

Town of Briarcliffe Acres Volunteer Water Quality Monitoring Program Data Conference 8/18/20 Agenda

Data report

Trends and how to find your data online

Comparison with downstream DHEC surf zone data

Development of site specific norms



Outreach Tools

- ✓ CCU WWA Website
- ✓ Town of Briarcliffe Acres website
- ✓ Business-style card
- ✓ Data Conference
- ✓ WWA Monthly newsletter
- ✓ Videos
- ✓ Technical stuff
 - Provisional Reports
 - New Handbook
 - QAPP DHEC approval

The screenshot displays the website for Briarcliffe Acres. At the top, the header includes the name "BRIARCLIFFE ACRES" and a navigation menu with links for "CCU Home", "Academics", "Colleges", "Science", and "Waccamaw Watershed Academy". On the right side of the header, there are four icons: "Apply", "Visit", "Info", and "Tour". Below the header is a large landscape photograph of a marshy area with a winding stream.

The main content area is titled "Volunteer Water Quality Monitoring Program Database Access". It features a "Home" button and a "Select a program" section. This section contains a grid of four program options, each with a representative image and a radio button for selection:

- Waccamaw River**: Image shows two people on a boat in a river.
- Murrells Inlet**: Image shows a blue sign that reads "NOW ENTERING THE MURRELLS INLET WATERSHED Clean Land = Clean Water Please help keep the water clean!"
- Surfside Beach**: Image shows a sign with text about beach cleanup and water quality.
- Briarcliffe Acres**: Image shows an aerial view of a coastal area with a beach and buildings.

