Assessment Methods for 24-hour pH

Surface Water Quality Assessment Advisory Workgroup Meeting

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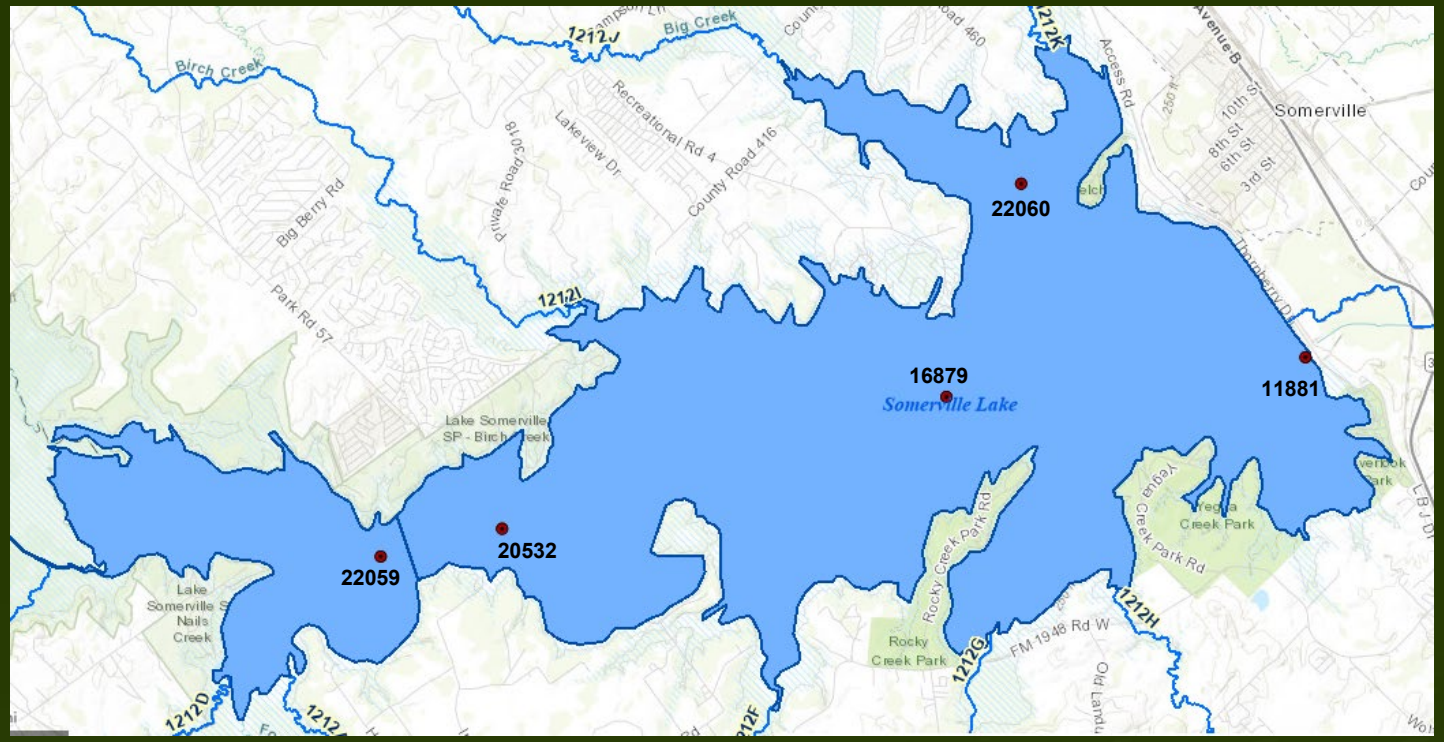
Objectives

- Present data from recent Lake Somerville Study
- Review proposed 24-hour pH assessments approaches
- Application of study data to the proposed approaches

