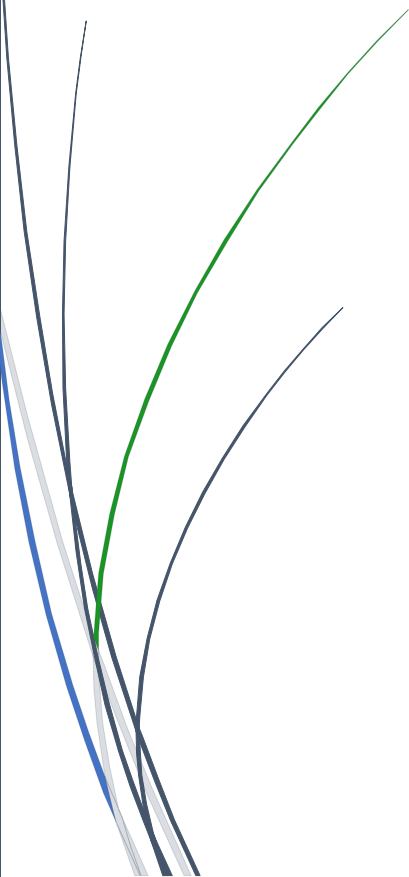


Brightsand Lake: 2021 Water Sampling Summary

Prepared for:
RM Mervin



Compiled by:
North Saskatchewan River
Basin Council Inc.



Acknowledgments

Special thanks to the RM of Mervin for their NSRBC membership aiding our source water protection initiatives, and their dedication and encouragement for water quality monitoring for Brightsand Lake.

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Introduction

The North Saskatchewan River Basin Council (NSRBC) was contracted to collect water quality samples for Brightsand Lake in 2021. There's concern from residents and local government on various lake water quality issues and how the lake has fared since the last lake water quality study completed by Crosby Hanna & Associates in 2017. The year 2021 held a considerable drought, with multiple lakes experiencing similar water quality issues such as low lake levels and reduced nutrient dilution, resulting in poor water clarity and algae blooms. Though the drought had a significant impact on lakes, various other factors play a role in lake sustainability.

Methods

Quality Assurance and Quality Control

All sampling collection and handling follow appropriate Standard Operating Procedures (SOPs) and Quality Assurance and Quality Control protocols. NSRBC SOPs were developed using methods and procedures established and endorsed by Saskatchewan Polytechnic. Some assurance measures implemented to secure accuracy include:

- Ensuring accuracy of limnology testing. The YSI is calibrated before each field trip and as needed in the field. Verification of pH 7 and pH 4 calibration standards are used to ensure accuracy.
- Samples are discarded if issues were observed with quality control, such as sediment disturbance or equipment malfunction.
- All collection equipment and bottles are cleaned prior to collection of the sample.

Water samples were collected at the baseline location (53.594950, -108.875349) to assess for nutrients and general chemistry parameters. Samples were collected on September 13, 2021. YSI meter water quality readings were taken in-situ. However, equipment malfunctions deemed results void and were discarded and associated fees were not charged. The water samples for lab analysis were collected using a Van Dorn water sampler. Samples were preserved using collection bottles and instructions provided by the Saskatchewan Research Council. Samples were taken to the Saskatchewan Research Council (SRC) Environmental Analytical Laboratories

for analysis. SRC’s lab experienced a data hack at the time of sample submission, resulting in analysis sub-contracted to ALS Environmental (Appendix).

Results

The following 6 figures compare data collected in 2017 (Crosby Hanna & Associates, 2017), to the samples collected by NSRBC in 2021. It should be noted with 2021 experiencing an extreme drought and the added stress inflicted on lakes as a result, it’s expected that parameters would vary from data obtained in 2017. Only data collected in both sample years is compared in below figures. The raw data with all parameters tested accompanies this report.

