Aoyama, Haruka

From: Office, Clerks
Sent: Friday, August 6, 2021 10:03 AM
To: Aoyama, Haruka
Cc: Singh, Sweta; Rai, Phoebe
Subject: FW: [External Email] Proposed Presentation on BMBC Lakes
Attachments: BMBC Lake Report Summary August 2021.docx

-----Original Message-----
From: Don [redacted]
Sent: Friday, August 6, 2021 9:58 AM
To: Office, Clerks <clerks@halifax.ca>
Cc: Lovelace, Pam <lovelap@halifax.ca>; Dale Smith [redacted]; Mary Ellen Donovan [redacted]
Subject: [External Email] Proposed Presentation on BMBC Lakes

[This email has been received from an external person or system]

This April I led a water quality survey of 21 lakes in the Blue Mountain-Birch Cove urban wilderness park under development. I attach a summary of the survey and results. Full details are provided in the final report which is about to be posted on the Friends of Blue Mountain-Birch Cove website. This report has been widely distributed, including to Councillors Pam Lovelace, Iona Stoddard, Kathryn Morse and Sam Austin.

Councillor Lovelace asked me to give a presentation on the survey to the HRM Environment and Sustainability Committee. I am quite willing to do so and therefore am asking for such a presentation to be placed on the agenda of an upcoming meeting. This would be quite timely with the recent announcement by Parks Canada of the new National Urban Parks program which will include the Blue Mountain-Birch Cove lakes.

Please let me know if you have any questions.

Regards,

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August 2021

A WATER QUALITY SURVEY OF LAKES IN THE BLUE MOUNTAIN-BIRCH COVE LAKES REGIONAL PARK, APRIL 2021

Donald Gordon, Pierre Clement, Dusan Soudek, Heather Leslie and David Young

Friends of the Blue Mountain-Birch Cove Lakes

The full details of this survey can be found in the complete report which is posted on the Friends of Blue Mountain-Birch Cove Lakes website (bluemountainfriends.ca).

SUMMARY

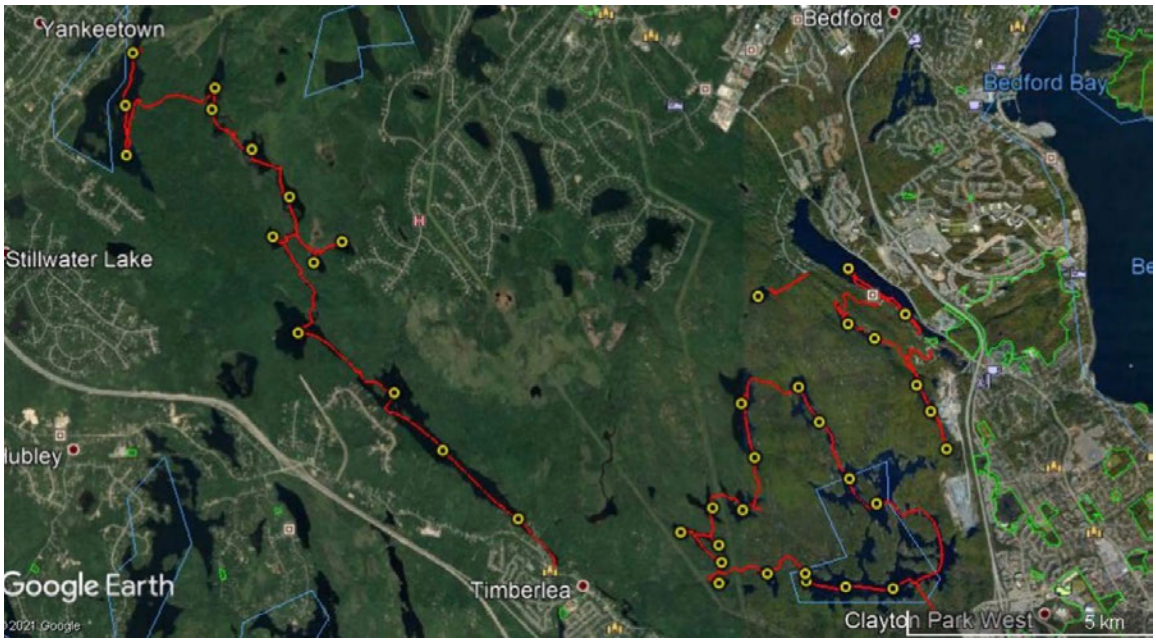
In April 2021, a team of volunteers conducted a water quality survey by canoe of 21 lakes within the conceptual boundary of the Blue Mountain-Birch Cove Regional Park. Variables measured included Secchi depth (a measure of turbidity), dissolved oxygen, specific conductance, pH and total phosphorus. Vertical profiles indicated that all lakes were well mixed from surface to bottom at the time of sampling. Mean values of each variable at all depths were then calculated for each lake. Mean Secchi depth ranged from 1.5 to 3.0 m, dissolved oxygen ranged from 79 to 101 %, specific conductance ranged from 21 to 208 μS/cm, pH ranged from 3.49 to 6.15 and total phosphorus ranged from 4 to 9 μg/l. The highest values for specific conductance occurred in the lower part of the Kearney Run Watershed and indicate the addition of road salt and other pollutants from surrounding development. The lowest values for pH can be attributed to the bedrock geology and widespread acid precipitation during the latter part of the twentieth century. Overall, the water quality of the lakes appears excellent but continued monitoring is recommended, especially in the lakes in the lower part of the Kearney Run Watershed such as Susies, Quarry, Washmill and Kearney lakes which are currently the most affected by development.