Data report: 34 samplings

Home

Sampling Sites


- North Lake
- South Lake
- Head of Swash
- Cabana Road
- Mouth of Swash

Check All

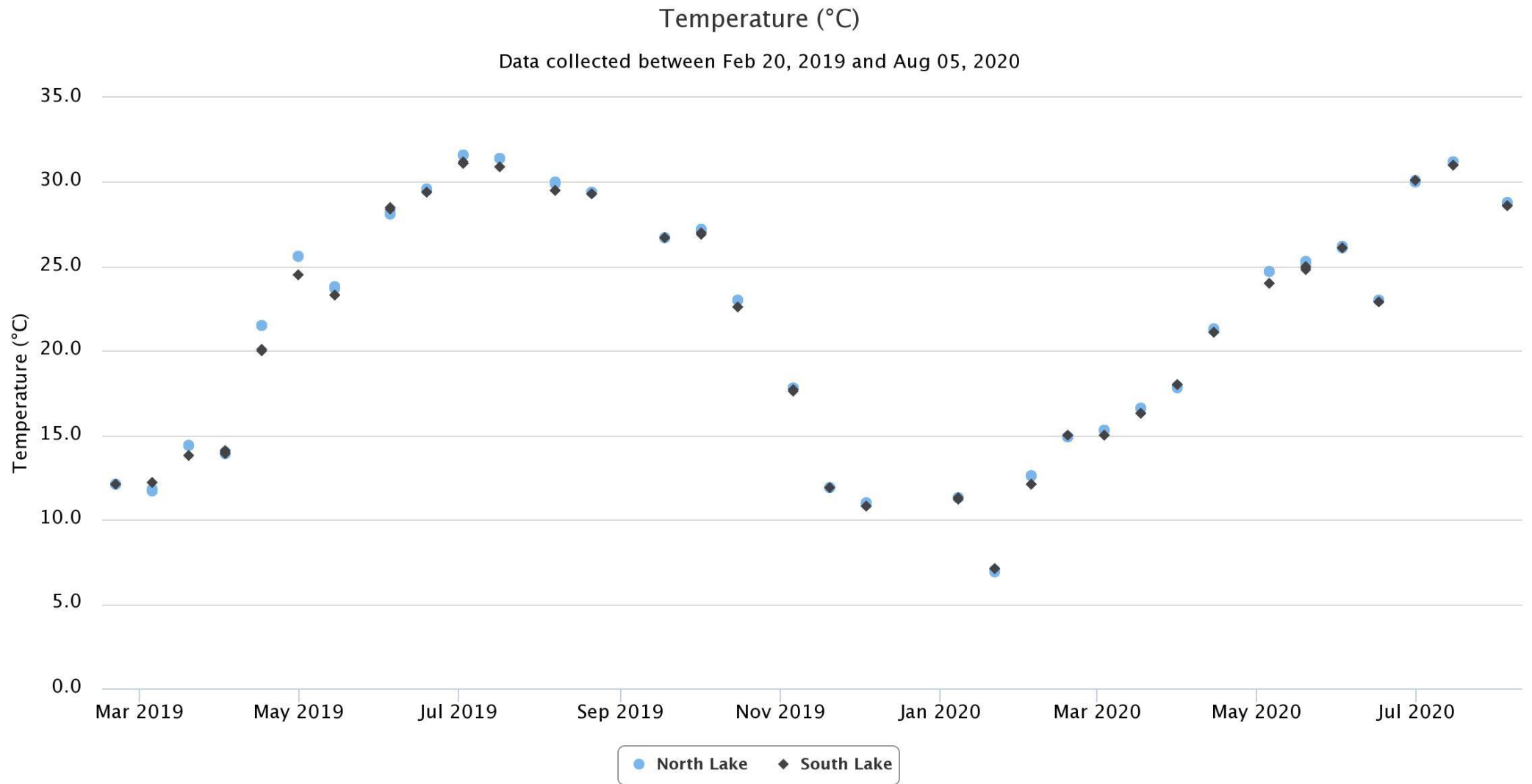
Uncheck All

Selected program: Briarcliffe Acres

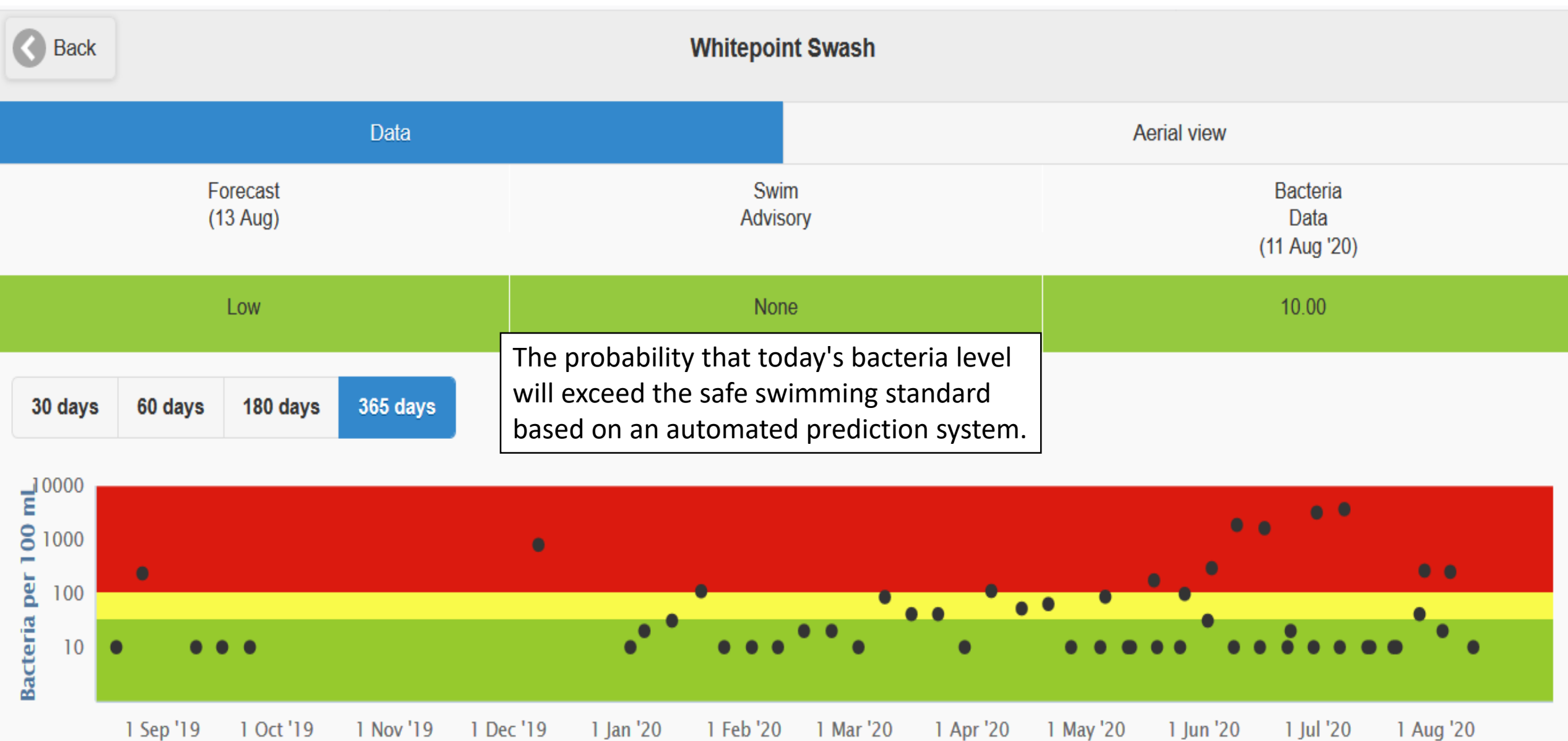


-  Sampling Site
-  Selected Sampling Site

TIME TREND GRAPHS



Frequent contraventions of swimming standards continue in the surf zone



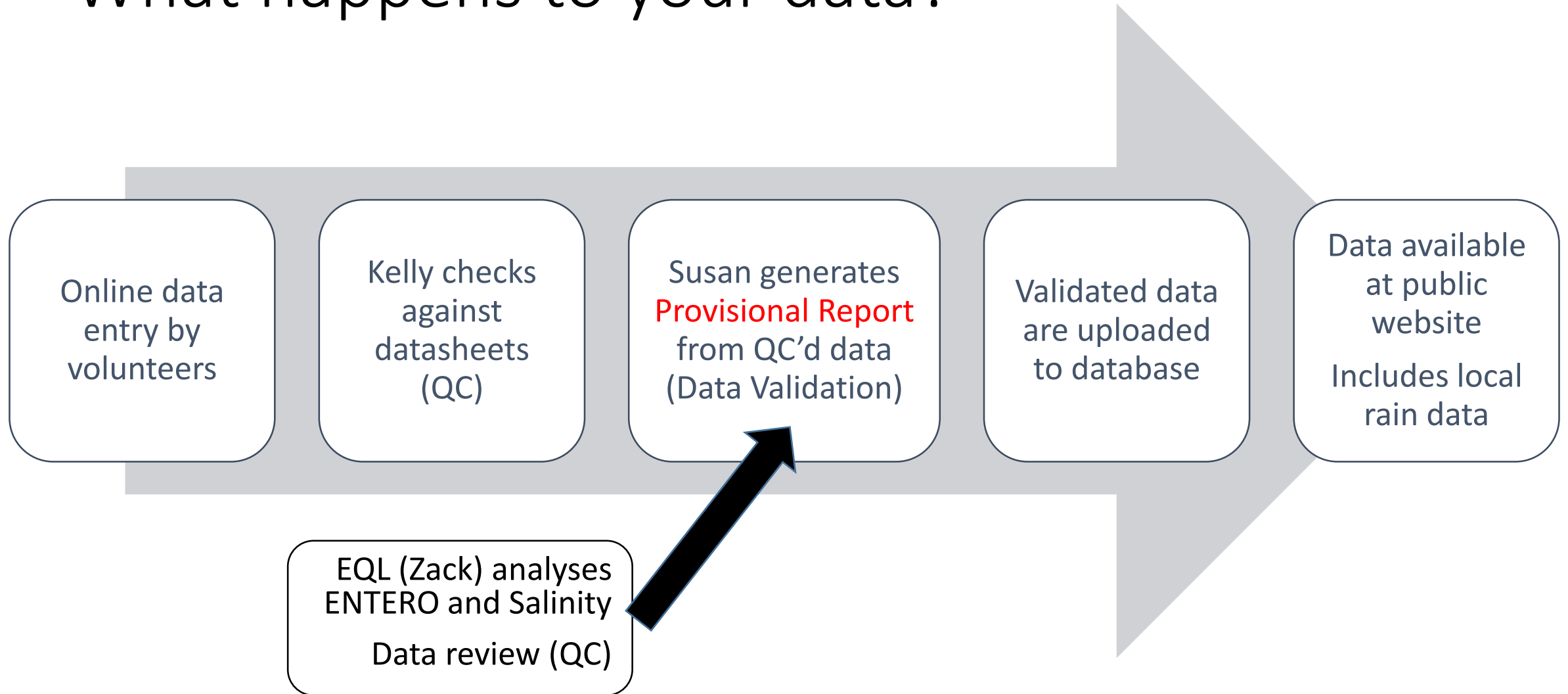
Swash enterococci

| Site | Total Count | EPA Beach Action Value | | Swimming Advisories | | Swimming Advisories | |
|----------------|-------------|------------------------|------------|---------------------|------------|---------------------|------------|
| | | >60 | | >104 | | >500 | |
| | | MPN/100 mL | MPN/100 mL | MPN/100 mL | MPN/100 mL | MPN/100 mL | MPN/100 mL |
| | | Count | % | Count | % | Count | % |
| Head of Swash | 35 | 29 | 83% | 27 | 77% | 10 | 29% |
| Cabana Road | 34 | 27 | 79% | 21 | 62% | 9 | 26% |
| Mouth of Swash | 35 | 29 | 83% | 27 | 77% | 10 | 29% |
| WAC-09A (EQL) | 71 | 31 | 44% | 25 | 35% | 10 | 14% |

- Recreational Water Quality Standards
 - Class SFH and Class SA/SB
 - Long-term advisories if >10% of 5 years data exceed WQS
- Comparison to prior BA work (Zack)
- Next slides – VM data



What happens to your data?



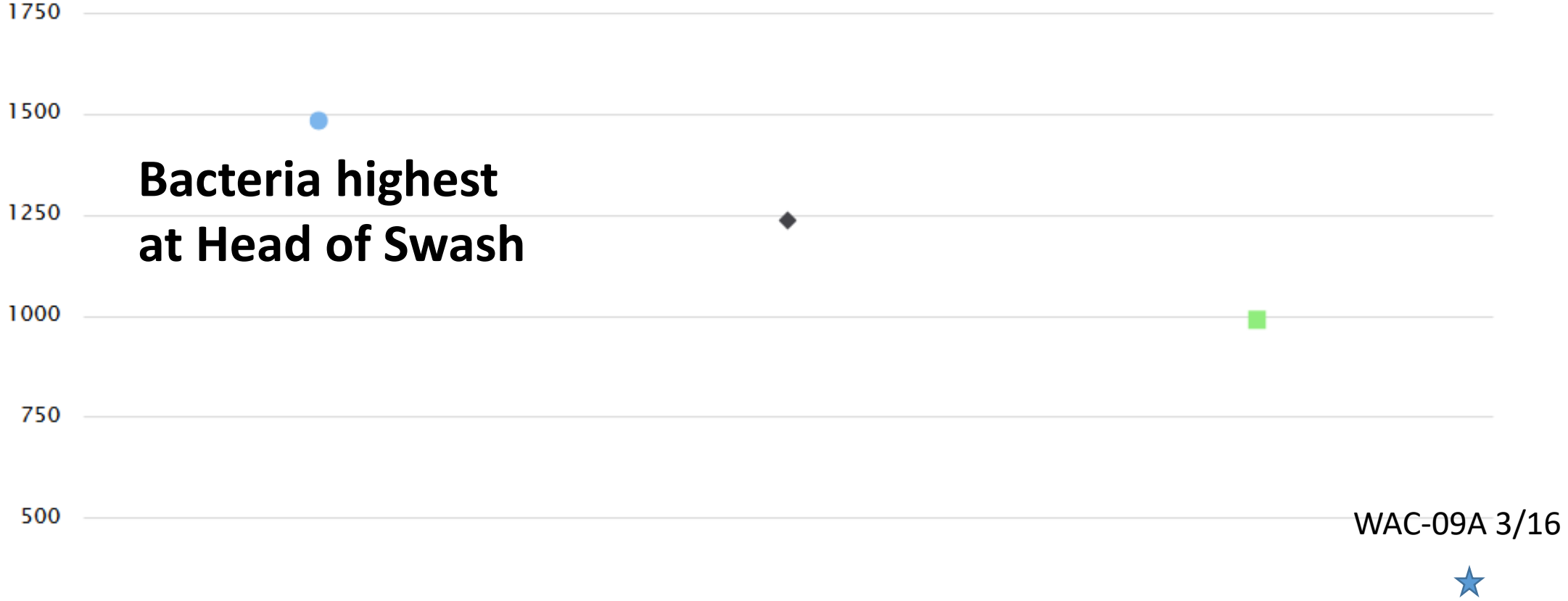
Enterococci (MPN/100mL) Head and Mouth of Swash and Cabana Road Only