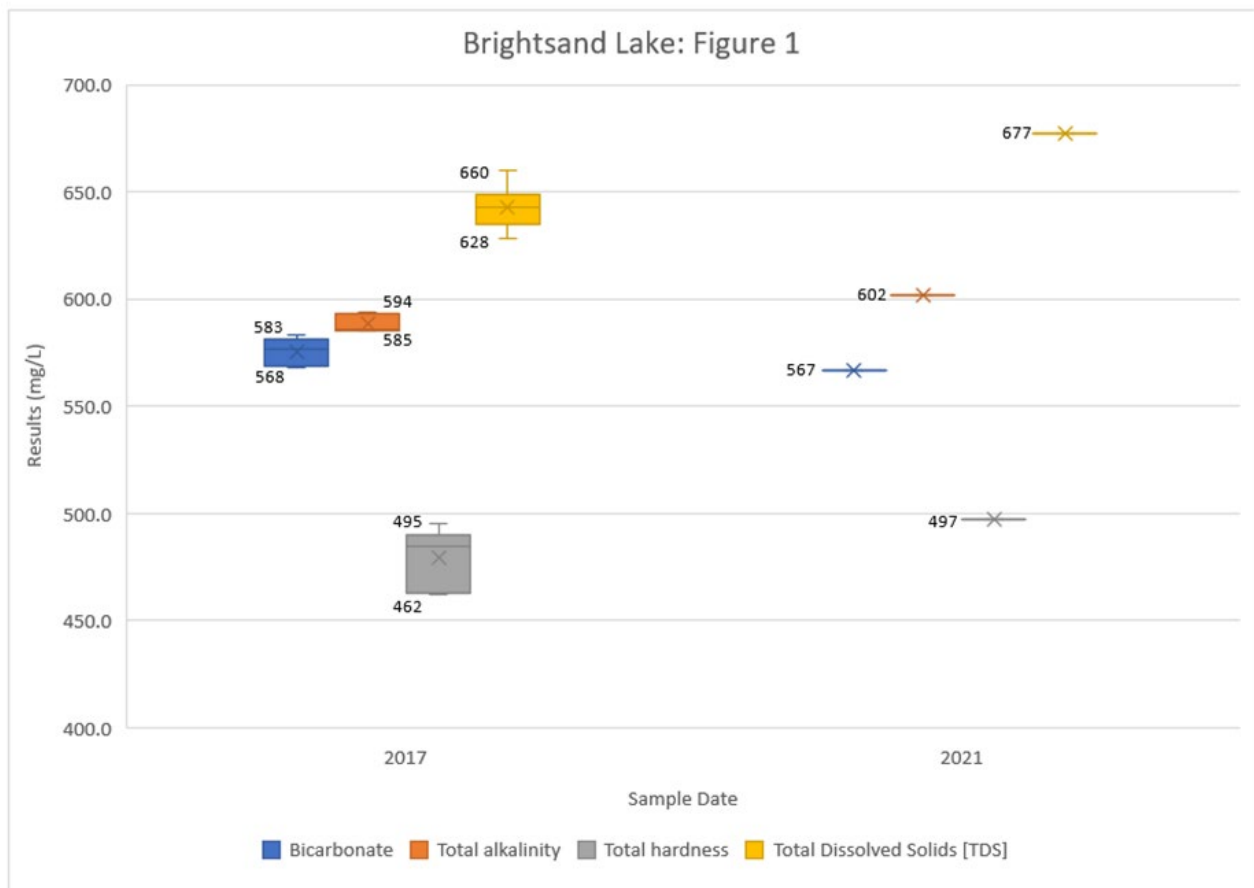


Figure 1 (Bicarbonate, Total alkalinity, Total hardness, TDS): Compares Brightsand Lake data collected from summer of 2017 by Crosby Hanna & Associates, to baseline data collected by the NSRBC in fall of 2021. 2017 shows values for minimum and maximum readings obtained from the data range. 2021 shows lab results from baseline water samples collected.

