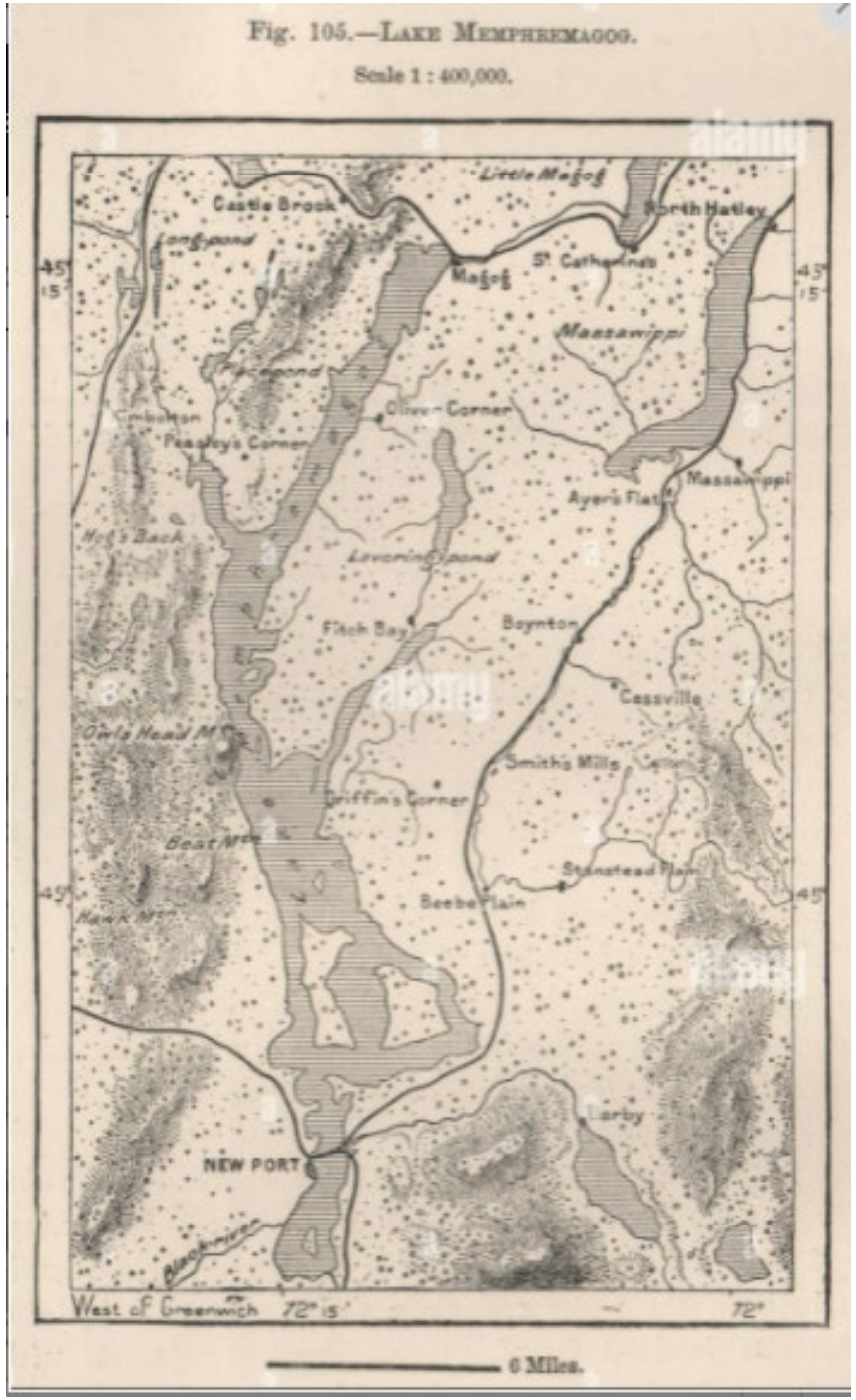


Quebec VT Steering Committee:
Lake & Tributary Water Quality Trends & Vermont Aquatic Invasive Species Update