METHODS

All water quality information was collected by a team of four volunteers using two canoes on 8 April, 10 April and 14 April 2021, soon after the ice in the lakes disappeared (the last lake to open was Frasers Lake on 27 March). The routes travelled were recorded on smart phones equipped with GPS. The total distance traversed was 48.5 km (41.2 km paddling and 7.3 km portaging). Twenty-one different lakes were sampled. In each lake, a sampling station was selected as close to the deepest part as possible, aided by the bathymetric maps that were available for Coxs, Frasers and Kearney lakes. One or two additional sampling stations were also selected in the larger lakes.

Collecting water quality information by canoe in Charlies Lake.

GPS tracks of the three paddling and portaging routes followed to sample the 21 lakes and the locations of the 39 sampling stations.



In order to help locate sampling locations, water depth was determined using a hand-held HawkEye DepthTrax H1 digital depth recorder. Water transparency was measured at each station with a 20 cm diameter Secchi disk. This disk was lowered slowly in the water and the depth at which it disappeared was recorded. These readings have low precision when made from a canoe under windy conditions. Readings for both water depth and Secchi depth were recorded by pencil on field sheets.

Water quality measurements were made using a YSI Professional Plus multi-probe, provided by the Atlantic Water Network of Saint Mary's University, equipped with a 30 m cable which allowed vertical profiling. The variables measured were temperature, dissolved oxygen, conductivity, specific conductance, total dissolved solids and pH, all key variables for lake water quality studies. Barometric pressure was also recorded. The multi-probe was properly calibrated before use. The depths at which readings were made were estimated by the length of cable deployed. However, due to windy conditions, the cable was not always vertical so some readings at deeper depths may have been made at depths a few meters shallower than reported. Standard practice was to first lower the probe to the lake bottom and then take readings during recovery. Data were read from the handheld display and recorded by pencil on field sheets. They were also recorded internally for later downloading and processing.

The YSI Professional Plus multi-probe equipped with a 30 m cable.

A surface water sample was collected in each lake using a pre-rinsed sterilized 250 ml plastic bottle for the determination of total phosphorus. These were delivered the next day after overnight storage in a refrigerator to the Environmental Services Laboratory of the Nova Scotia Health Authority for analysis. In addition, surface samples were collected in Coxs, Long, Ash and Quarry lakes using two one liter pre-rinsed plastic bottles. These were subsequently delivered to Rob Jamieson at Dalhousie University for

processing along with the samples collected on 31 March 2021 during the fifth Metro Area Lake Synoptic Survey. The results are not included in this report.

All data collected were subsequently entered into Excel spreadsheets. One spreadsheet included the data read in the field and recorded on the field sheets while the other included the data later downloaded from the multi-probe. These two data sets were compared and any inconsistencies rectified. The downloaded data set was used in preparing the tables and figures in this report. Conductivity readings are highly sensitive to water temperature and therefore data are reported as specific conductance which is conductivity corrected to the standard temperature of 25 °C so that different water bodies can be compared.

For those interested, the downloaded data are posted on the Atlantic DataStream website (https://atlanticdatastream.ca/) managed by the Atlantic Water Network (https://atlwaternetwork.ca/) based at Saint Mary's University in Halifax.

Elevation, maximum measured depth, number of stations and number of observations of the lakes sampled within the Nine Mile River Watershed.