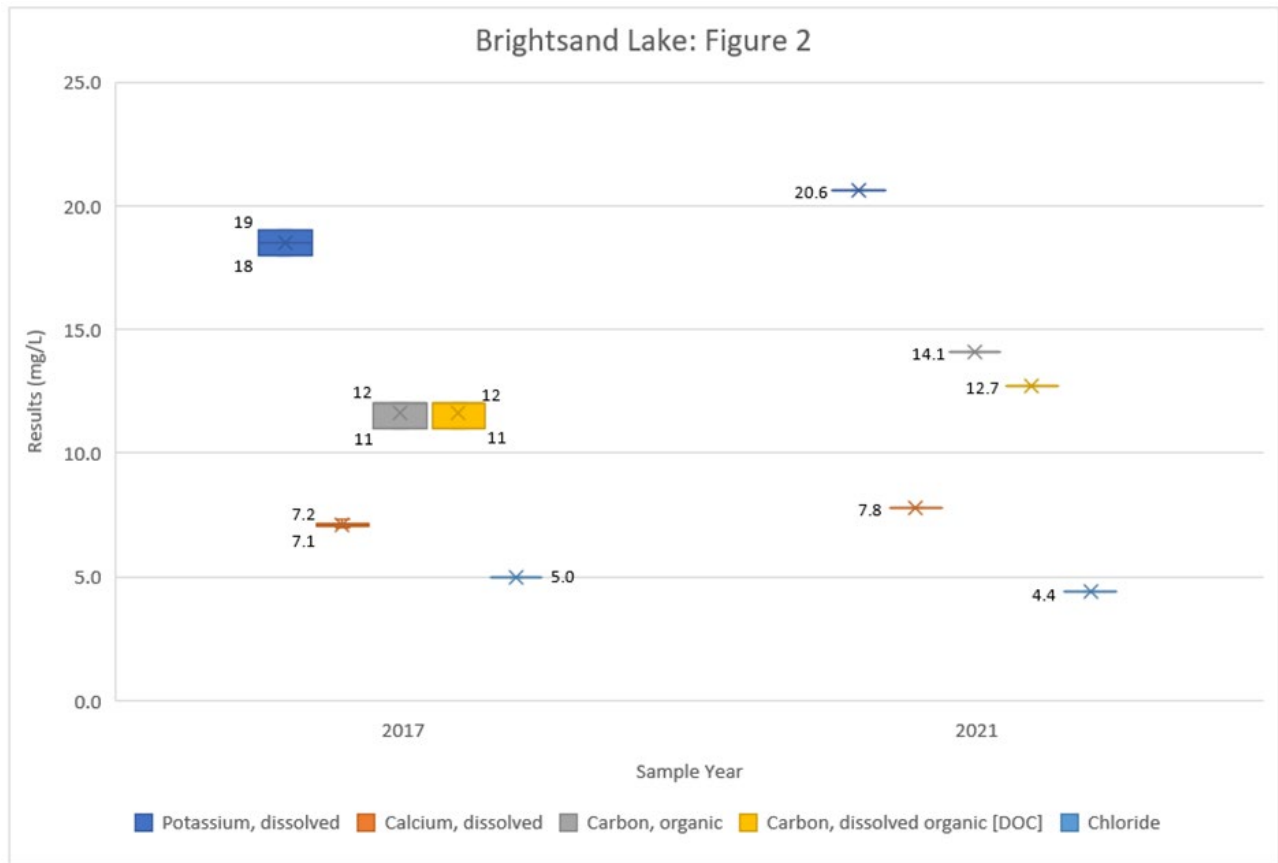


Figure 2 (Dissolved Potassium, dissolved Calcium, Organic Carbon, DOC, Chloride): Compares Brightsand Lake data collected from summer of 2017 by Crosby Hanna & Associates, to baseline data collected by the NSRBC in fall of 2021. 2017 shows values for minimum and maximum readings obtained from the data range. 2021 shows lab results from baseline water samples collected.

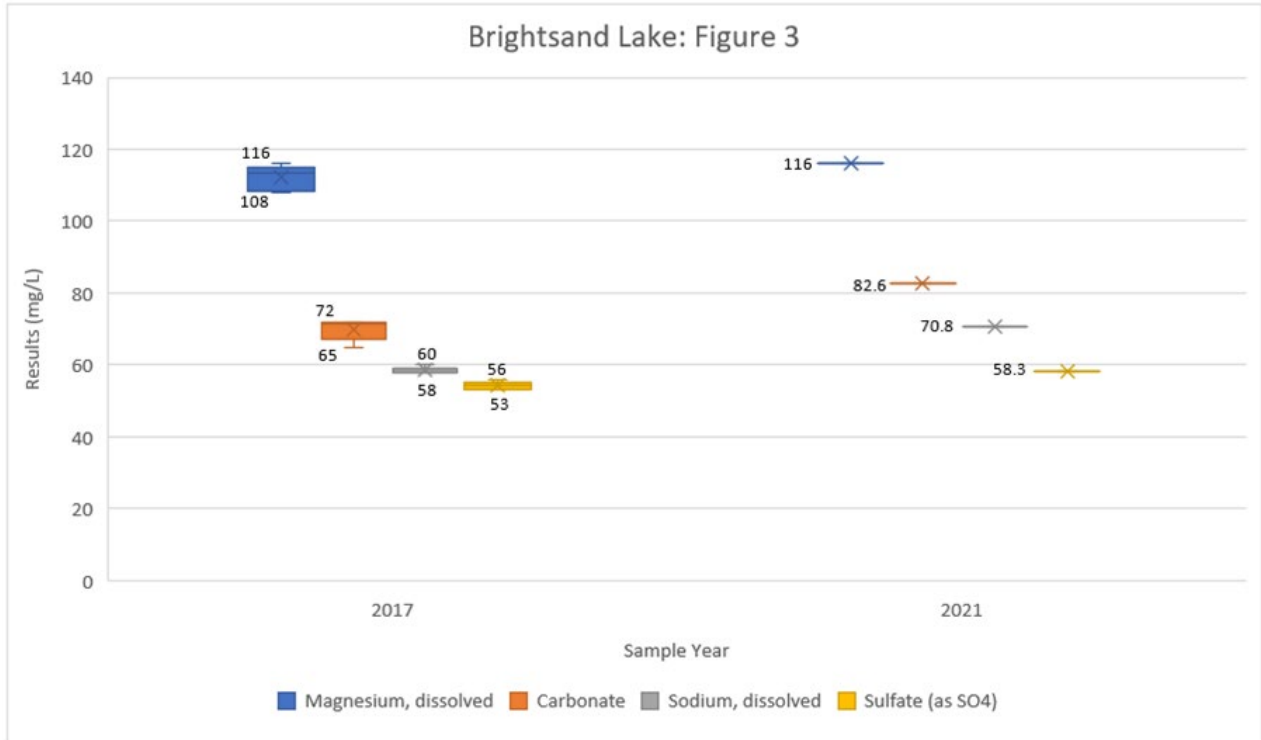


Figure 3 (Dissolved Magnesium, Carbonate, dissolved Sodium, Sulfate (SO₄): Compares Brightsand Lake data collected from summer of 2017 by Crosby Hanna & Associates, to baseline data collected by the NSRBC in fall of 2021. 2017 shows values for minimum and maximum readings obtained from the data range. 2021 shows lab results from baseline water samples collected.

