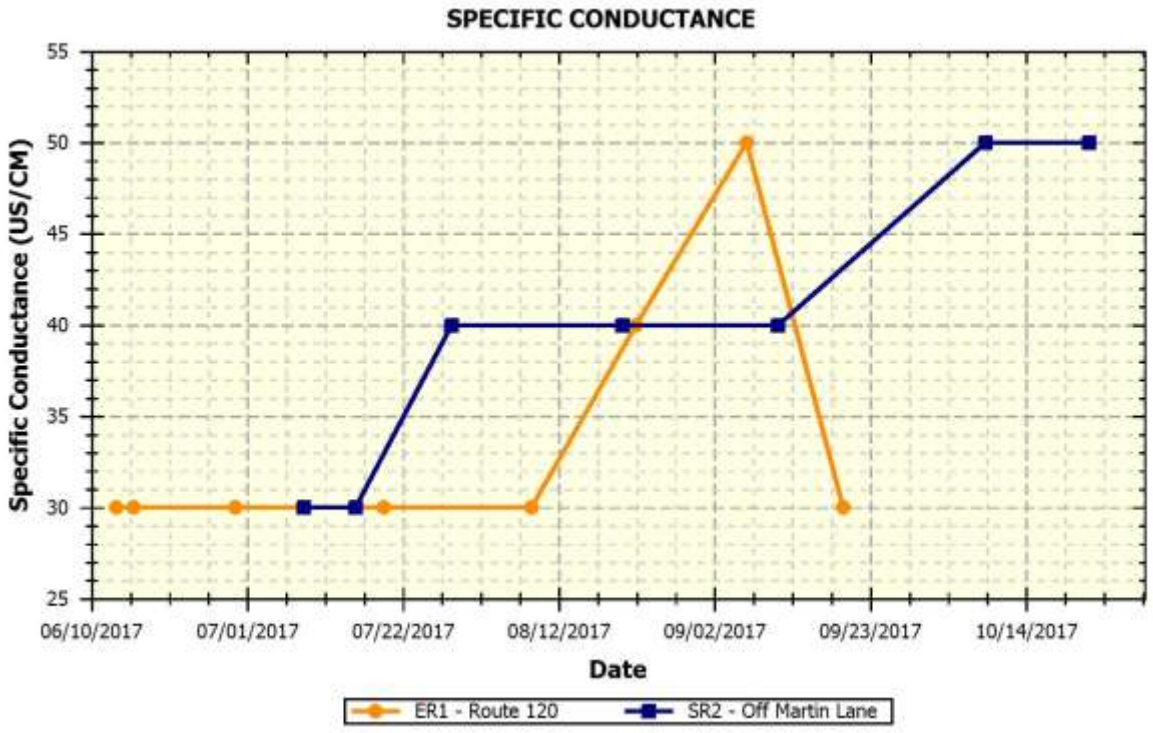


Figure 5-1-9: Graph of specific conductance (main stem)



Turbidity

The State of Maine does not have turbidity standards. Turbidity is a measure of the amount of suspended materials in the water; including soil particles, algae, plankton, and decaying vegetation. Precipitation events that are great enough to cause runoff and land use activities such as construction, agriculture, and logging may contribute to increased turbidity.

2017 Results

Turbidity was measured at sites BB1 and ML1. All values were low.

Table 5-1-6: A summary of minimum, maximum, and mean turbidity values (NTU) for at Androscoggin River Watershed Council monitoring sites.

Site	Class	# Sample Points	Mean	Minimum	Maximum	Criterion	# Exceeding Criterion
BB1	B	4	1.7	1.1	2.3	n/a	n/a
ML1	B	4	1.1	0.8	1.8	n/a	n/a
AR5	B	-	-	-	-	n/a	n/a
AR6	C	-	-	-	-	n/a	n/a
SR2	A	-	-	-	-	n/a	n/a
ER1	A	-	-	-	-	n/a	n/a

Discussion and Recommendations

There are numerous sources of pollution and other stresses to the Androscoggin River sites monitored by the Androscoggin River Watershed Council that could potentially have an impact on water quality. Some of those sources of pollution and stress may include:

- Point source pollution (pollution originating from a direct discharge including wastewater treatment plant discharge, combined sewer overflows and overboard discharges).
- Non-point source pollution (e.g., eroded soil, fertilizers, pesticides, heavy metals, petroleum residues, road salt, septic systems, wildlife and pet feces) and polluted stormwater originating from urban impervious surfaces (e.g., streets, parking lots, driveways, rooftops), agriculture, and forestry.
- Ponds and impoundments (which often create more pond-like aquatic habitat conditions that may have higher water temperatures and lower dissolved oxygen concentrations than free-flowing waters).
- Natural effects of wetlands (such as contributing waters to a stream/river that have low dissolved oxygen levels due to the decomposition of large amounts of organic matter, respiration of abundant plant matter, and low re-aeration rates that are characteristic of many wetlands).