May 5, 2022

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
LAKES & PONDS PROGRAM

Lake Memphremagog Water Quality Background

- Lake Memphremagog is an international waterbody with over 73% of its surface area in Quebec, while 27% is in Vermont (watershed is inverse)
- Vermont portion of the Lake does not meet the VT standard of 14 ug/l
  - VT section of Lake is impaired; September 2017 TMDL to restore lake
- Quebec portion of Lake meets applicable phosphorus guidelines for Province
- The Quebec-Vermont Steering Committee has worked collaboratively to model phosphorus reduction requirements and implemented phosphorus loading reduction projects
- VT state agencies have invested $6.9 million in clean water projects in the Memphremagog Basin from 2016-2020 & reduced phosphorus load by almost 4 metric tons over this period

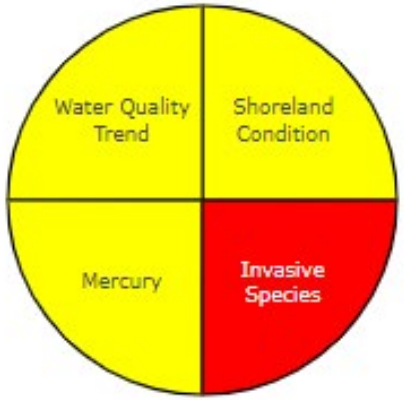
Lake Memphremagog Water Quality Monitoring

- Lay Monitoring Program Data
  - 1984 – 2020 (Red circles)
- TMDL Monitoring
  - 2017 to Present (Green Circle)

Vermont Lake Score Card

Lake Memphremagog

Scores | Water Quality Data | Lake Information



Watershed:	Highly Disturbed
WQ Standards:	Impaired

Details

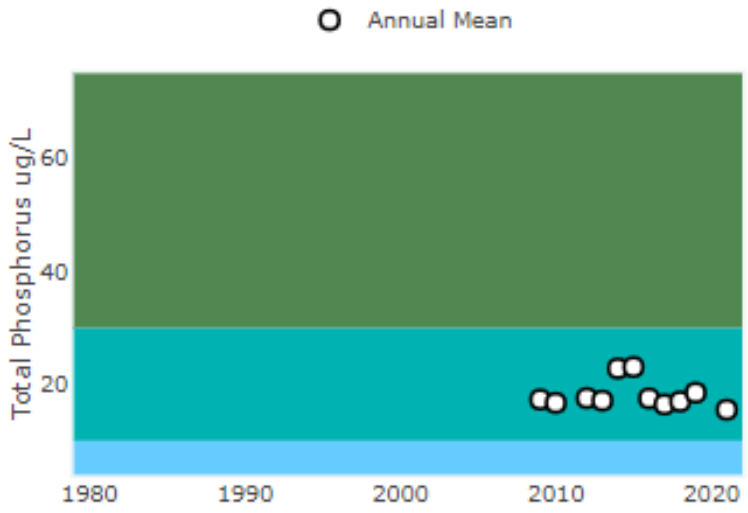
Impaired – Phosphorus
Altered – flow

Color Scoring System
- Good Conditions
- Fair Conditions
- Poor Conditions
- Insufficient Data

Learn How Lakes Are Scored

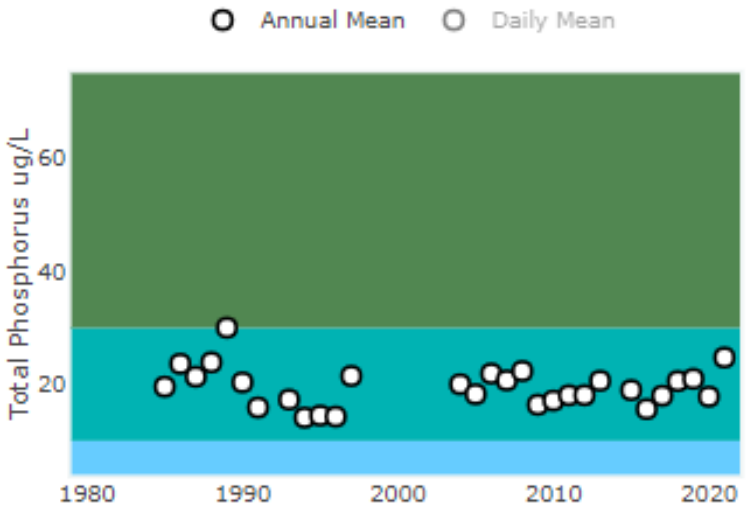
Spring Phosphorus

Trend: Stable (p-value=0.5858)



