

Pine River Water Quality Monitoring

Township of Huron-Kinloss, Bruce County, Ontario
Ontario Ministry of the Environment, July 2008

Background

The Pine River watershed is located in the Township of Huron-Kinloss, Bruce County and has an approximate area of 15,767 ha. Landuse in the watershed is dominated mainly by agriculture. There is a landfill site and sewage treatment lagoons present in the watershed both of which operate under a certificate of approval. There is also a Cheese and Butter Cooperative located in the watershed which spray irrigates lagoon effluent to surrounding fields. The co-op operates under a certificate of approval complete with monitoring requirements.

The Pine River is routinely monitored as part of the Provincial Water Quality Monitoring Network (PWQMN) at Lurgan Beach by the Saugeen Valley Conservation Authority. Historical water quality monitoring results are available for most parameters for 1964-1978 and 2002-present. The Township of Huron-Kinloss also routinely monitors water quality in the Pine River as a part of their Water Quality Monitoring Program. The monitoring program was established in 2001. The purpose of the Township's monitoring program is to establish and maintain a data base of water quality information that will assist in the future evaluation of development proposals, track of changes over time and to allow the Township to make decisions to protect the water resources and the beach resources.

In late spring of 2008, a local resident brought to the attention of the Ministry of the Environment (MOE) concerns over water quality in the Pine River, specifically at the outlet to Lake Huron. The Pine River was thought to be contributing to abundant algae and detritus along the lakeshore due to possible nutrient loading. Numerous photos were sent to the MOE depicting the accumulation at the Lake.

The Ministry's Environmental Monitoring and Reporting Branch (EMRB) communicated these concerns with Southwest Regional and Owen Sound District MOE staff and a field program was set up to determine if the impacts were localized or watershed wide (point source or non-point source).

Study Design

Ministry Staff from the Southwest Regional Office completed visual observations and water sampling in the Pine River watershed on July 7th and 8th of 2008. Sample sites were chosen that captured various locations along the Pine River and its tributaries. A sample site was also chosen on Clark Creek as a reference site in a smaller watershed nearby the Pine River.

Water samples were analysed for the same parameters that are within routine PWQMN monitoring such as: BOD, solids, conductivity, pH, alkalinity, nitrate, ammonia, Total Kjeldahl Nitrogen (TKN) and total phosphorous. The samples were also analyzed for bacteria including E. coli.

Ministry Staff visited the shoreline of Lake Huron at the outlet of the Pine River and some neighbouring tributaries to determine if the detritus and algae on the beach as noted by a local resident were specific to the outlet of the Pine River or more widespread.