The following are recommendations for future monitoring:

- **Continue monitoring at existing monitoring sites to develop a long-term trend database.**
- **Continue to obtain at least some measurements early in the morning (before 8:00 am), especially during the summer months of July and August and obtain early morning measurements at site(s) that have not been doing this.**
- **Make sure to record dissolved oxygen in both mg/l and percent saturation.**
- **Recruit additional volunteers so most or all of the sampling stations can be monitored consistently.**
- **Investigate low flow conditions at Ellis River.**

Appendix A

* Sampling depths are only reported for Tier 1 VRMP sites.

** "N/A" = normal environmental sample ; "D" = field duplicate; "D.O." = dissolved oxygen; "Spec. Cond" = specific conductance; "TDS" = Total disolved solids; "TSS" = total suspended solids"

Organization Site Code	VRMP Site ID	Date	Time	** Sample Type Qualifier	* Sample Depth	Depth Unit	Water Temp (DEG C)	** D.O. (MG/L)	** D.O. Sat. (%)	** Spec. Cond. (US/CM)	Salinity (PPTH)	Turbidity (NTU)	** TDS (MG/L)	** TSS (MG/L)	E. coli Bacteria (MPN/ 100ML)	Entero-cocci (MPN/ 100ML)
Androscoggin River (Upper) - Androscoggin Watershed Council: Approved Sites																
AR5	ANDROSCOGGIN RIVER - A1032 - VRMP	6/21/2017	7:24 AM	NA			20.9	8.4	93.6	34						
AR5	ANDROSCOGGIN RIVER - A1032 - VRMP	7/3/2017	7:03 AM	NA			19.0	8.0	85.5	25						
AR5	ANDROSCOGGIN RIVER - A1032 - VRMP	7/17/2017	7:12 AM	NA			22.1	8.5	96.9	34						
AR5	ANDROSCOGGIN RIVER - A1032 - VRMP	8/7/2017	6:17 AM	NA			19.6	8.0	87.6	29						
AR5	ANDROSCOGGIN RIVER - A1032 - VRMP	8/7/2017	6:17 AM	D			19.6	8.0	87.7	30						
AR5	ANDROSCOGGIN RIVER - A1032 - VRMP	8/21/2017	7:18 AM	NA			20.5	7.8	86.4	33						
AR5	ANDROSCOGGIN RIVER - A1032 - VRMP	9/4/2017	7:18 AM	NA			15.4	9.2	92.5	33						
AR5	ANDROSCOGGIN RIVER - A1032 - VRMP	9/18/2017	7:27 AM	NA			20.1	7.2	79.5	37						
ML-1	ANDROSCOGGIN RIVER - A1087 - VRMP	6/21/2017	8:00 AM	NA			16.0	10.1	103.9	30.1		0.77				
ML-1	ANDROSCOGGIN RIVER - A1087 - VRMP	7/12/2017	8:56 AM	NA			19.9	9.5	105.6	35.8		1.79				
ML-1	ANDROSCOGGIN RIVER - A1087 - VRMP	8/16/2017	7:59 AM	NA			18.6	9.7	105.2	35.2		0.97				
ML-1	ANDROSCOGGIN RIVER - A1087 - VRMP	8/16/2017	7:59 AM	D			18.3	9.7	104.8	35.2		0.8				
ML-1	ANDROSCOGGIN RIVER - A1087 - VRMP	9/20/2017	8:47 AM	NA			19.2	9.3	102.3	43		0.82				
ML-1	ANDROSCOGGIN RIVER - A1087 - VRMP	9/20/2017	8:47 AM	D								0.81				
AR6	ANDROSCOGGIN RIVER - A939 - VRMP	6/21/2017	6:59 AM	NA			21.7	8.3	94.9	36						
AR6	ANDROSCOGGIN RIVER - A939 - VRMP	7/3/2017	6:42 AM	NA			18.8	8.0	85.0	22						
AR6	ANDROSCOGGIN RIVER - A939 - VRMP	7/17/2017	6:51 AM	NA			21.7	8.6	98.0	33						
AR6	ANDROSCOGGIN RIVER - A939 - VRMP	8/7/2017	6:56 AM	NA			19.8	8.0	87.5	26						
AR6	ANDROSCOGGIN RIVER - A939 - VRMP	8/21/2017	6:54 AM	NA			21.6	7.6	86.1	35						
AR6	ANDROSCOGGIN RIVER - A939 - VRMP	9/4/2017	6:54 AM	NA			16.1	9.3	93.7	34						
AR6	ANDROSCOGGIN RIVER - A939 - VRMP	9/18/2017	7:04 AM	NA			21.3	7.5	84.2	38						
AR-1	ANDROSCOGGIN RIVER-A1150-VRMP	6/21/2017	8:42 AM	NA			19.5	9.2	101.9	33.3		2.31				
AR-1	ANDROSCOGGIN RIVER-A1150-VRMP	7/12/2017	8:10 AM	NA			21.9	8.8	101.6	30.5		1.97				
AR-1	ANDROSCOGGIN RIVER-A1150-VRMP	7/12/2017	8:10 AM	D			21.9	8.8	101.5	30.6		1.94				
AR-1	ANDROSCOGGIN RIVER-A1150-VRMP	8/16/2017	8:51 AM	NA			20.8	9.1	103.9	32.5		1.57				
AR-1	ANDROSCOGGIN RIVER-A1150-VRMP	9/20/2017	8:05 AM	NA			20.2	9.1	102.2	35.2		1.13				
AR-1	ANDROSCOGGIN RIVER-A1150-VRMP	9/20/2017	8:05 AM	D								1.37				
ER-1	ELLLIS RIVER-AES199-VRMP	6/13/2017	7:45 AM	NA			22.4		97.5	30						
ER-1	ELLLIS RIVER-AES199-VRMP	6/15/2017	2:25 PM	NA			21.9	7.7	87.5	30						
ER-1	ELLLIS RIVER-AES199-VRMP	6/29/2017	7:40 AM	NA			19.0		84.9	30						
ER-1	ELLLIS RIVER-AES199-VRMP	7/19/2017	8:25 AM	NA			21.9		70.4	30						
ER-1	ELLLIS RIVER-AES199-VRMP	7/19/2017	8:25 AM	D			21.9		69.1	30						
ER-1	ELLLIS RIVER-AES199-VRMP	8/8/2017	8:00 AM	NA			18.9		72.6	30						