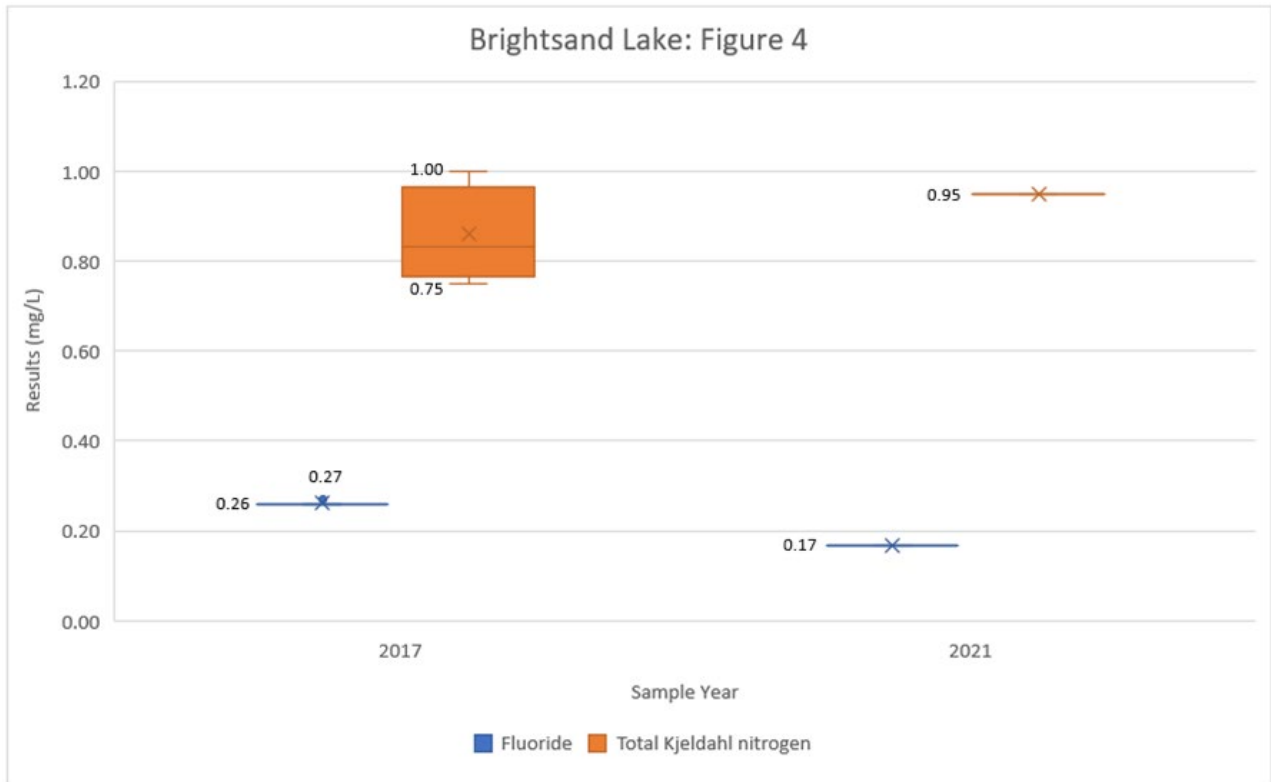


Figure 4 (Fluoride, Total Kjeldahl Nitrogen): Compares Brightsand Lake data collected from summer of 2017 by Crosby Hanna & Associates, to baseline data collected by the NSRBC in fall of 2021. 2017 shows values for minimum and maximum readings obtained from the data range. 2021 shows lab results from baseline water samples collected.