Data collected on Mar 18, 2020

MPN/100mL Head and Mouth of Swash and Cabana Road Only

**Bacteria highest
at Head of Swash**



Notes: 1.02" rain fell the day prior to sampling which was conducted on an ebbing tide.

- Due to recent significant rainfall, conductivity was low at most sites – the lakes were unusually low and two of the swash sites were somewhat low.
- Enterococcus levels exceeded SC DHEC recreational criteria (104 MPN/100 mL) at all three swash sites. Levels were unusually high at the Head of the Swash (1483 MPN/100 mL) and somewhat high at Cabana Road (1236 MPN/100 mL) and the Mouth of the swash (990 MPN/100 mL). At Cabana Road, E. coli (600 CFU/100 mL) exceeded the SC DHEC water quality criteria (349 CFU/100 mL)

Enterococci (MPN/100mL) Head and Mouth of Swash and Cabana Road Only



Data collected on Apr 15, 2020

Enterococci (MPN/100mL) Head and Mouth of Swash and Cabana Road Only



Bacteria highest at Mouth of Swash

WAC-09A 4/14



Notes: 0.43" rain fell 2 days prior to sampling which was conducted on a flooding tide.

- Due to recent significant rainfall, conductivity continues to be unusually low in the lakes.
- Enterococcus levels exceeded SC DHEC recreational criteria (104 MPN/100 mL) at all three swash sites. Levels were site normal at the Head of the Swash (226 MPN/100 mL) and Cabana Road (288 MPN/100 mL) and were somewhat high at the Mouth of the swash (563 MPN/100 mL).