Androscoggin River (Upper) - Androscoggin Watershed Council: Approved Sites																
ER-1	ELLLIS RIVER-AES199-VRMP	8/22/2017	8:00 AM	NA			20.7		69.6	40						
ER-1	ELLLIS RIVER-AES199-VRMP	9/6/2017	7:43 AM	NA			16.0		70.5	50						
ER-1	ELLLIS RIVER-AES199-VRMP	9/19/2017	8:06 AM	NA			20.4		68.5	30						
SR-2	SUNDAY RIVER - ASY08 - VRMP	7/8/2017	2:15 PM	NA			19.6	8.7	94.4	30						
SR-2	SUNDAY RIVER - ASY08 - VRMP	7/15/2017	1:00 PM	NA			15.3	9.7	96.5	30						
SR-2	SUNDAY RIVER - ASY08 - VRMP	7/28/2017	11:15 AM	NA			17.8	8.9	93.2	40						
SR-2	SUNDAY RIVER - ASY08 - VRMP	8/20/2017	12:35 PM	NA			18.6	8.8	94.2	40						
SR-2	SUNDAY RIVER - ASY08 - VRMP	8/20/2017	12:35 PM	D			18.4	8.9	94.4	40						
SR-2	SUNDAY RIVER - ASY08 - VRMP	9/10/2017	12:30 PM	NA			15.9	9.6	95.0	40						
SR-2	SUNDAY RIVER - ASY08 - VRMP	10/8/2017	11:30 AM	NA			15.3	8.3	82.1	50						
SR-2	SUNDAY RIVER - ASY08 - VRMP	10/22/2017	10:30 AM	NA			12.2	9.2	85.1	50						