Background: Somerville Lake



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Somerville Lake stations

- **Dam site**: AU 01, station 11881- SOMERVILLE LAKE NEAR DAM on the eastern end of the lake
- **Middle site**: AU 03, station 16879- approximately 4.3 kilometers west of the dam site near the Birch Creek
- **Upper site**: AU 04, station 22059- which lies at the ADJOINING POINT OF BURLESON LEE AND WASHINGTON COUNTIES near western end of the reservoir

Background on pH in TSWQS

- *General Criteria (§307.4 of TSWQS) - Consistent with §307.1 of this title, pH levels in all surface water in the state must be maintained so as to not interfere with the reasonable use of such waters.*
- *Site-Specific Uses and Criteria for Classified Segments (§307.7 of TSWQS) - Site-specific numerical criteria for pH are established as absolute minima and maxima.*
- Lake Somerville pH criteria range: 6.5-9 minima/maxima
- There is no 24-hour pH assessment method

Assessment History

High pH	AU_01 (11881)			AU_03 (16879, 20532)			AU_04 (11882, 22059)		
	Grab/24 hour	Grab	24-hour maxima	Grab/24 hour	Grab	24-hour maxima	Grab/24 hour	Grab	24-hour maxima
2008IR	NS	--	--	NS	--	--	FS	--	--
2010IR	--	FS	NS	--	FS	NS	--	FS	NS
2012IR	--	FS	NS	--	FS	NS	--	FS	NS

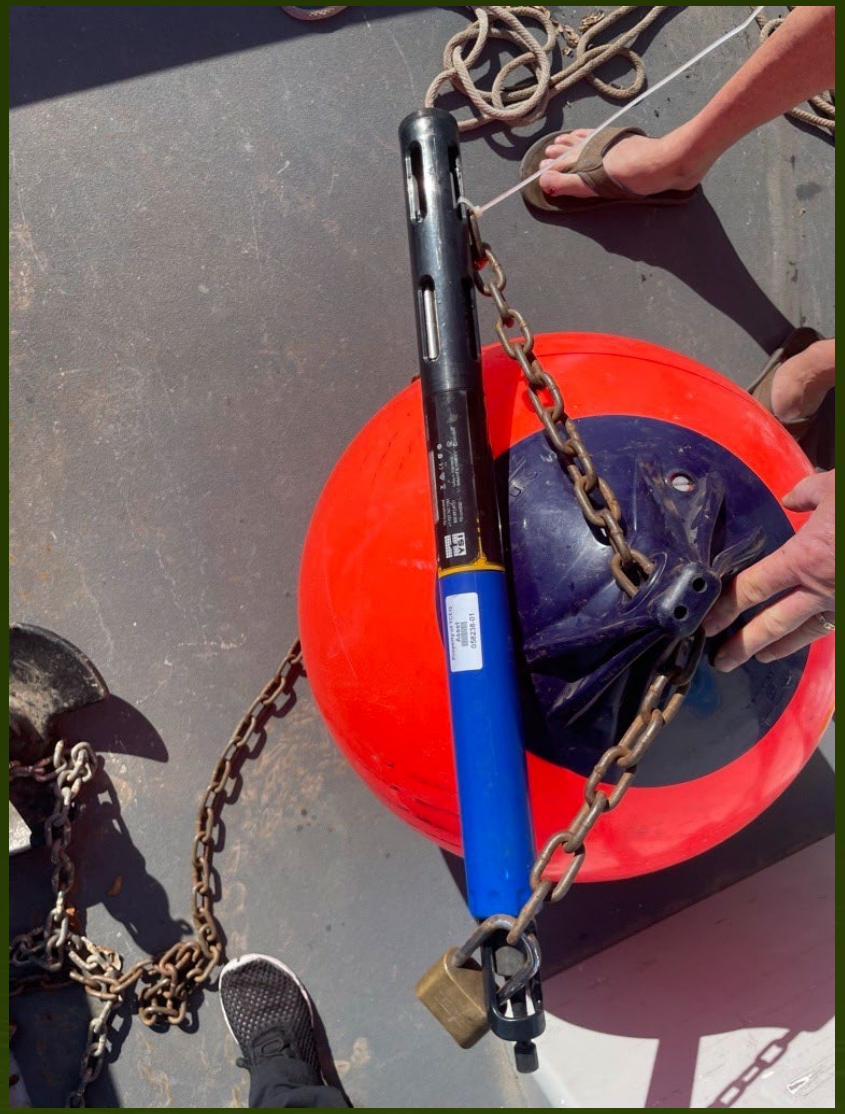
Monitoring Diel pH in Somerville Lake- 2022 study