EQL measured Salinity (‰) Head and Mouth of Swash and Cabana Road Only

Data collected on Apr 15, 2020

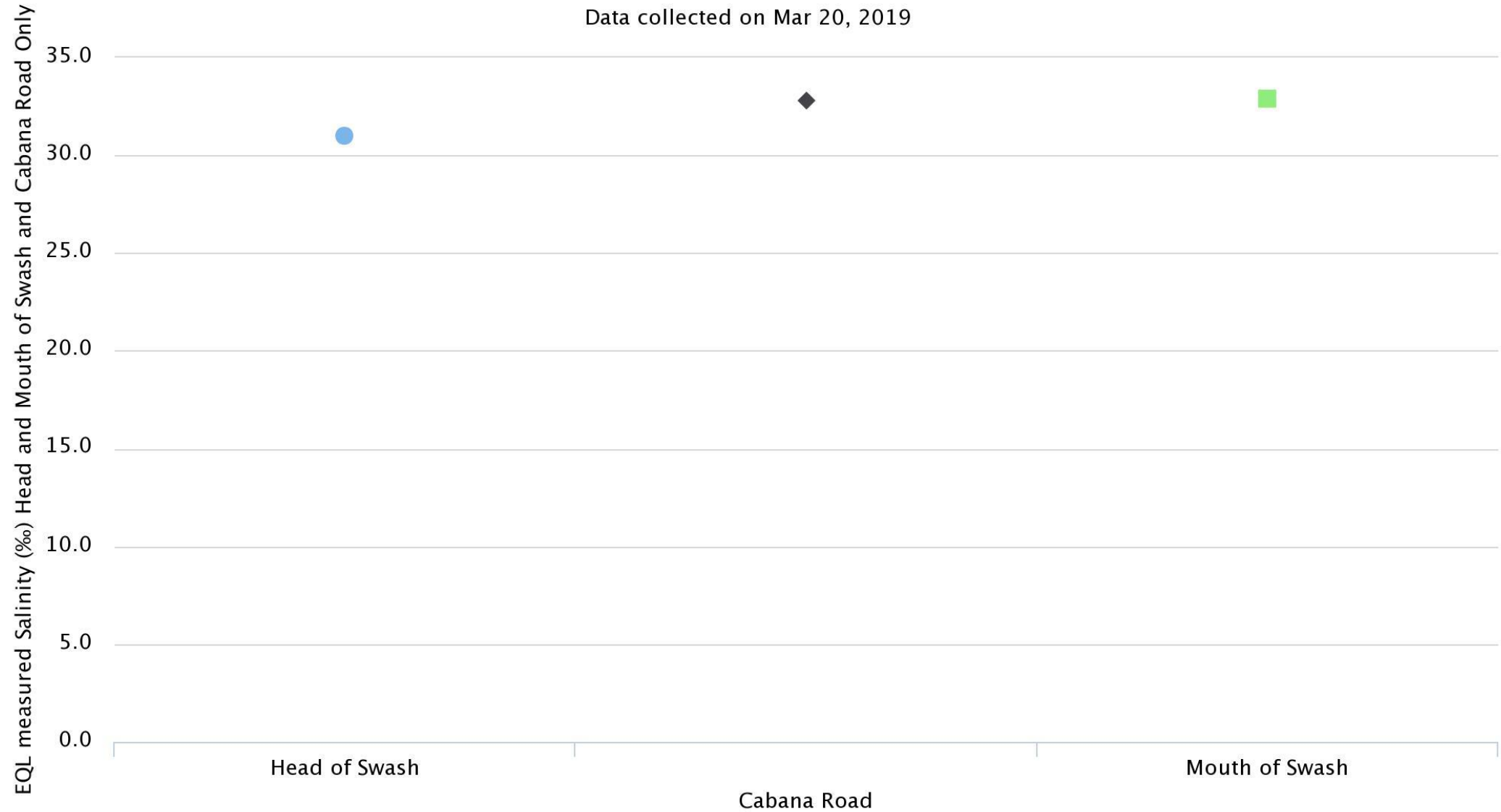


**Salinity lowest at
Head of Swash**

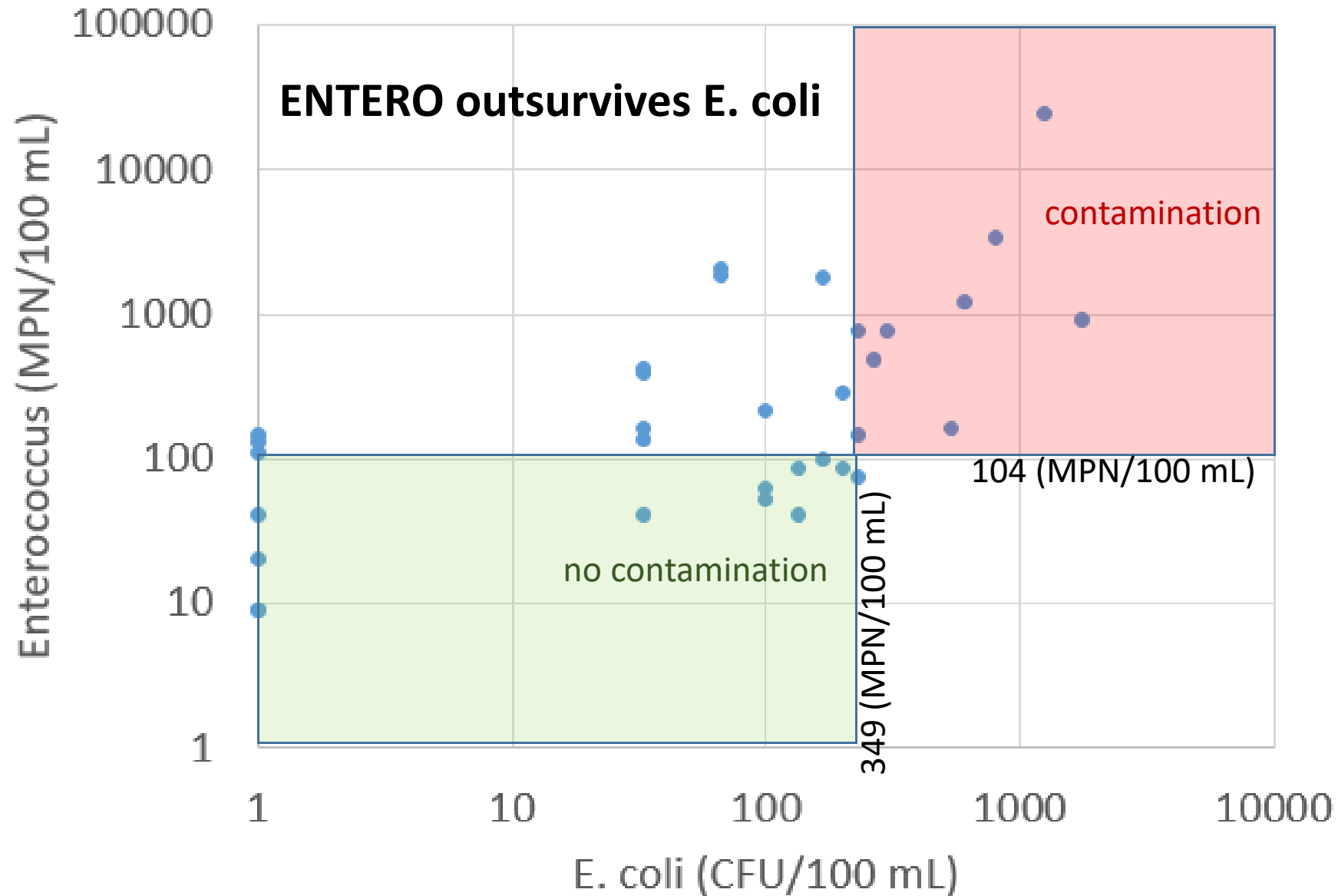
Other kinds of salinity trends

EQL measured Salinity (‰) Head and Mouth of Swash and Cabana Road Only

Data collected on Mar 20, 2019

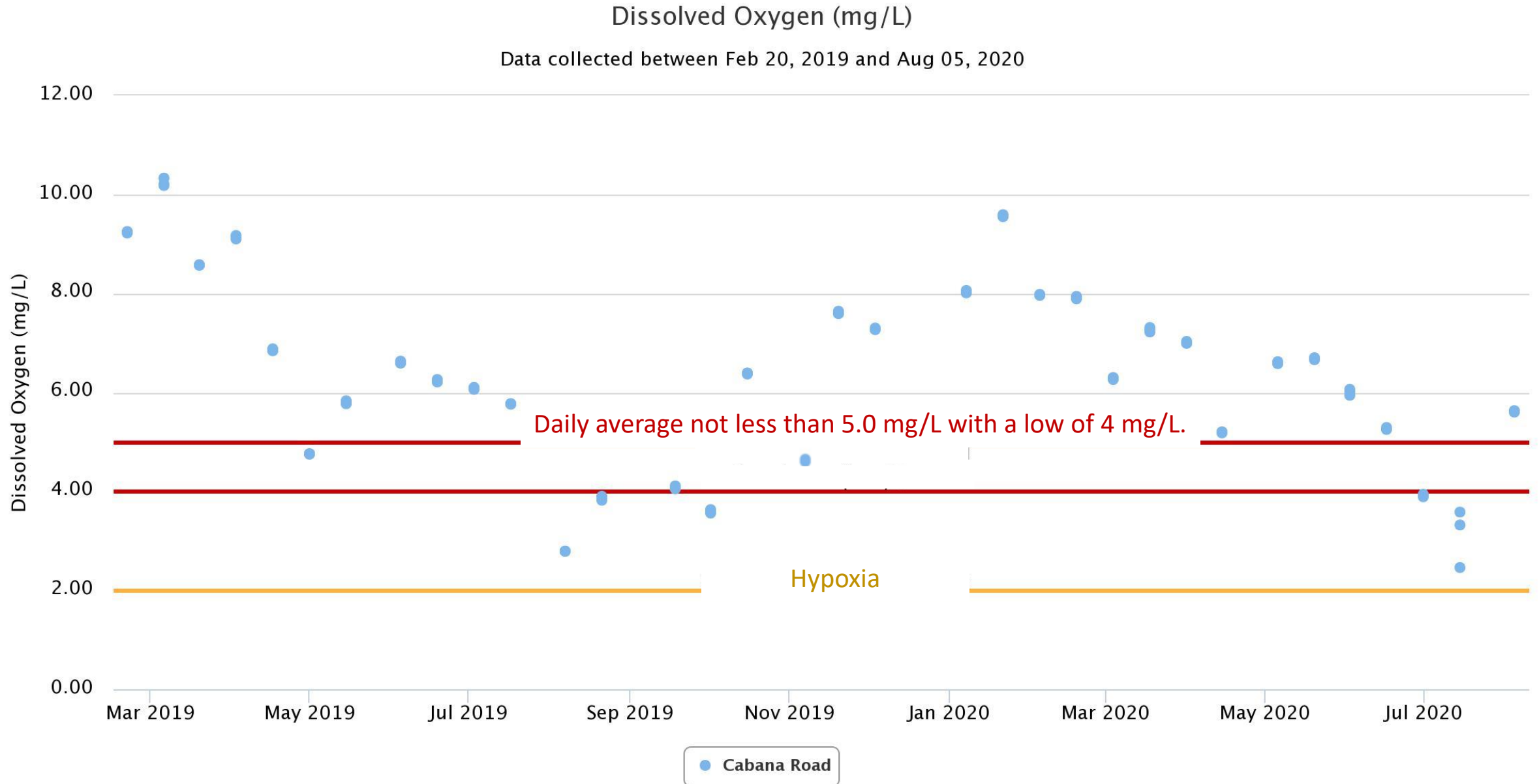


Saltwater indicator



Freshwater indicator

Low oxygen common in marshes in summer. No hypoxia detected.