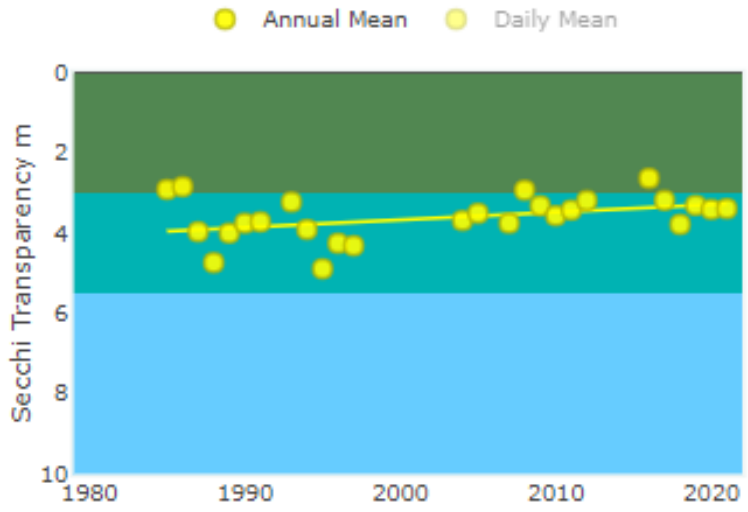
Summer Phosphorus

Trend: Stable (p-value=0.4548)