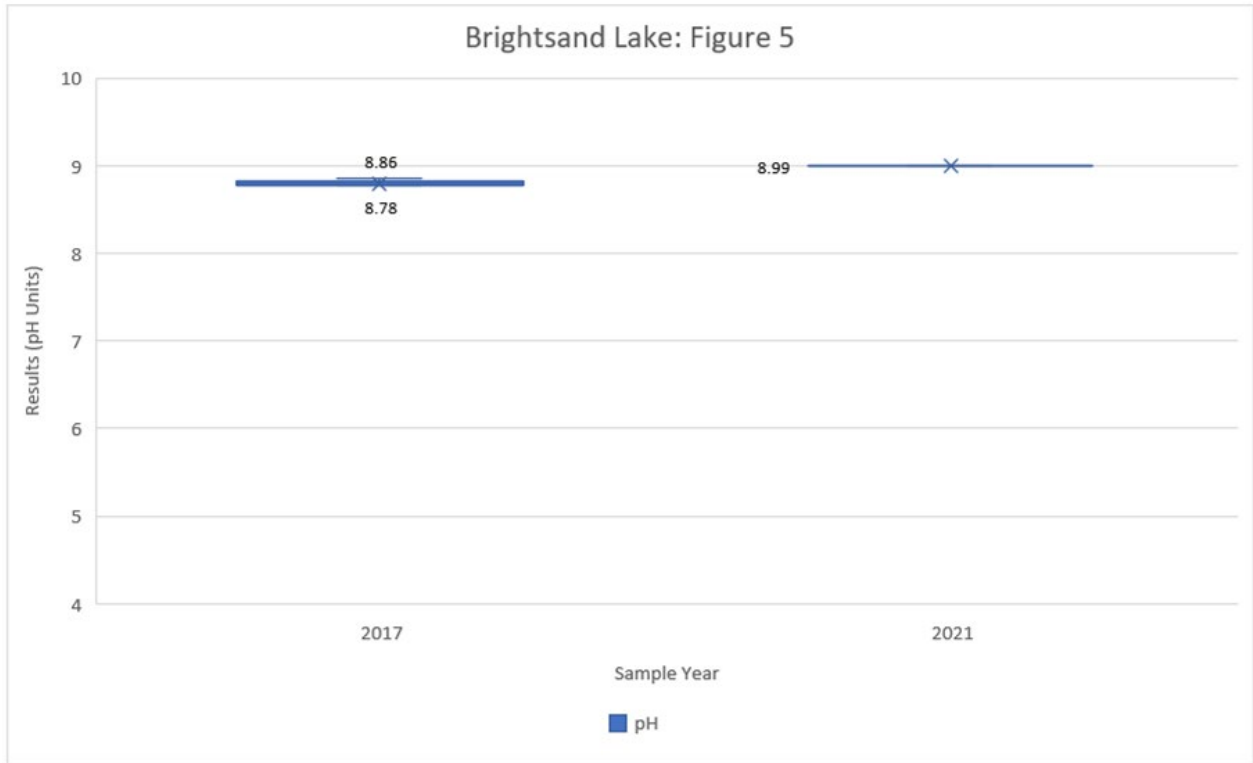


Figure 5 (pH): Compares Brightsand Lake data collected from summer of 2017 by Crosby Hanna & Associates, to baseline data collected by the NSRBC in fall of 2021. 2017 shows values for minimum and maximum readings obtained from the data range. 2021 shows lab results from baseline water samples collected.