Lake Trends

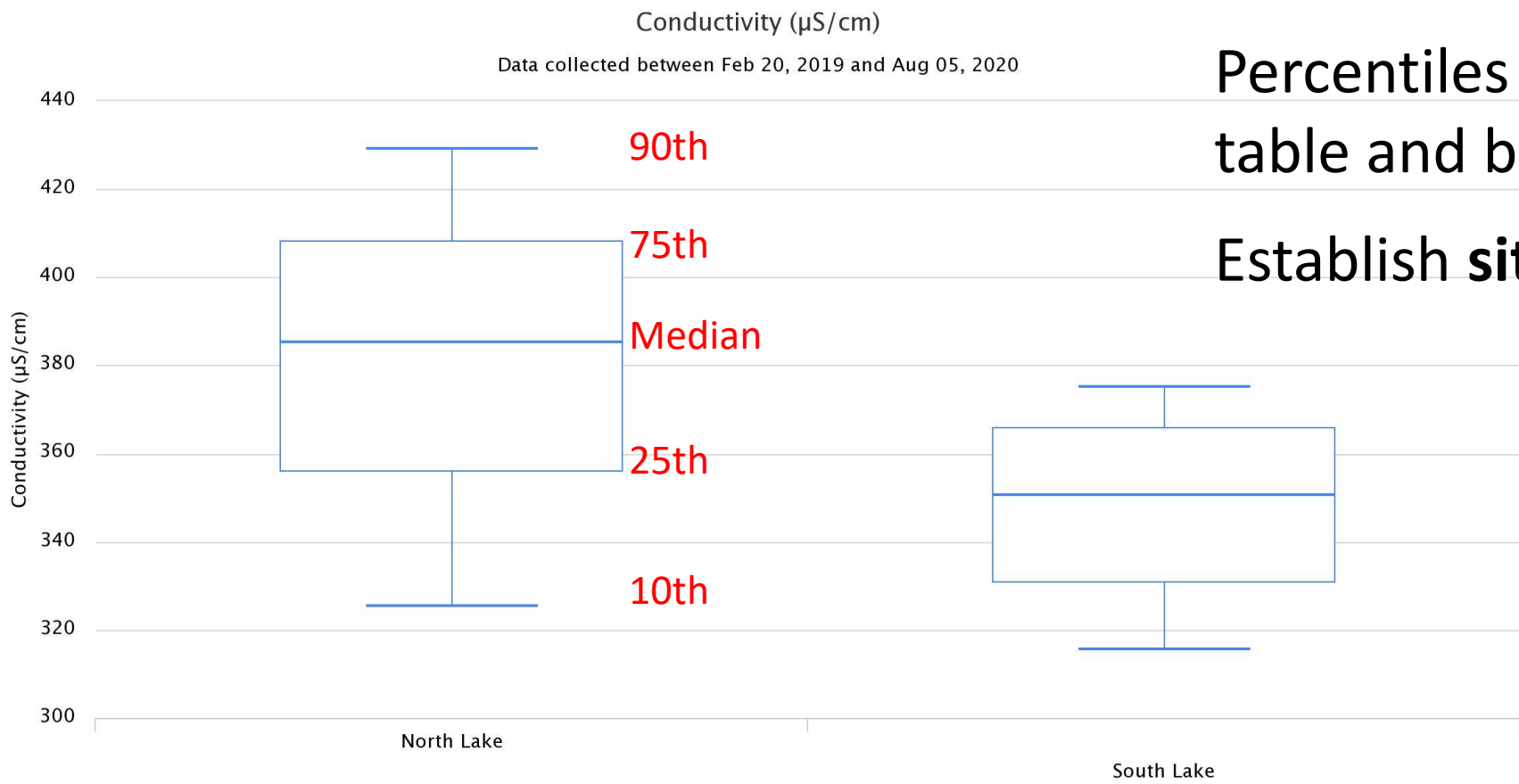
Total dissolved solids

Water source tracer like salinity

No water quality standard

Conductivity ($\mu\text{S}/\text{cm}$)

| Site Name | # Samples | Mean | S.D. | Median | Max | Min | 10th | 25th | 75th | 90th |
|------------|-----------|------|------|--------|-----|-----|------|------|------|------|
| North Lake | 34 | 393 | 86 | 385 | 846 | 304 | 325 | 356 | 408 | 429 |
| South Lake | 34 | 348 | 24 | 351 | 388 | 279 | 316 | 331 | 366 | 375 |

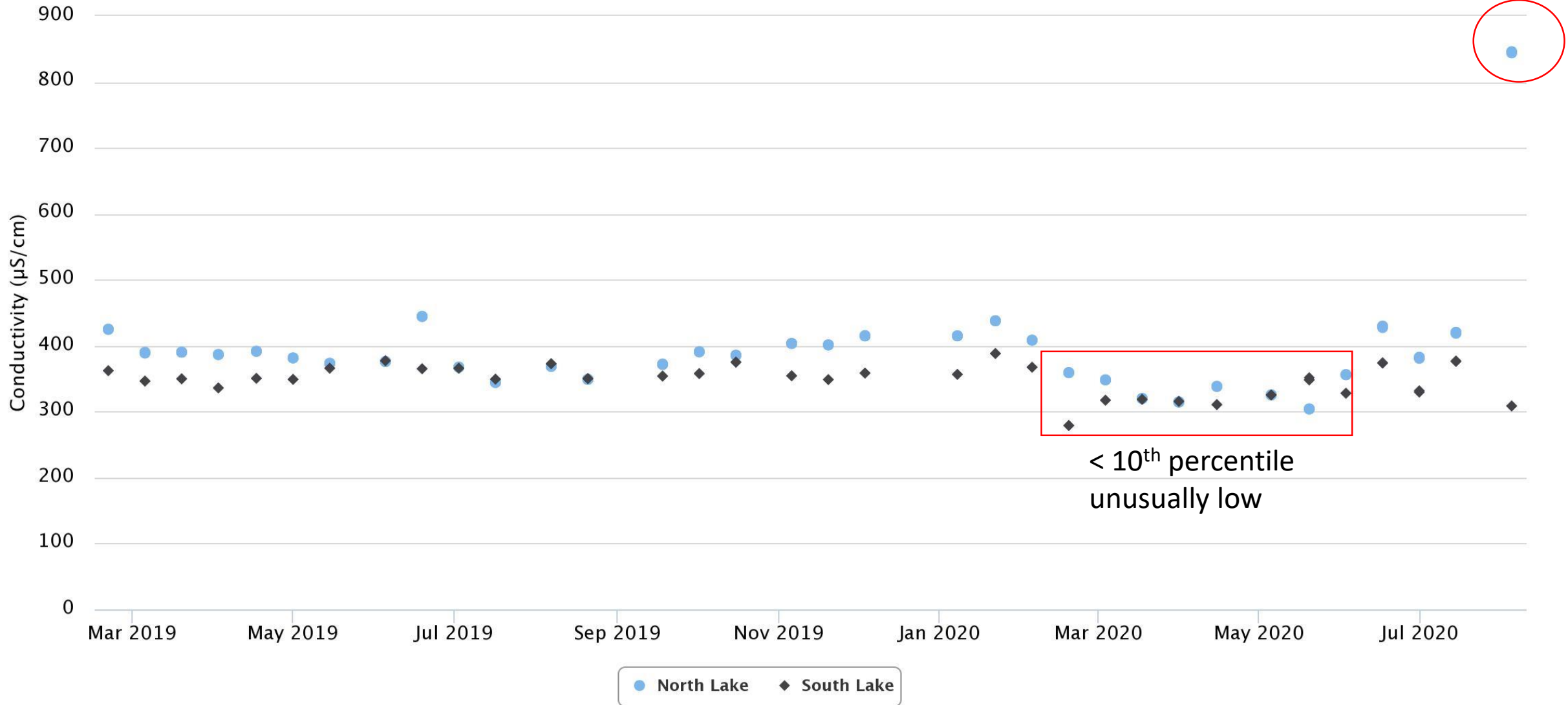


Outlier in North Lake. Feb to June low.