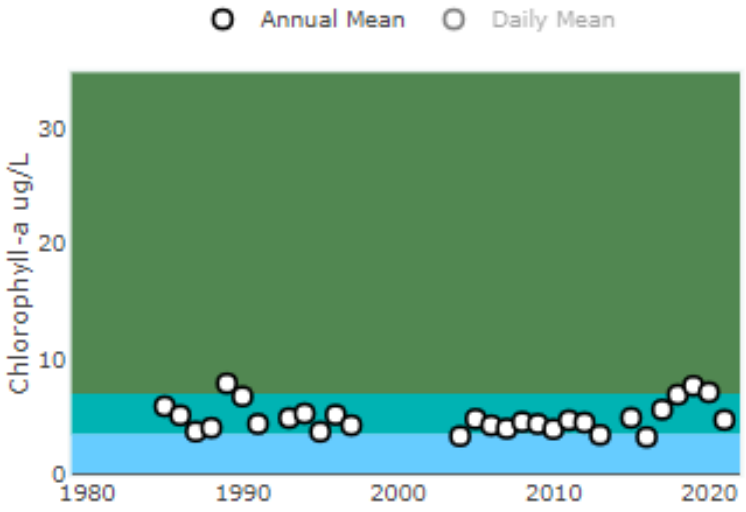
Summer Secchi

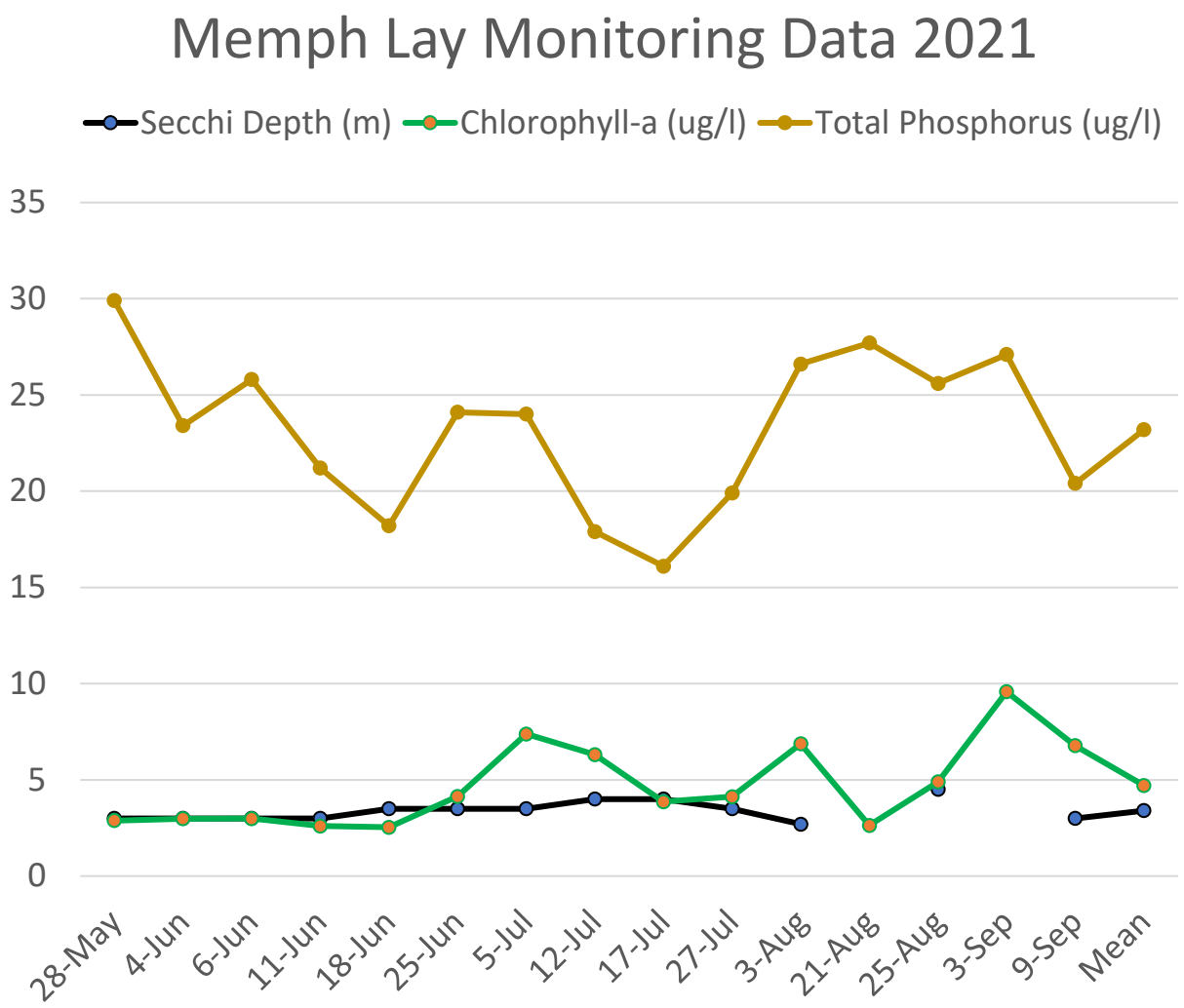
Trend: Significantly Decreasing (p-value=0.0399)