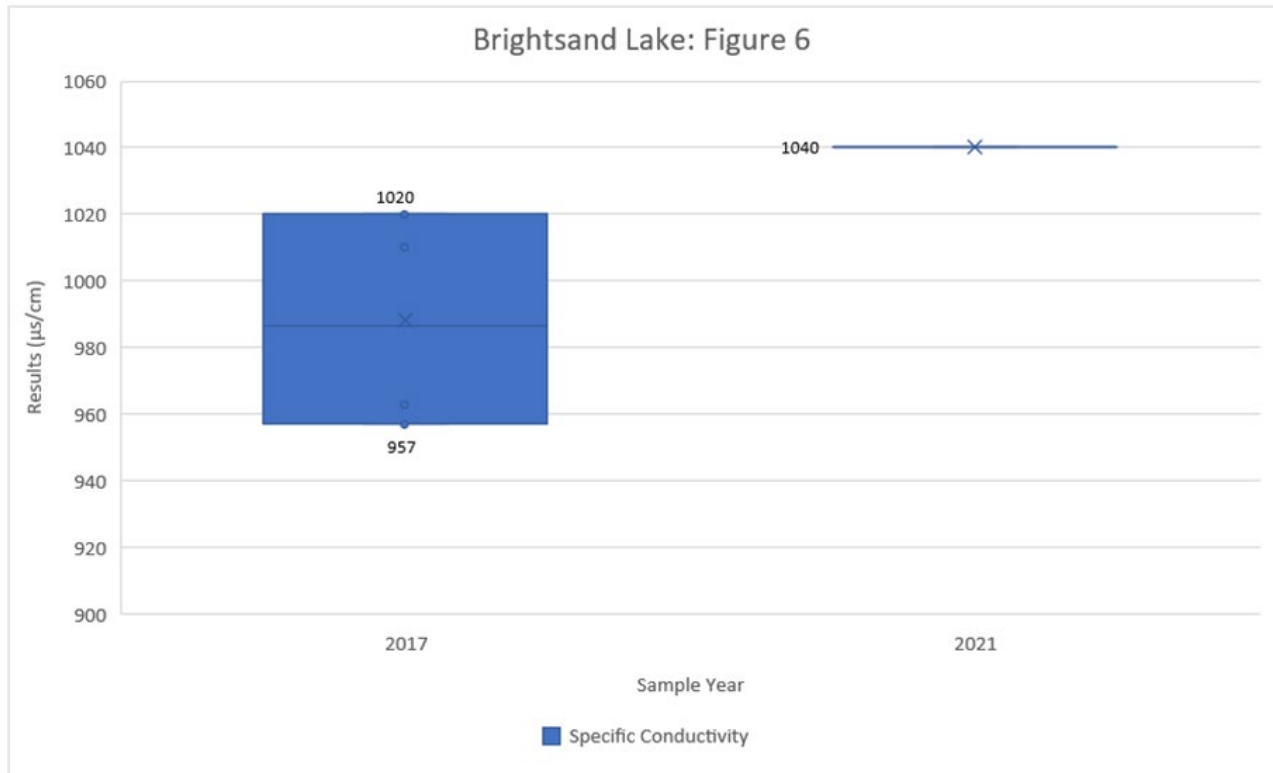


Figure 6 (Specific Conductivity): Compares Brightsand Lake data collected from summer of 2017 by Crosby Hanna & Associates, to baseline data collected by the NSRBC in fall of 2021. 2017 shows values for minimum and maximum readings obtained from the data range. 2021 shows lab results from baseline water samples collected.

Conclusion

The drought in 2021 placed additional stress on lakes with symptoms of algae, low water clarity, and low water levels, experienced throughout the North Saskatchewan River Watershed. With lake levels down from normal, this created a scenario of higher nutrient concentration. With less water comes less dilution of nutrients, leading to increase in major water quality events and algae blooms. This does not mean a tremendous shift in water quality will permanently be experienced in subsequent years, though a possible ongoing drought will likely see similar conditions arise in the future. Data collected in 2021 was to establish a baseline for ongoing sampling and an initial comparison to historic data. Future and ongoing sample is required over subsequent years to establish trends for data that can be used to make informed decisions or projections long term.

Recommendations

Drought is only a glimpse into the story of water quality at Brightsand Lake. The results obtained and water quality events from 2021 should not raise alarm, rather encourage continued monitoring to establish trends. Though it takes years to establish reliable trends and accurately determine significant changes, it's data that will aid in future work to protect and preserve Brightsand Lake. Continued observation and testing are in everyone's best interest to keep this lake asset viable. Baseline monitoring is encouraged at least annually to learn where the lake's water quality is headed over time. In addition to monitoring water quality, addressing any current known threats (i.e., leaky septic, shoreline vegetation loss, aquatic invasive species, agricultural runoff, etc.) is insurance and prevention to future restoration costs or loss of lake value.

References

Crosby Hanna & Associates. 2017. Brightsand Lake: Lakeshore Management Study.

ALS Environmental. 2021. Work order: SK2103505



Environmental

Appendix

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **SK2103505**

Client : **Saskatchewan Research Council**

Contact : **Maddie Simpo**

Address : **143- 111 RESEARCH DRIVE**
Saskatoon, SK Canada S7N 3R2

E-mail : **maddie@nstrbc.ca**

Telephone : **----**

Facsimile : **----**

Project : **----**

Purchase order number : **----**

C-O-C number : **----**

Site : **----**

Sampler : **----**

Laboratory : **Saskatoon - Environmental**

Contact : **Brian Morgan**

Address : **819 58 Street East**
Saskatoon, Saskatchewan Canada S7K 6X5

E-mail : **Brian.Morgan@ALSGlobal.com**

Telephone : **1 306 221 7147**

Facsimile : **+1 306 668 8383**

Page : **1 of 5**

Quote number : **RG2021SASR1000001 (standard rates)**

QC Level : **ALS Canada Standard Quality Control**

Dates

Date Samples Received : **16-Sep-2021 12:00**

Client Requested Due Date : **23-Sep-2021**

Issue Date : **17-Sep-2021**

Scheduled Reporting Date : **23-Sep-2021**

Delivery Details

Mode of Delivery : **Undefined**

No. of coolers/boxes : **----**

Receipt Detail : **----**

Security Seal : **Not Available**

Temperature : **13.4**

No. of samples received / analyzed : **1 / 1**

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances (if any)
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- *Where possible, ALS will store samples for the following durations, measured from date of sample submission: 45 days for Soil and Water samples; 6 months for Tissue/Biota samples; 14 days for air samples collected on re-usable media; and 3 days for water samples submitted for microbiological testing. Longer storage times are available upon request.*



Issue Date : 17-Sep-2021
 Page : 2 of 5
 Work Order : SK2103505 Amendment 0
 Client : Saskatchewan Research Council

Sample Container(s)/Preservation Non-Compliances (if any)

All comparisons are made against pretreatment/preservation practices published by CCME, BC ENV, Ontario MOE, Environment Canada, Health Canada, US EPA, APHA Standard Methods, ASTM, or ISO, and comply with provincial requirements for the laboratory location.