Conductivity ($\mu\text{S}/\text{cm}$)

Data collected between Feb 20, 2019 and Aug 05, 2020

>90th percentile
unusually high

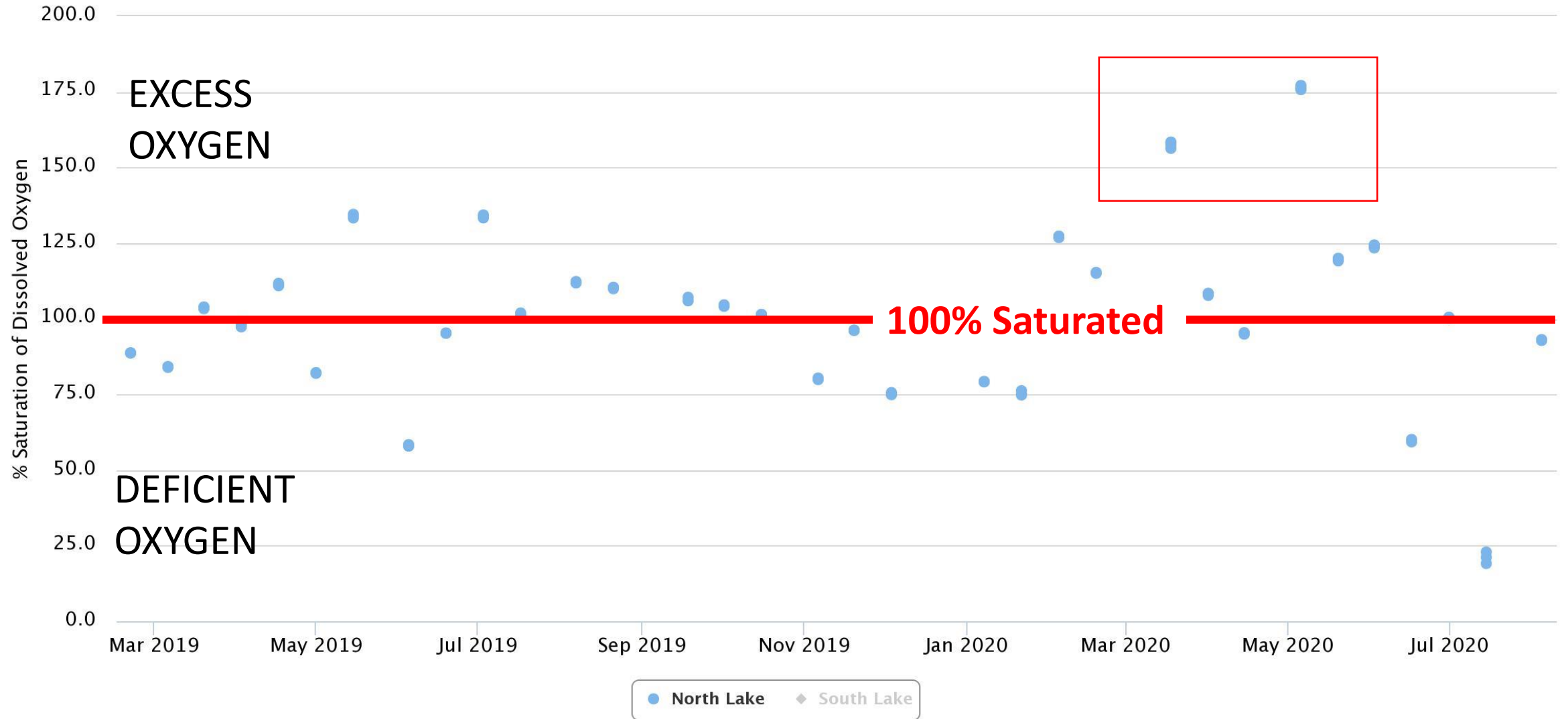


Each lake has had **only one** DO measurement fall below the WQS

North Lake evidence of algal blooms

% Saturation of Dissolved Oxygen

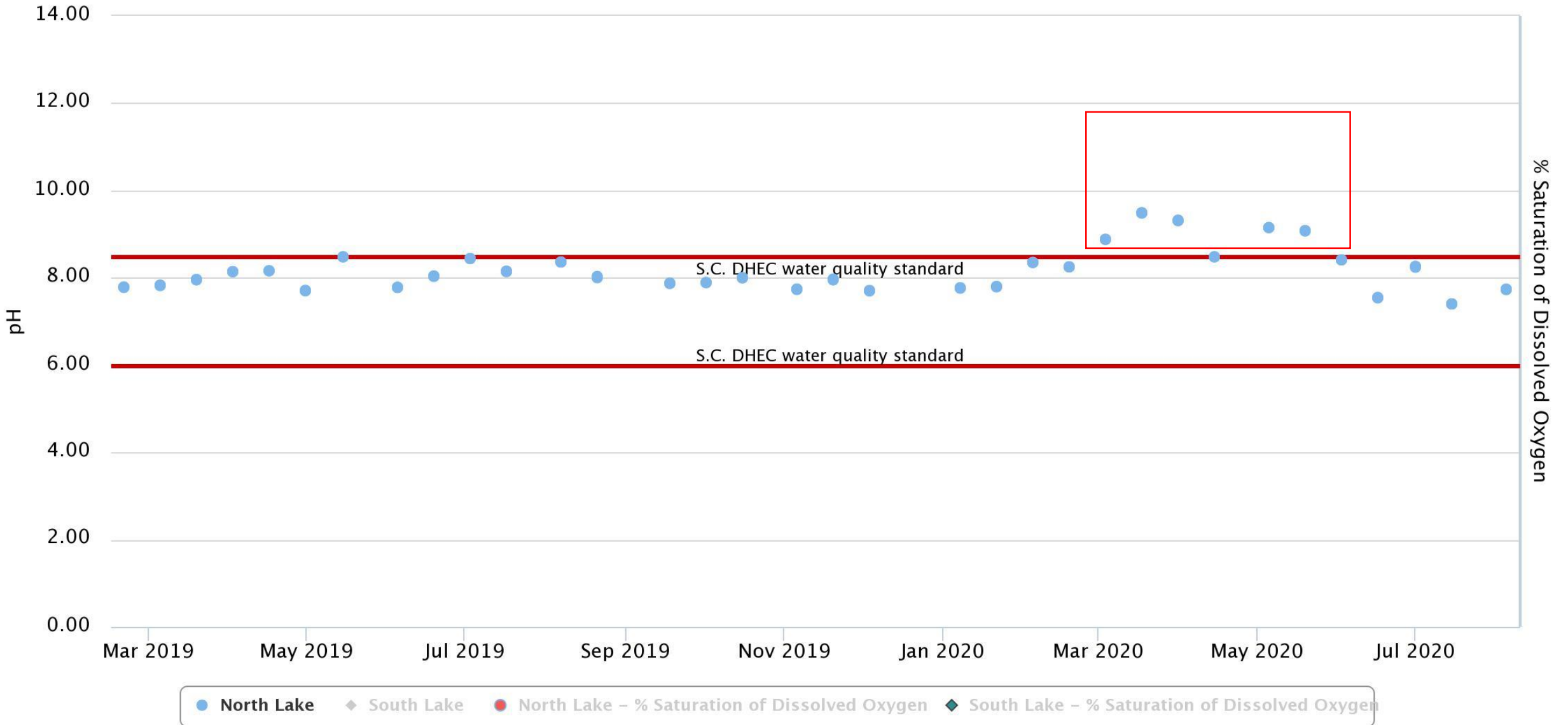
Data collected between Feb 20, 2019 and Aug 05, 2020