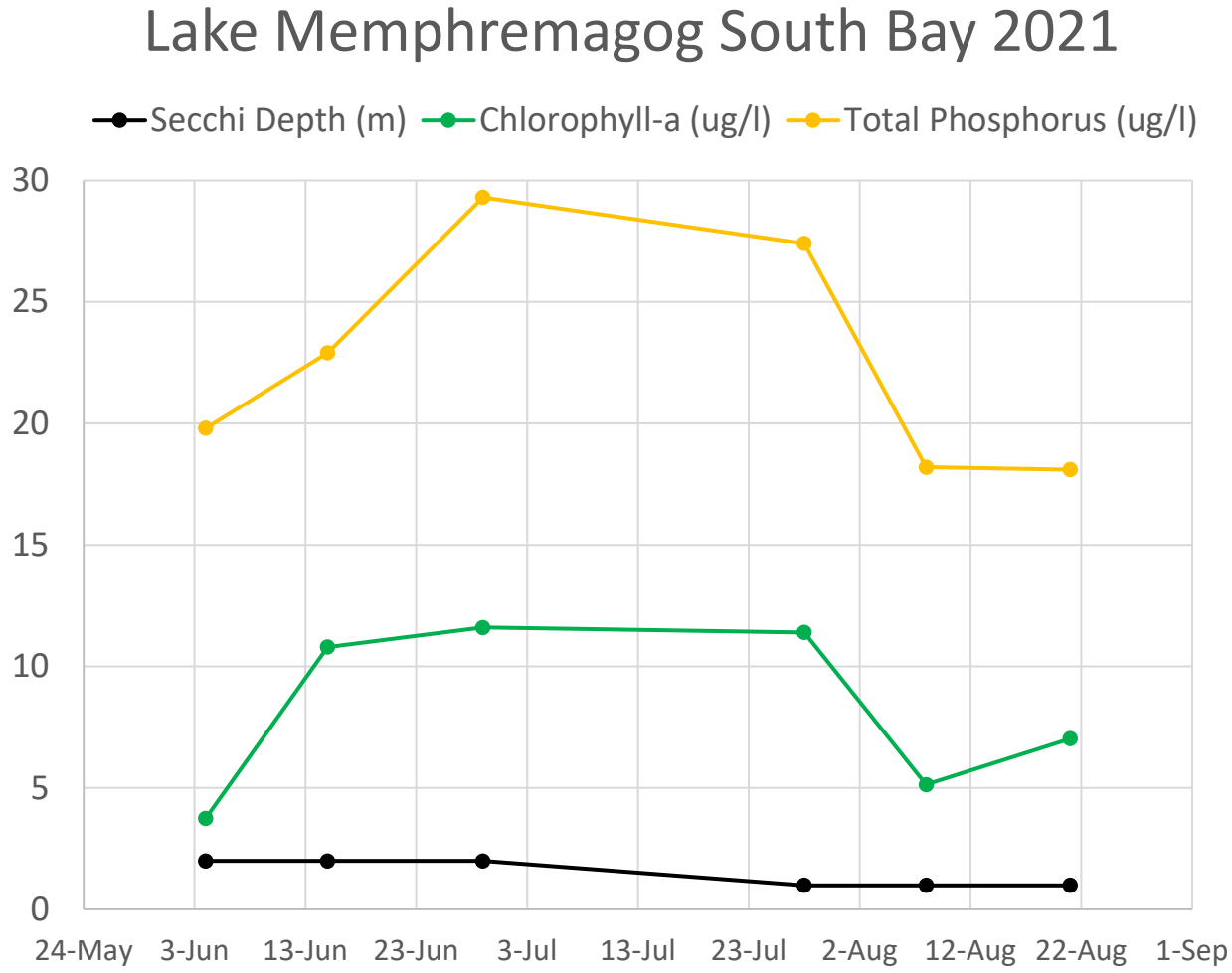


Summer Chlorophyll-a

Trend: Stable (p-value=0.9834)