Figure 1. Pine River Watershed and Sample Locations

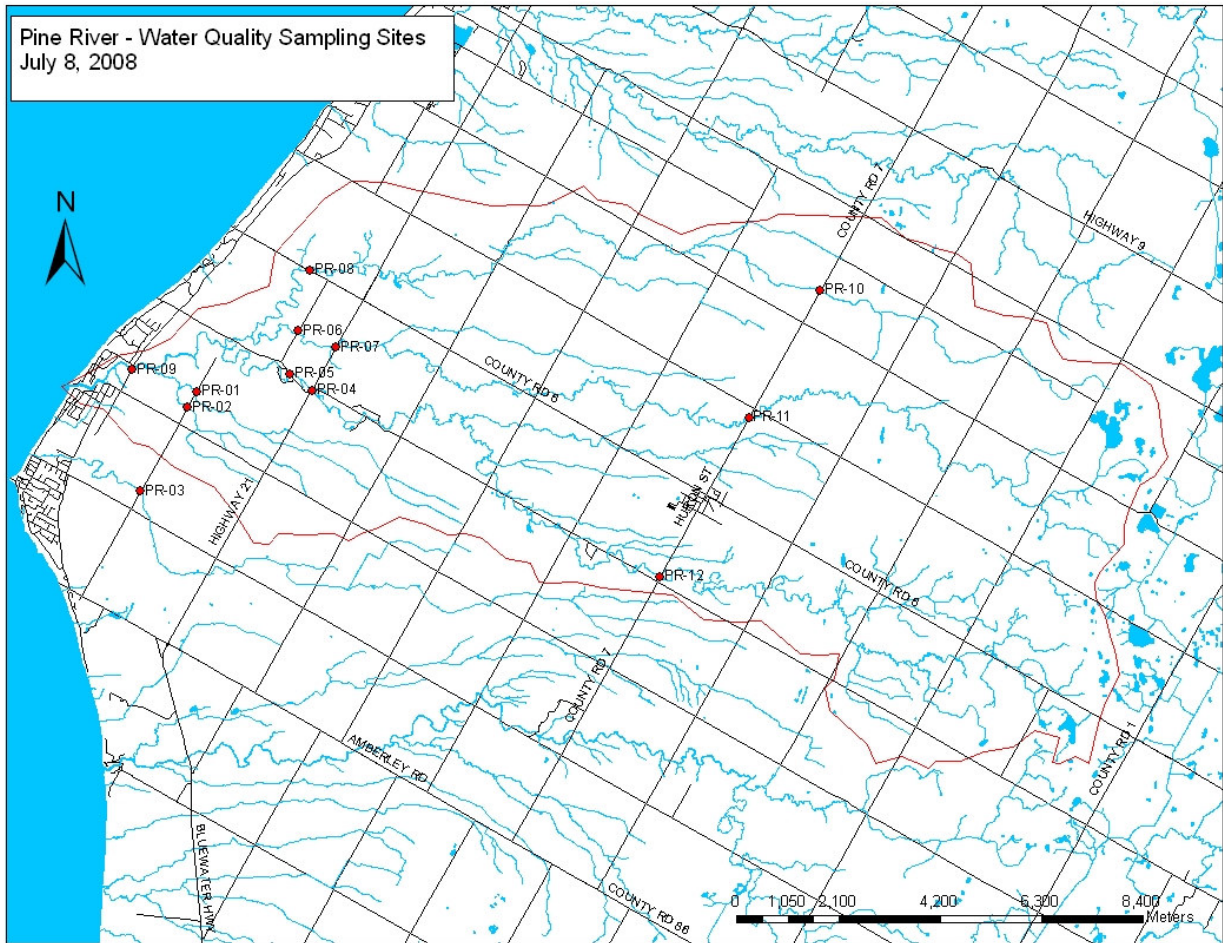


Figure 2. Water Quality Results, July 8, 2008 (mg/l unless otherwise noted)