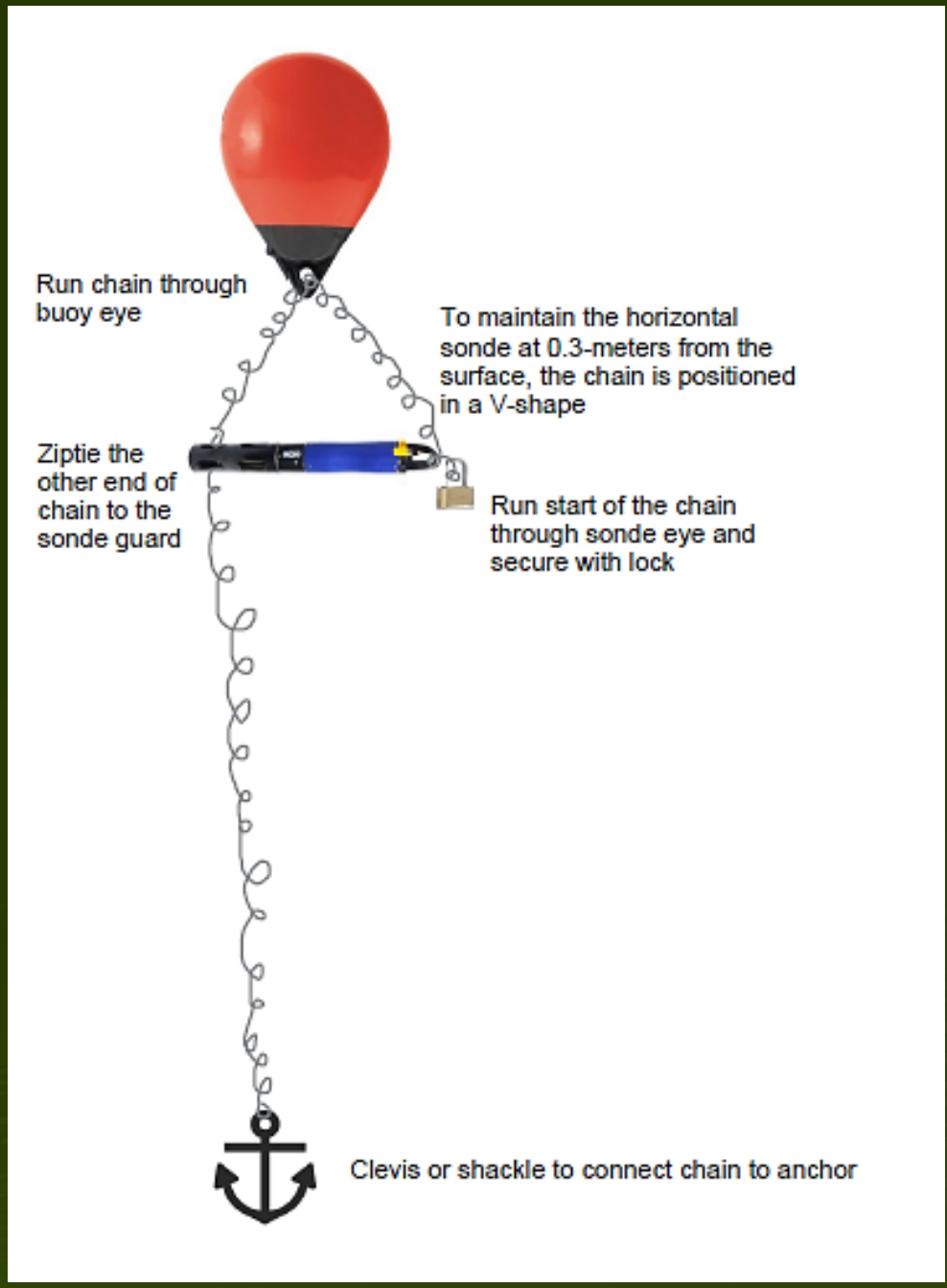
- Project statement: To obtain a more consistent dataset for the evaluation of several 24-hour pH assessment methods
- Determine if Somerville Lake still experiences high pH exceedances
- Developing assessment methods to implement in a future Integrated Report