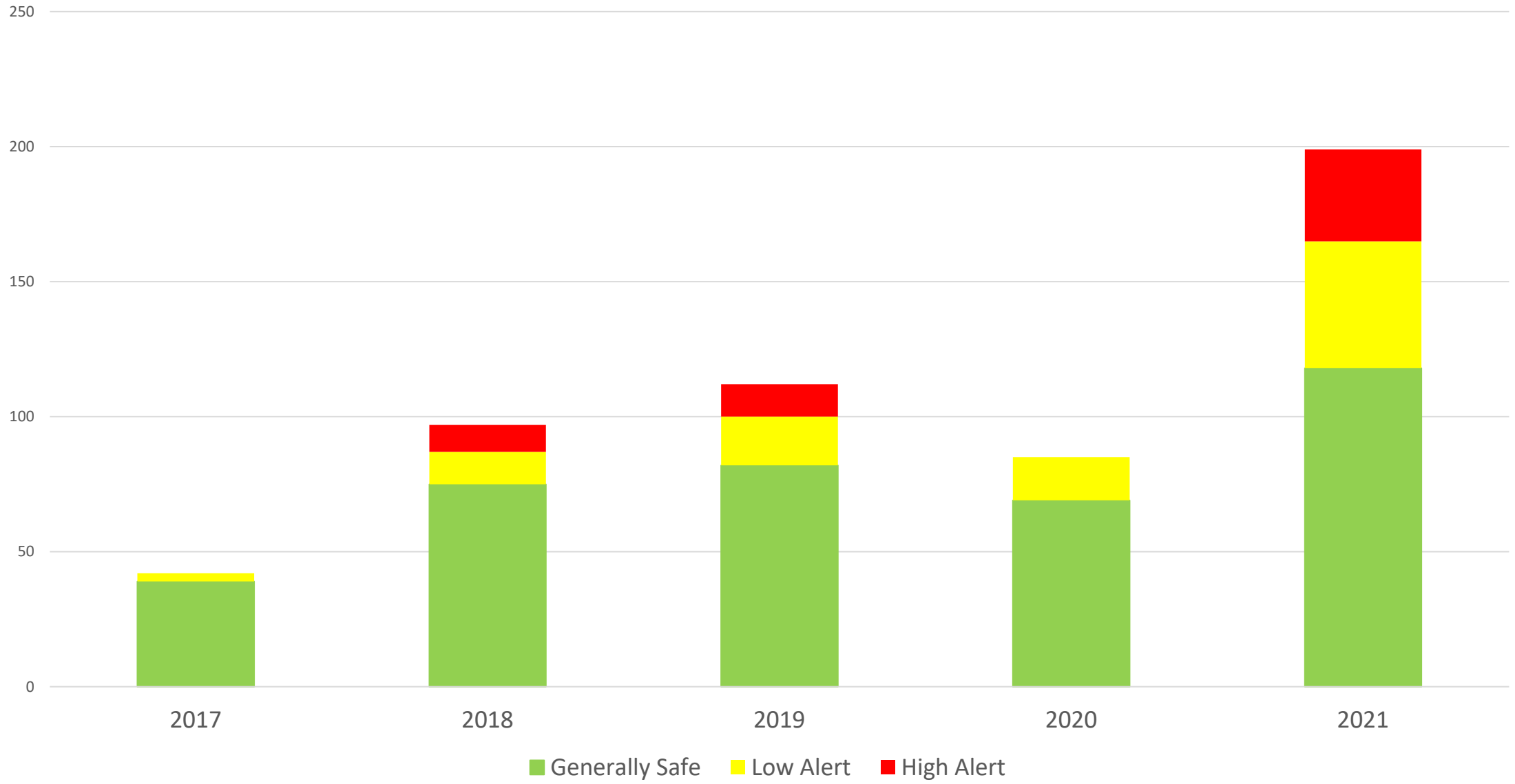




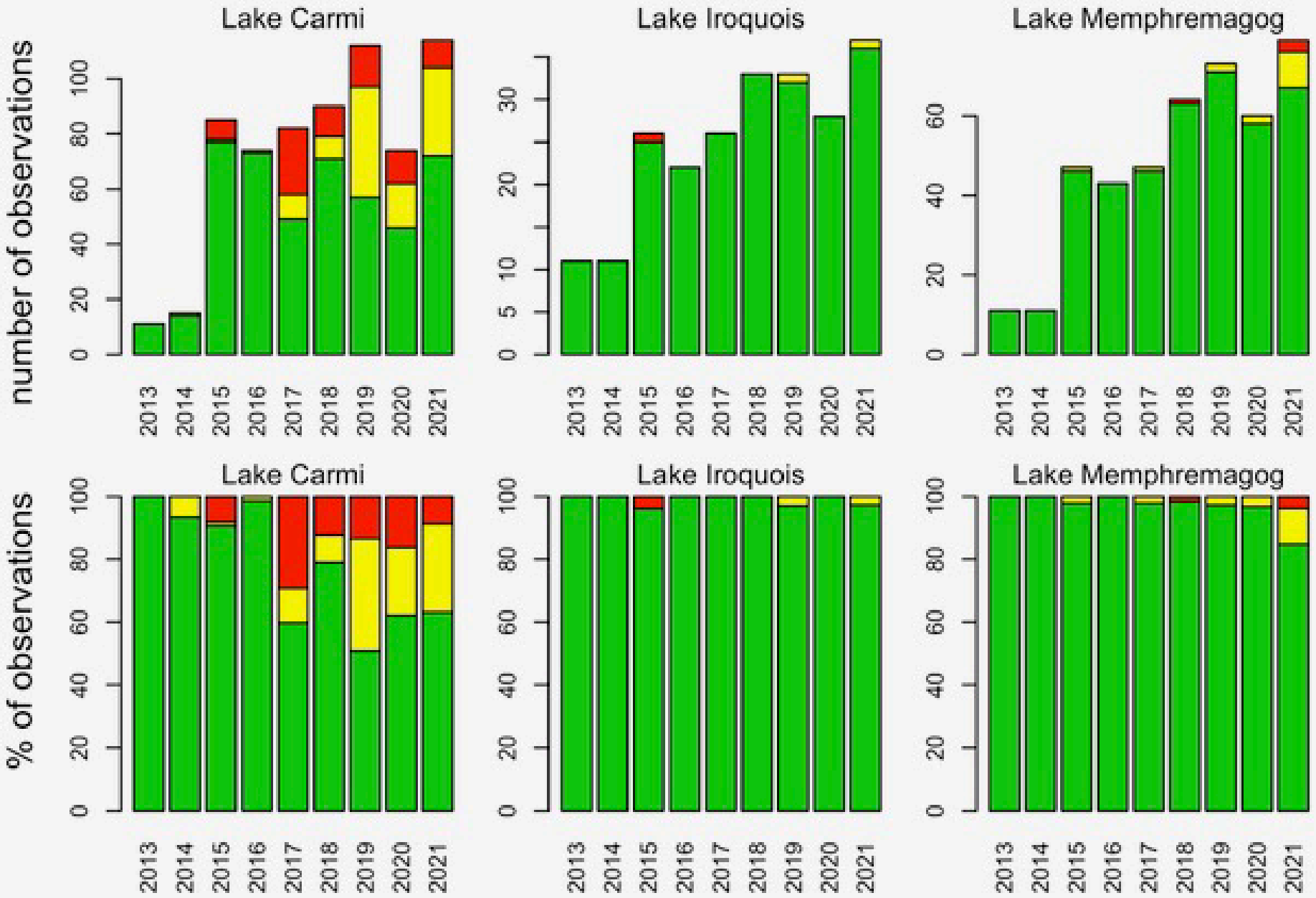
Mean TP: 23.2 ug/L (19.2 ug/L)
Mean Chll A: 4.7 ug/L (4.8 ug/L)
Mean Secchi: 3.4 m (3.6 ug/L)

Mean TP: 22.6 ug/L (22.9 ug/L)
Mean Chll A: 8.3 ug/L (6.8 ug/L)
Mean Secchi: 1.5 m (1.7 m)

All Reported Cyanobacteria Blooms on Memphremagog



Routine Monitoring Cyanobacteria Bloom Reports, for Lake Memphremagog Lake Carmi, and Lake Iroquois 2013-2021