Method	Sample Container Received	Preferred Sample Container for Analysis
Client sample ID	Sample Container Received Preferred Sample Container for Analysis	
Dissolved Metals in Water by CRC ICPMS : E421		
Brightsand Lake Baseline (53.594950,-108.875349)	- HDPE	
	- HDPE dissolved (nitric acid)	

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Matrix: **Water**

Laboratory sample ID	Client sampling date / time	Client sample ID
SK2103505-001	13-Sep-2021 11:00	Brightsand Lake Baseline (53.594950,-108.87

Water - E235.N02	Nitrite in Water by IC (0.01mg/L)	✓
Water - E235.N03	Nitrate in Water by IC (0.02mg/L)	✓
Water - E298	Ammonia by Fluorescence	✓
Water - E318	Total Kjeldahl Nitrogen by Fluorescence (0.2	✓
Water - E355-L	Total Organic Carbon (Non-Purgeable) by	✓
Water - E358-L	Dissolved Organic Carbon by Combustion (0.5	✓
Water - E372-U	Total Phosphorus by Colourimetry (0.002 mg/L)	✓
Water - E378-H	Dissolved Orthophosphate by Colourimetry (0.05	✓
Water - PR01	Routine Water	✓



Issue Date : 17-Sep-2021
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 Client : Saskatchewan Research Council

Proactive Holding Time Report

The following sample(s) were received with less than half the recommended holding time remaining for the indicated tests. ALS cannot guarantee analysis for these tests within holding times.

Client Sample ID	Test Method	Recommended Holding Time
Brightsand Lake Baseline (53.594950,-108.875349)	E235.NO2	3 days
Brightsand Lake Baseline (53.594950,-108.875349)	E235.NO3	3 days
Brightsand Lake Baseline (53.594950,-108.875349)	E358-L	3 days
Brightsand Lake Baseline (53.594950,-108.875349)	E378-H	3 days

The following samples were received beyond the recommended holding times for the indicated tests.

Client Sample ID	Test Method	Recommended Holding Time
Brightsand Lake Baseline (53.594950,-108.875349)	E108	0.25 hours

Requested Deliverables

Maddie Simps

Certificate of Analysis (Crosstab) (COA - CrossTab (CAN)) Email maddie@nsrbc.ca
 Sample Receipt Notification with Analytes & LORs (SRN - Long (CAN)) Email maddie@nsrbc.ca

Roxane Ortmann

Certificate of Analysis (Crosstab) (COA - CrossTab (CAN)) Email roxane.ortmann@src.sk.ca
 Sample Receipt Notification with Analytes & LORs (SRN - Long (CAN)) Email roxane.ortmann@src.sk.ca
 Tax Invoice (INVOICE (CAN)) Email roxane.ortmann@src.sk.ca



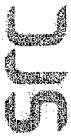
Summary of Requested Analysis with Methods and Limit of Reporting (LOR)

Sale item Method	Method Reference	Laboratory	Analyte	LOR	Unit
Ammonia by Fluorescence [Water]					
E298	Ammonia by Fluorescence	Waterloo	ammonia, total (as N)	0.005	mg/L
Dissolved Metals Water Filtration [Water]					
EP421	Dissolved Metals Water Filtration	Saskatoon	dissolved metals filtration location	-	-
Dissolved Organic Carbon by Combustion (0.5 mg/L) in Water [Water]					
E358-L	Dissolved Organic Carbon by Combustion (Low Level)	Waterloo	carbon, dissolved organic [DOC]	0.5	mg/L
Dissolved Orthophosphate by Colourimetry (0.05 mg/L) [Water]					
E378-H	Dissolved Orthophosphate by Colourimetry	Saskatoon	phosphate, ortho-, dissolved (as P)	0.05	mg/L
Nitrate in Water by IC (0.02mg/L) [Water]					
E235.NO3	Nitrate in Water by IC	Saskatoon	nitrate (as N)	0.02	mg/L
Nitrite in Water by IC (0.01mg/L) [Water]					
E235.NO2	Nitrite in Water by IC	Saskatoon	nitrite (as N)	0.01	mg/L
Routine Water [Water]					
E100	Conductivity in Water	Saskatoon	conductivity	2	µS/cm
E108	pH by Meter	Saskatoon	pH	0.1	pH units
E235.Cl	Chloride in Water by IC	Saskatoon	chloride	0.5	mg/L
E235.F	Fluoride in Water by IC	Saskatoon	fluoride	0.02	mg/L
E235.NO2	Nitrite in Water by IC	Saskatoon	nitrite (as N)	0.01	mg/L
E235.NO3	Nitrate in Water by IC	Saskatoon	nitrate (as N)	0.02	mg/L
E235.SO4	Sulfate in Water by IC	Saskatoon	sulfate (as SO4)	0.3	mg/L
E290	Alkalinity Species by Titration	Saskatoon	alkalinity, bicarbonate (as HCO3)	1	mg/L
E290	Alkalinity Species by Titration	Saskatoon	alkalinity, carbonate (as CO3)	1	mg/L
E290	Alkalinity Species by Titration	Saskatoon	alkalinity, hydroxide (as OH)	1	mg/L
E290	Alkalinity Species by Titration	Saskatoon	alkalinity, total (as CaCO3)	2	mg/L
E421	Dissolved Metals in Water by CRC ICPMS	Saskatoon	calcium, dissolved	0.05	mg/L
E421	Dissolved Metals in Water by CRC ICPMS	Saskatoon	iron, dissolved	0.03	mg/L
E421	Dissolved Metals in Water by CRC ICPMS	Saskatoon	magnesium, dissolved	0.005	mg/L
E421	Dissolved Metals in Water by CRC ICPMS	Saskatoon	manganese, dissolved	0.005	mg/L
E421	Dissolved Metals in Water by CRC ICPMS	Saskatoon	potassium, dissolved	0.05	mg/L
E421	Dissolved Metals in Water by CRC ICPMS	Saskatoon	sodium, dissolved	0.05	mg/L
EC100	Dissolved Hardness (Calculated)	Saskatoon	hardness (as CaCO3), dissolved	0.5	mg/L
EC101	Ion Balance using Dissolved Metals	Saskatoon	anion sum	0.1	meq/L
EC101	Ion Balance using Dissolved Metals	Saskatoon	cation sum	0.1	meq/L