	Royal Oak Creek PR-10		Pine River PR-11		Pine River PR-07		PR-06		South Pine River PR-12		PR-04		PR-05		Pine River Trib PR-02		PR-01		Clark Creek PR-03		Pine River PR-09	
LAB RESULTS																						
BOD	0.9	1.1	1.2	0.9	0.9	0.9	0.9	0.9	0.7	0.8	0.8	0.8	0.8	0.8	1.1	1	1	1.2				1
Suspended Solids	4.8	9.9	14.3	10.4	6.9	6.9	6.9	6.9	8.5	5.6	5.6	5.6	5.1	5.1	7.3	25.6	12.8					10.5
Total Solids	355	328	350	350	342	342	342	342	346	363	363	363	362	362	463	432	406					344
Dissolved Solids	350	318	336	339	336	336	336	337	337	357	357	357	357	357	456	406	394					334
Conductivity (µS/cm)	538	489	517	522	516	516	516	519	519	549	549	549	549	549	701	625	606					513
pH	8.35	8.37	8.33	8.37	8.38	8.38	8.38	8.44	8.44	8.4	8.4	8.4	8.36	8.36	8.35	8.23	8.3					8.43
Alkalinity	257	223	278	278	270	270	270	263	263	277	277	277	280	280	305	274	269					247
Ammonia + Ammonium <i>Unionized Ammonia</i> <i>(calculated)</i>	0.025	0.024	0.113	0.021	0.025	0.025	0.025	0.032	0.032	0.023	0.023	0.023	0.02	0.02	0.083	0.044	0.09					0.012
Nitrite	0.001	0	0.002	0	0	0	0	0.001	0	0	0	0	0	0	0.001	0.001	0.001					0
Nitrate	0.094	0.036	0.053	0.033	0.025	0.025	0.025	0.025	0.025	0.028	0.028	0.028	0.027	0.027	0.37	0.111	0.099					0.033
<i>Nitrate (calculated)</i>	6.906	5.694	2.357	1.697	2.025	2.025	2.025	3.315	3.315	2.912	2.912	2.873	2.873	2.873	8.82	8.319	7.081					3.717
Nitrate + Nitrite	7	5.73	2.41	1.73	2.05	2.05	2.05	3.34	3.34	2.94	2.94	2.9	2.9	2.9	9.19	8.43	7.18					3.75
Phosphate	0.0074	0.0016	0.0122	0.0019	0.0021	0.0021	0.0054	0.0054	0.0054	0.0027	0.0027	0.0027	0.0025	0.0025	0.0042	0.0015	0.0056					0.0006
Total Phosphorus	0.033	0.026	0.054	0.026	0.025	0.025	0.029	0.029	0.022	0.022	0.022	0.022	0.022	0.022	0.036	0.045	0.037					0.022
TKN	0.73	0.79	1.05	0.73	0.71	0.71	0.73	0.73	0.62	0.62	0.62	0.6	0.6	0.6	0.94	0.82	0.82					0.63
<i>Escherichia coli</i> (c/100mL)	330	330	580	210	330	330	84	84	180	180	180	280	280	280	500	530	20					180
<i>Fecal Streptococcus</i> (c/100mL)	800	230	80	300	120	120	24	24	230	230	230	220	220	220	620	1200	16					48
<i>Pseudomonas aeruginosa</i> (c/100mL)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	28	2					2
FIELD MEASUREMENTS																						
pH	7.7	7.55	7.61	7.55	7.5	7.5	7.5	7.8	7.8	7.5	7.5	7.56	7.56	7.46	7.58	7.48						7.59
Conductivity (µS/cm)	483	432	466	463	463	463	473	473	492	492	492	493	493	603	498	533						449
Temperature (°C)	22.3	21.6	23.2	22.2	21.9	21.9	23.8	23.8	21.8	21.8	21.8	21.8	21.8	20.4	20.4	21.4						22.8
Dissolved Oxygen	9.08	7.65	5.65	7.41	7.56	7.56	8.01	8.01	7.18	7.18	7.18	7.29	7.29	8.94	7.01	7.5						7.61

LAB RESULTS

BOD
Suspended Solids
Total Solids
Dissolved Solids
Conductivity (µS/cm)
pH
Alkalinity
Ammonia + Ammonium
Unionized Ammonia
(calculated)
Nitrite
Nitrate (calculated)
Nitrate + Nitrite
Phosphate
Total Phosphorus
TKN
Escherichia coli (c/100mL)
Fecal Streptococcus
(c/100mL)
Pseudomonas aeruginosa
(c/100mL)

FIELD MEASUREMENTS

pH
Conductivity (µS/cm)
Temperature (°C)
Dissolved Oxygen

Discussion

The sample results indicate that nitrate numbers are slightly elevated, but not uncommon for agricultural systems in Southern Ontario.

Royal Oak Creek at Highway 21 had significant presence of filamentous algae present at the crossing and it was also seen at Concession 8. These were the only two locations which had visible algae growth. A tributary to the Pine River as well as Clark Creek (Lake tributary) also have elevated nitrate numbers, but exhibited no visible evidence of eutrophication. In general the numbers are within the historical results from the Township of Huron-Kinloss water quality monitoring program, which actually found that water quality was improving with respect to nitrate concentrations in 2007 (the 2008 report is not yet published).

Also, visual surveys along Lake Huron tributaries in the vicinity of the Pine River indicated that algae mats are not restricted to the outlet of the Pine River. Furthermore, the closest sampling location to the Lake was PR-09 and the water quality results were within a normal range. Therefore it is not possible to say that the river is the sole contributor to the algae mats found along the lakeshore.

Overall, the results also indicate that there were no specific point sources found to be degrading the water quality in the Pine River.

Recommendations

It is recommended that water quality sampling continue through the Township of Huron-Kinloss as per their water quality monitoring program. The frequency and coverage provided by the monitoring program should be sufficient to capture ambient water quality and any anomalies that may occur.

The Ministry of the Environment is also conducting a 2-3 year study of the algae build-up in the Huron-Kinloss coastal area. The results of this study may further explain the algae mats and debris which are concerns of local residents.