Lake	Elevation (m)	Maximum Measured Depth (m)	Number of Stations	Number of Observations
Coxs	85	14.3	3	21
Flat (1)	82	3.5	2	6
Long	81	2.9	2	6
Witherod	77	2.7	1	3
Cranberry	77	4.1	1	4
Un-named pond	75	3.6	1	4
Maple	72	10.5	1	6
Frasers	71	20.2	3	18

Elevation, maximum measured depth, number of stations and number of observations of the lakes sampled within the Kearney Run Watershed.

Lake	Elevation (m)	Maximum Measured Depth (m)	Number of Stations	Number of Observations
Ash	81	10.4	3	13
Crane	77	4.6	1	5
Three Finger	78	2.6	1	3
Big Horseshoe	77	2.6	3	8
Flat (2)	77	2.0	1	3
Big Cranberry	76	3.0	1	4
Susies	74	5.8	3	16
Fox	79	8.2	2	9
Quarry	74	5.9	2	10
Charlies	69	5.0	2	8
Washmill	57	8.1	3	12
Hobsons	76	8.0	1	6
Kearney	43	27.9	2	20

RESULTS

With the exception of some expected minor temperature stratification in surface water, the combined data of all variables indicate that without exception the lakes were well mixed at the time of sampling. Therefore, it was justifiable to calculate mean values of each variable for all lakes for comparison purposes. The mean values of Secchi depth, temperature, dissolved oxygen, specific conductance and pH for each lake are listed below with the date of sampling.

Mean values for temperature, Secchi depth, dissolved oxygen, specific conductance and pH in each lake. All stations and depths combined.

Lake	Date	Temperature (C)	Secchi Depth (m)	Dissolved Oxygen (% Saturation)	Specific Conductance (µS/cm)	pH
Coxs	8 April	5.9	2.5	100	88	6.15
Flat (1)		7.0	2.5	97	77	5.77
Long		8.4	2.5	100	71	5.47
Witherod		8.4	2.5	95	99	5.96
Cranberry		8.7	2.0	96	93	5.91
Un-named pond		8.4	2.0	98	77	5.70
Maple		7.1	2.5	99	72	5.58
Frasers		6.0	2.0	101	71	5.36
Susies	10 April	8.4	2.5	84	128	4.49
Big Cranberry		9.5	2.0	79	27	3.62
Flat (2)		10.0	1.5	81	33	3.49
Big Horseshoe		9.9	2.0	85	26	3.54
Three Finger		10.8	1.5	83	24	3.60
Crane		9.7	2.5	89	23	3.92
Ash		7.8	3.0	94	21	4.26
Fox		9.1	2.0	88	23	4.13
Quarry		8.9	2.0	94	141	4.76
Charlies	14 April	8.7	2.5	81	24	3.97
Washmill		8.3	2.0	84	200	5.54
Hobsons		7.0	2.0	81	27	3.63
Kearney		6.9	1.5	86	208	5.79

Ranking of lakes by mean Secchi depth (m).

Lake	Watershed	Secchi Depth (m)
Ash	Kearney Run	3.0
Long	Nine Mile River	2.5
Witherod	Nine Mile River	2.5
Coxs	Nine Mile River	2.5
Flat (1)	Nine Mile River	2.5
Maple	Nine Mile River	2.5
Crane	Kearney Run	2.5
Susies	Kearney Run	2.5
Charlies	Kearney Run	2.5
Quarry	Kearney Run	2.0
Cranberry	Nine Mile River	2.0
Big Cranberry	Kearney Run	2.0
Fox	Kearney Run	2.0
Washmill	Kearney Run	2.0
Un-named pond	Kearney Run	2.0
Frasers	Nine Mile River	2.0
Big Horseshoe	Kearney Run	2.0
Hobsons	Kearney Run	2.0
Flat (2)	Kearney Run	1.5
Kearney	Kearney Run	1.5
Three Finger	Kearney Run	1.5

Ranking of lakes by mean oxygen concentration (% Saturation).

Lake	Watershed	Mean Oxygen (% Saturation)
Frasers	Nine Mile River	101
Coxs	Nine Mile River	100
Long	Nine Mile River	100
Maple	Nine Mile River	99
Un-named pond	Nine Mile River	98
Flat (1)	Nine Mile River	97
Cranberry	Nine Mile River	96
Witherod	Nine Mile River	95
Ash	Kearney Run	94
Quarry	Kearney Run	94
Fox	Kearney Run	89
Crane	Kearney Run	89
Kearney	Kearney Run	86
Big Horseshoe	Kearney Run	85
Susies	Kearney Run	84
Washmill	Kearney Run	84
Three Finger	Kearney Run	83
Flat (2)	Kearney Run	81
Charlies	Kearney Run	81
Hobsons	Kearney Run	81
Big Cranberry	Kearney Run	79

Ranking of lakes by mean specific conductance values (µS/cm).