Methods

- Monthly 24-hour sonde deployments at three stations
  - Dam, mid-lake, upper lake
  - Collect data for up to 24 months
- Deployed at 0.3-1.0 meters from the water surface
- Measurements taken every 5 minutes = 288 total datapoints

Methods




Run chain through buoy eye
To maintain the horizontal sonde at 0.3-meters from the surface, the chain is positioned in a V-shape
Ziptie the other end of chain to the sonde guard
Run start of the chain through sonde eye and secure with lock
Clevis or shackle to connect chain to anchor

Proposed assessment methods for 24-hour pH

Daily Min/Max - Binomial 10%	Binomial 10% - 10% Rule	Rapid Changes in pH	Evaluation of Chronic pH
• Data evaluated using daily minimum and maximum statistics • Each **daily** value constitutes **one sample** • Impaired if **>10% of the daily min/max values fall outside the appropriate criterion range** according to the binomial test	• Data evaluated using a daily statistic • **Daily result** is considered an exceedance when **>10% of readings fall outside the specified criterion range** according to the binomial test • Impaired if **>10% of the daily results exceeded criterion** according to the binomial test	• Data evaluated based on **rapid changes** • Impaired if a **specified number of changes +/-0.5 pH units** • Compare number of rapid changes to **the total number of sonde readings** in 2-year dataset based on the binomial test	• Data evaluated using a chronic statistic (e.g., hourly) • Chronic toxicity event if **≥ 1 consecutive hours are outside criterion range** • Impaired if a **specified number of chronic toxicity events occur** compared to half of total sonde readings in 2-year dataset based on the binomial test

Results- Dam site (Station 11881)

Table 1. Results of the presented assessment approaches after diel (24-hour) pH data analysis of Somerville Lake at the eastern end near the dam site (Segment 1212_01, Station 11881). Red squares indicate an exceedance level of 9 pH within a given sample event according to the assessment approach methodology.

*LOS: Level of support for this use, method, assessment parameter. FS: Fully Supporting, CN: Use Concern, NS: Nonsupport

Month/Year	Daily Min/Max-Binomial 10%	Binomial 10%-10% Rule	Rapid Changes in pH	Chronic pH
	Exceedance	LOS*	# Rapid Chngs (+-0.5)	# Chronic Hours
November-2022	N	FS	0	0
December-2022	N	FS	0	0
January-2023	N	FS	0	0
February-2023	Y	FS	0	1
March-2023	N	FS	0	0
April-2023	No data recorded			
May-2023	No data recorded			
June-2023	N	FS	0	0
July-2023	Y	NS	0	9
August-2023	Y	FS	0	1
September-2023	No data recorded			
October-2023	N	FS	0	7
November-2023	N	FS	0	0
December-2023	N	FS	0	0
January-2024	Y	NS	1	3
February-2024	N	FS	0	0
March-2024	N	FS	0	0
April-2024	N	FS	0	0
May-2024	N	FS	0	0
June-2024	No data recorded			
July-2024	N	FS	0	0
August-2024	N	FS	1	0
September- 2024	Y	NS	1	7
# Exceedances/ Total Events or Sonde Recordings	5 / 19	3 / 19	3 / 931	28 / 465.5
FINAL ASMT OUTCOME	NS	CN	FS	FS

Results- Mid-lake site (Station 16879)

Table 2. Results of Somerville Lake, Segment 1212_03, Station 16879. Red squares indicate an exceedance level of 9 pH within a given sample event according to the assessment approach methodology.