Algal photosynthesis increases pH

pH

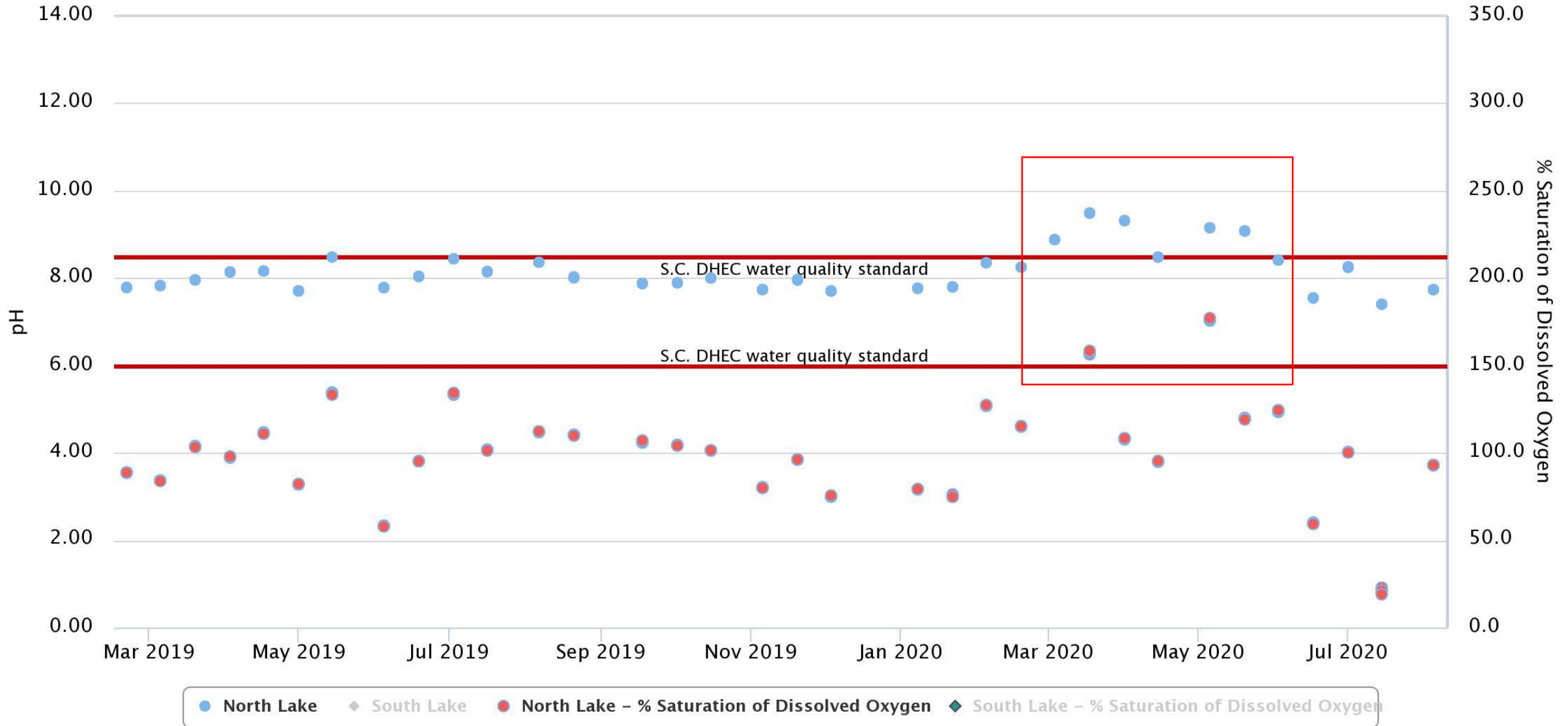
Data collected between Feb 20, 2019 and Aug 05, 2020