Lake	Watershed	Mean Specific Conductance (µS/cm)
Kearney	Kearney Run	208
Washmill	Kearney Run	200
Quarry	Kearney Run	141
Susies	Kearney Run	128
Witherod	Nine Mile River	99
Cranberry	Nine Mile River	93
Coxs	Nine Mile River	88
Un-named pond	Nine Mile River	77
Flat (1)	Nine Mile River	77
Maple	Nine Mile River	72
Long	Nine Mile River	71
Frasers	Nine Mile River	71
Flat (2)	Kearney Run	33
Big Cranberry	Kearney Run	27
Hobsons	Kearney Run	27
Big Horseshoe	Kearney Run	26
Three Finger	Kearney Run	24
Charlies	Kearney Run	24
Crane	Kearney Run	23
Fox	Kearney Run	23
Ash	Kearney Run	21

Ranking of lakes by mean pH values.

Lake	Watershed	Mean pH
Coxs	Nine Mile River	6.15
Witherod	Nine Mile River	5.96
Cranberry	Nine Mile River	5.91
Kearney	Kearney Run	5.79
Flat (1)	Nine Mile River	5.77
Un-named pond	Nine Mile River	5.70
Maple	Nine Mile River	5.58
Washmill	Kearney Run	5.54
Long	Nine Mile River	5.47
Frasers	Nine Mile River	5.36
Quarry	Kearney Run	4.76
Susies	Kearney Run	4.49
Ash	Kearney Run	4.26
Fox	Kearney Run	4.13
Charlies	Kearney Run	3.97
Crane	Kearney Run	3.92
Hobsons	Kearney Run	3.63
Big Cranberry	Kearney Run	3.62
Three Finger	Kearney Run	3.60
Big Horseshoe	Kearney Run	3.54
Flat (2)	Kearney Run	3.49

Ranking of lakes by mean total phosphorus concentration (µg/l) and inferred trophic status. The exceptionally high value for Flat Lake (2) is highly suspicious.

Lake	Watershed	Total Phosphorus (µg/l)	Trophic Status
Flat (2)	Kearney Run	97 (?)	Eutrophic
Coxs	Nine Mile River	9	Oligotrophic
Big Horseshoe	Kearney Run	9	Oligotrophic
Flat (1)	Nine Mile River	8	Oligotrophic
Long	Nine Mile River	8	Oligotrophic
Witherod	Nine Mile River	8	Oligotrophic
Cranberry	Nine Mile River	8	Oligotrophic
Un-named pond	Nine Mile River	8	Oligotrophic
Maple	Nine Mile River	8	Oligotrophic
Frasers	Nine Mile River	8	Oligotrophic
Big Cranberry	Kearney Run	8	Oligotrophic
Susies	Kearney Run	7	Oligotrophic
Three Finger	Kearney Run	7	Oligotrophic
Hobsons	Kearney Run	7	Oligotrophic
Crane	Kearney Run	5	Oligotrophic
Fox	Kearney Run	5	Oligotrophic
Quarry	Kearney Run	5	Oligotrophic
Washmill	Kearney Run	5	Oligotrophic
Ash	Kearney Run	4	Oligotrophic
Charlies	Kearney Run	4	Oligotrophic
Kearney	Kearney Run	4	Oligotrophic

ACKNOWLEDGEMENTS

We thank the many people who contributed to the success of this study. The Planning Committee of the Friends of Blue Mountain-Birch Cove Lakes provided valuable advice during the planning of this project. Laura Chandler, Atlantic Water Network of Saint Mary's University, kindly provided the Wet-Pro Field kit and Secchi disk for the water quality measurements. Dawn MacNeill, Nova Scotia Department of Environment and Climate Change, facilitated the permit required to conduct research in a provincial wilderness area. Cameron Deacoff, Nova Scotia Department of Environment and Climate Change, arranged for and funded the total phosphorus analyses by the Environmental Services Laboratory of the Nova Scotia Health Authority and also provided valuable advice throughout the planning and execution of this project. Eric Jorden kindly loaned his Kevlar canoe for the field sampling. And finally, we thank Cameron Deacoff, Rob Jamieson, David Patriquin, Laura Chandler and the Planning Committee of Friends of Blue Mountain-Birch Cove Lakes for reviewing this draft report and offering suggestions for improvement. This project was initially scheduled for April 2020 but had to be cancelled at the last moment due to the Covid 19 pandemic. We are particularly pleased that we were able to carry it out in 2021 before the third wave hit.