Issue Date : 17-Sep-2021
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 Client : Saskatchewan Research Council

EC101	Ion Balance using Dissolved Metals	Saskatoon	ion balance (cation-anion difference)	0.01	%
EC101	Ion Balance using Dissolved Metals	Saskatoon	ion balance (cations/anions ratio)	0.01	%
EC103	TDS in Water (Calculation)	Saskatoon	solids, total dissolved [TDS], calculated	1	mg/L
EC235.N+N	Nitrate and Nitrite (as N) (Calculation)	Saskatoon	nitrate + nitrite (as N)	0.05	mg/L
Total Kjeldahl Nitrogen by Fluorescence (0.2 mg/L) [Water]					
E318	Total Kjeldahl Nitrogen by Fluorescence (Low Level)	Waterloo	Kjeldahl nitrogen, total [TKN]	0.2	mg/L
Total Organic Carbon (Non-Purgeable) by Combustion (0.5 mg/L) in Water [Water]					
E355-L	Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	Waterloo	carbon, total organic [TOC]	0.5	mg/L
Total Phosphorus by Colourimetry (0.002 mg/L) [Water]					
E372-U	Total Phosphorus by Colourimetry (Ultra Trace)	Waterloo	phosphorus, total	0.002	mg/L



SRC Environmental Analytical Laboratories
102-422 Downey Rd, Saskatoon, SK S7N 4N1
Ph. (306)933-6932, Toll free 800-240-8808

CHAIN OF CUSTODY / ANALYSIS FORM

Environmental Division
Saskatoon
Work Order Reference
SK2103505

Turnaround Time: Regular Rush (100% surcharge)
 Rush (100% surcharge + overtime charges authorized*)
* Contact lab in advance to authorize

Invoice to:

Company Name: North Saskatchewan River Basin Council
Contact Name: Maddie Simpo
Address: Box 458
City/Prov: Halifax, SK
Postal Code: S0U 1A0 Phone: 306-201-3272

Email: Maddie @nsrbc.ca
Quote #: _____

Report Format: Report Results to:

PDF Excel Water Security Agency WaterTrax Database

Report to: Same as Invoice to?

Company Name: _____
Contact Name: _____
Address: _____
City/Prov: _____
Postal Code: _____
Phone: _____
Email: _____
Email: _____
Email: _____

Special Instructions/Notes:

ORTHO-P - expired
Sub ALS Sept 16/21

Lab Use Only:
Radioactivity: background
 0.05-0.2mR/hr
 >0.2mR/hr
WSA Flag

of bottles _____
Preservatives _____
Size _____
In Subgroup # _____

Received by: CJT

5-16-9

Telephone: -1 306 688 6870

Tests Required

DOC (Lab Filtered)	<input checked="" type="checkbox"/>
General Chemistry	<input checked="" type="checkbox"/>
Nutrients (Nitrates, TKN, NH3)	<input checked="" type="checkbox"/>
Ortho-Phosphate	<input checked="" type="checkbox"/>
Total Organic Carbon	<input checked="" type="checkbox"/>
P, total	<input checked="" type="checkbox"/>
F, coll	<input type="checkbox"/>
Fecal coliform	<input type="checkbox"/>
Fecal strep.	<input type="checkbox"/>
Total coliform	<input type="checkbox"/>

Sample Site Description	# of Bottles per site	Sample Type (water, soil, etc.)	Date/Time Sampled
Brightsand Lake <u>baseline (53.5949501-108.875349)</u>	<u>3</u>	Water	<u>Sept 16/21 - 11AM</u>

I Maddie Simpo hereby relinquish the above listed samples to SRC Analytical and authorize the above listed analysis as per the Standard

ME3
16/9/21
12:00
13.4°

M. Simpo
Relinquished by Signature:

Terms and Conditions on the 14 day of September, 2021.
(Day) (Month) (Year)