* LOS: Level of support for this use, method, assessment parameter. FS: Fully Supporting, CN: Use Concern, NS: Nonsupport

Month/Year	Daily Min/Max-Binomial 10%	Binomial 10%-10% Rule	Rapid Changes in pH	Chronic pH
	Exceedance	LOS*	# Rapid Chngs (+-0.5)	# Chronic Hours
November-2022	N	FS	0	0
December-2022	N	FS	0	0
January-2023	N	FS	0	0
February-2023	N	FS	0	0
March-2023	N	FS	0	0
April-2023	N	FS	0	0
May-2023	Y	NS	1	10
June-2023	N	FS	0	0
July-2023	Y	NS	0	5
August-2023	Y	FS	0	0
September-2023	No data recorded			
October-2023	N	FS	0	0
November-2023	N	FS	0	0
December-2023	N	FS	0	0
January-2024	N	FS	0	0
February-2024	N	FS	0	0
March-2024	N	FS	0	0
April-2024	N	FS	0	0
May-2024	No data recorded			
June-2024	Y	NS	0	24
July-2024	N	FS	0	0
August-2024	N	FS	0	0
September- 2024	Y	NS	0	5
# Exceedances/ Total Events or Sonde Recordings	5 / 21	4 / 21	1 / 1029	44 / 514.5
FINAL ASMT OUTCOME	NS	NS	FS	FS

Results- Upper site (Station 22059)

Table 3. Results of Somerville Lake (Segment 1212_04, Station 22059). Red squares indicate an exceedance level of 9 pH within a given sample event according to the assessment approach methodology

* LOS: Level of support for this use, method, assessment parameter. FS: Fully Supporting, CN: Use Concern, NS: Nonsupport

Month/Year	Daily Min/Max-Binomial 10%	Binomial 10%-10% Rule	Rapid Changes in pH	Chronic pH
	Exceedance	LOS*	# Rapid Chngs (+-0.5)	# Chronic Hours
November-2022	N	FS	0	0
December-2022	N	FS	1	0
January-2023	N	FS	0	0
February-2023	N	FS	0	0
March-2023	N	FS	0	0
April-2023	N	FS	0	0
May-2023	N	FS	0	0
June-2023	N	FS	0	0
July-2023	N	FS	0	0
August-2023	No data recorded			
September-2023	No data recorded			
October-2023	Y	FS	0	0
November-2023	Y	NS	0	8
December-2023	N	FS	0	0
January-2024	N	FS	0	0
February-2024	N	FS	0	0
March-2024	N	FS	0	0
April-2024	N	FS	1	0
May-2024	No data recorded			
June-2024	Y	NS	0	6
July-2024	N	FS	0	0
August-2024	N	FS	0	0
September- 2024	Y	NS	0	20
# Exceedances/ Total Events or Sonde Recordings	4 / 20	3 / 20	2 / 980	34 / 490
FINAL ASMT OUTCOME	NS	FS	FS	FS

Future steps

- Continue sampling until end of November 2024
- Select an assessment method
- Develop a way to manage the data (via SAS or Excel Spreadsheets)
- Potentially adopt the method in 2026 IR

Discussion

- Choose method to evaluate Somerville Lake listing but do not implement statewide assessment/delisting methodology for 24-hour pH
- Implement the method into the TCEQ Guidance for Assessing and Reporting Surface Water Quality in Texas
- Develop a Binomial 24-hour pH parameter code in SWQMIS

Questions?

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Thank you to the Lake Somerville Marina and Campground staff and my SWQM CO team.