Co plotting features

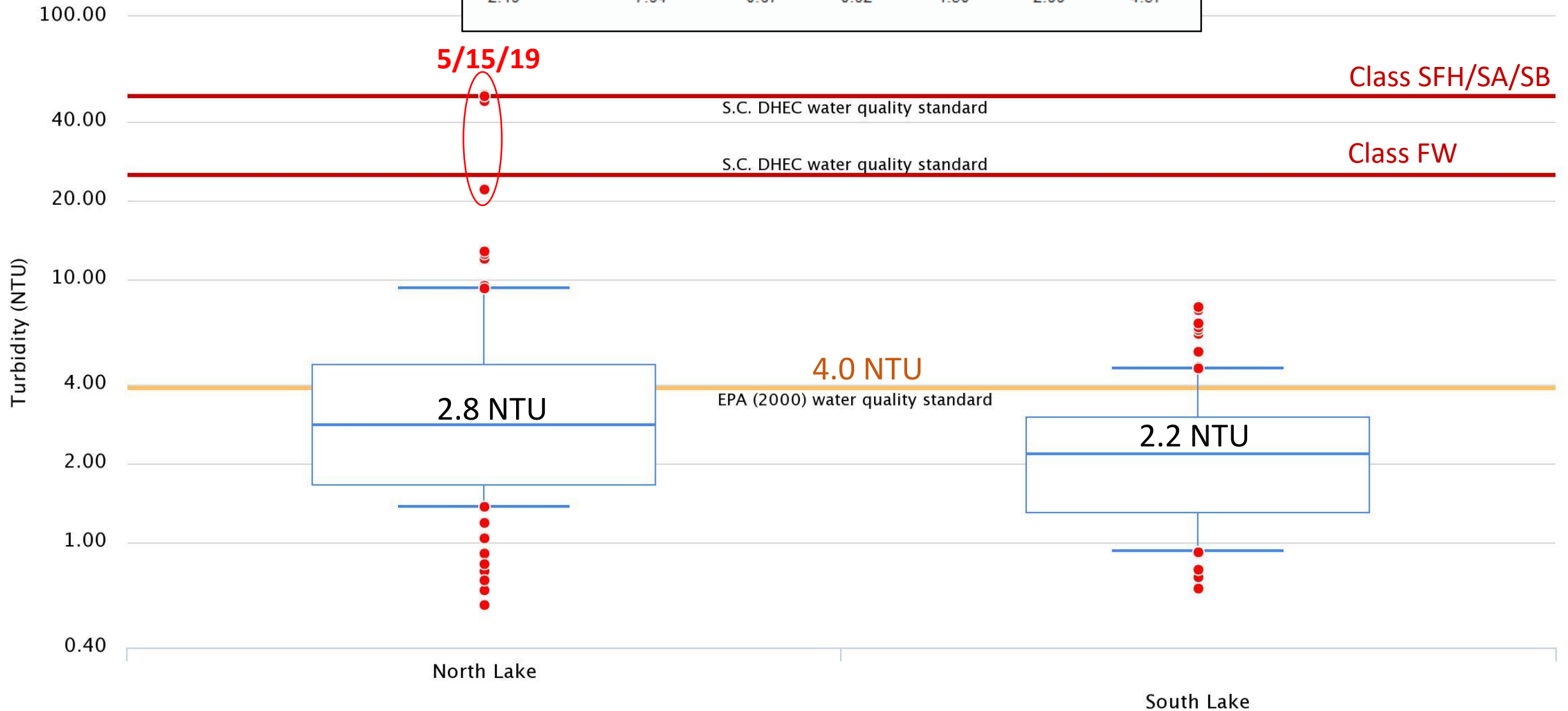
pH

Data collected between Feb 20, 2019 and Aug 05, 2020



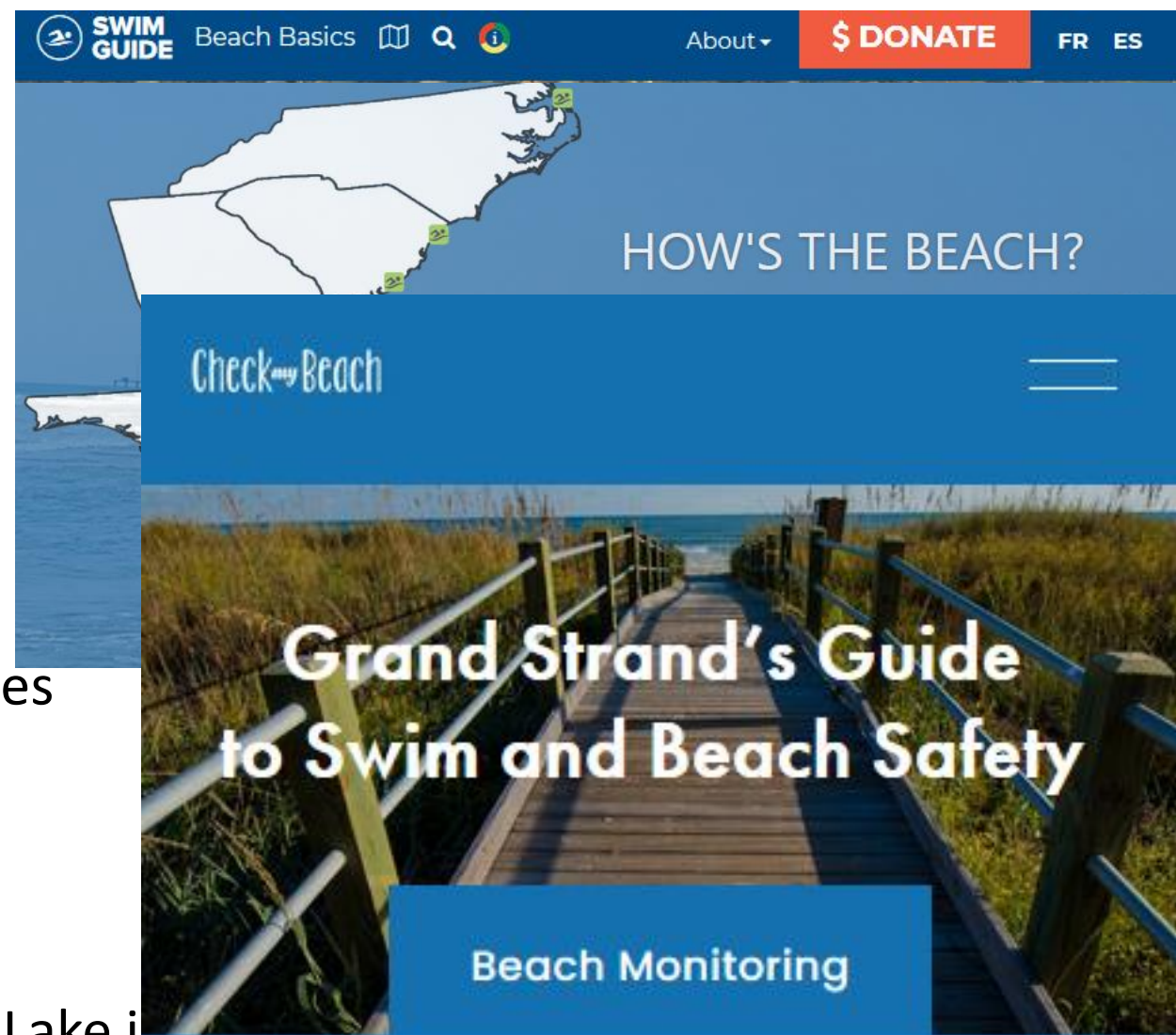
Good water quality – 75th percentile at or below EPA recommended level

| Median | Max | Min | 10th | 25th | 75th | 90th |
|--------|-------|------|------|------|------|------|
| 2.83 | 50.50 | 0.58 | 1.38 | 1.66 | 4.74 | 9.25 |
| 2.19 | 7.94 | 0.67 | 0.92 | 1.30 | 2.99 | 4.57 |



Bacteria Conclusions

- ENTERO in swash
 - Significant frequent elevations
 - Above water quality standard
 - Confirmed by E. coli
 - Geographic trends suggest two sources
 - Uplands in Briarcliffe watershed
 - Whitepoint Swash
 - (Resuspension from sediment)
- Lakes low (**good!**)
 - Exception of one high value at South Lake in Feb 2019
- No correlations with turbidity



Oxygen (eutrophication) Conclusions

- Mostly seasonal trends in DO
 - Temperature controls solubility
 - Temperature controls biological uptake
- North Lake has evidence of algal blooms
 - Some contraventions of pH
 - Why is conductivity higher?
 - Spike last sampling?
- Ammonia
 - About 1/3 of the samples in the lakes have detections
- Cabana road
 - Some low summertime DO but this is normal for a marsh
 - No hypoxia



Turbidity conclusions



CLASS FW
WQS in NTU

CLASS SFH and SA/SB
WQS in NTU

- Very infrequent elevated values (good!)
- Not correlated with bacteria or DO

Next steps

- Keep collecting data!
 - Refine site specific norms
 - Unusually high and low (10th and 90th percentiles)
 - Somewhat high and low (25th and 90th percentiles)
 - Keep comparing to regulatory water quality standards
- Learn how to use web app
- Watch new videos
- Read new monthly newsletters
- Implement provisional reporting for potential illicit discharge follow ups
- Consider additional investigation of microbial sources in the swashes

Briarcliffe Acres Volunteer Water Quality Monitoring Report

8/5/2020

| Sampling Sites | conductivity (μS/cm) | tds (ppm) | pH | DO (mg/L) > 20 C | %DO > 20 C | Temp > 20 C | turbidity (NTU) | nitrate (ppm N) | nitrite (ppm N) | ammonia (ppm N) | E. coli (CFU/100 mL) | Total coliform (CFU/100 mL) | Enterococcus (MPN/100 mL) |
|----------------|----------------------|-----------|-------------|------------------|-------------|-------------|-----------------|-----------------|-----------------|-----------------|----------------------|-----------------------------|---------------------------|
| North Lake | > 90th | > 90th | <10th | <25th | <25th | Site Normal | Site Normal | Site Normal | Site Normal | Site Normal | Site Normal | Site Normal | |
| South Lake | <10th | <10th | Site Normal | Site Normal | Site Normal | Site Normal | > 90th | Site Normal | Site Normal | Site Normal | Site Normal | > 90th | |
| Head of Swash | Site Normal | | | | | | | | | | | | > 90th |
| Cabana Road | <25th | <25th | Site Normal | Site Normal | Site Normal | Site Normal | > 90th | Site Normal | Site Normal | Site Normal | > 90th | > 90th | > 90th |
| Mouth of Swash | > 90th | | | | | | | | | | | | > 90th |

Notes: 2.1" rain from Hurricane Isaias fell two days prior to sampling which was conducted on a spring high tide. Impacts of polluted runoff from this significant rain event were observed at all sites.

- In North Lake, conductivity was at a record high (nearly twice the site median). The source of this elevated conductivity is unknown but could be a marker of polluted runoff. Dissolved oxygen was somewhat low and pH was unusually low. Neither contravened the water quality criteria. While the low pH could be due to the low oxygen, it is surprising given the countering effect that should have been exerted by the high conductivity.
- In South Lake, conductivity continues to be unusually low. This trend started in Feb 2019. Turbidity (6 NTU) was unusually high and the third highest measurement for this site. Both suggest impact of runoff from the significant rain event two days prior.
- At Cabana Road, salinity (17 psu) was somewhat low. Turbidity (31 NTU) was a record high and contravened the Class SFH water quality criteria (25 NTU). The second highest measurement to date has been 24 NTU on 8/21/19. Both fecal bacteria were unusually high with Enterococcus at a record high and E. coli the second highest measurement to date at this site. E. coli (1233 MPN/100 mL) comprised 77% of the total coliforms with only 59% of the blue colonies fluorescing. Enterococcus exceeded the upper detection limit (>24,196 MPN/100 mL).
- Enterococcus contravened the water quality criteria at all three swash sites at unusually high concentrations. The concentrations at the head of the swash (24,196 MPN/100 mL) and Cabana Road (>24,196 MPN/100 mL) were record highs for these sites. At the mouth of the swash, the concentration (1223 MPN/100 mL) was the fourth highest for this site. The downstream SC DHEC surf zone sample was 249 MPN/100 mL and the salinity was 30 psu, which is between the 10th and 25th percentiles. The salinity at the mouth of the swash (34 psu) was unusually high, reflecting sampling at high tide, whereas the salinity at Cabana Road (17 psu) was somewhat low and site normal at the Head of the Swash (3 psu).