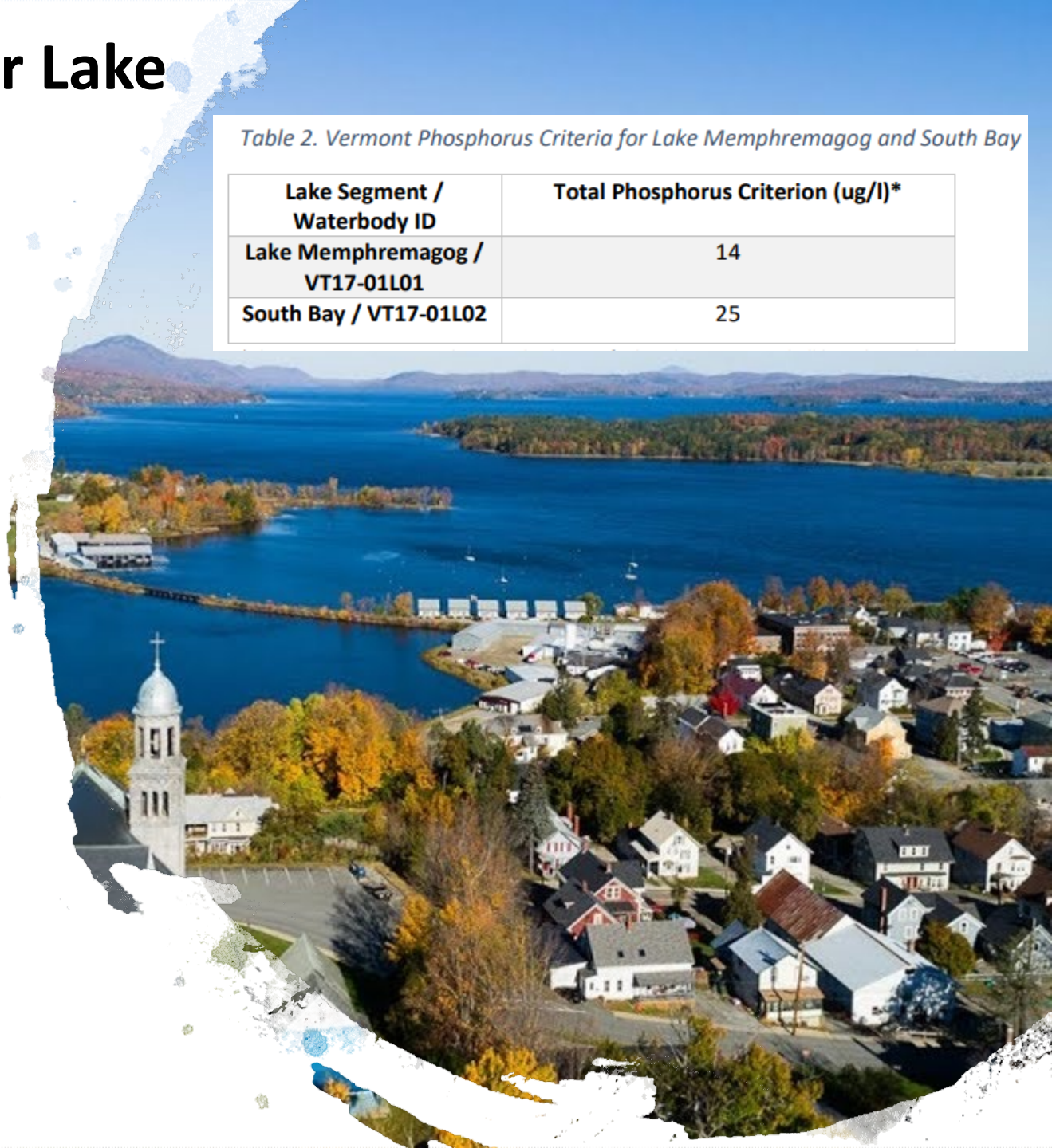


Summary of Data Observations for Lake

- Main Lake:
  - Trend from 1984 to Present: TP, Secchi, and Chl-A are all relatively stable
  - Lake is well-mixed, no anoxia, no detected internal loading
  - 2021 LMP data had highest recorded mean TP concentration of 23 ug/L
    - TMDL Target of 14 ug/L
  - Highest number of High Alert Cyanobacteria Blooms reported (34)
- South Bay:
  - No statistically significant trends 2021
  - Nutrient Response Variables closer to mean values and improved since 2020
  - Mean Summer TP at 22.6, meets TMDL Target of 25, slight increase since 2008

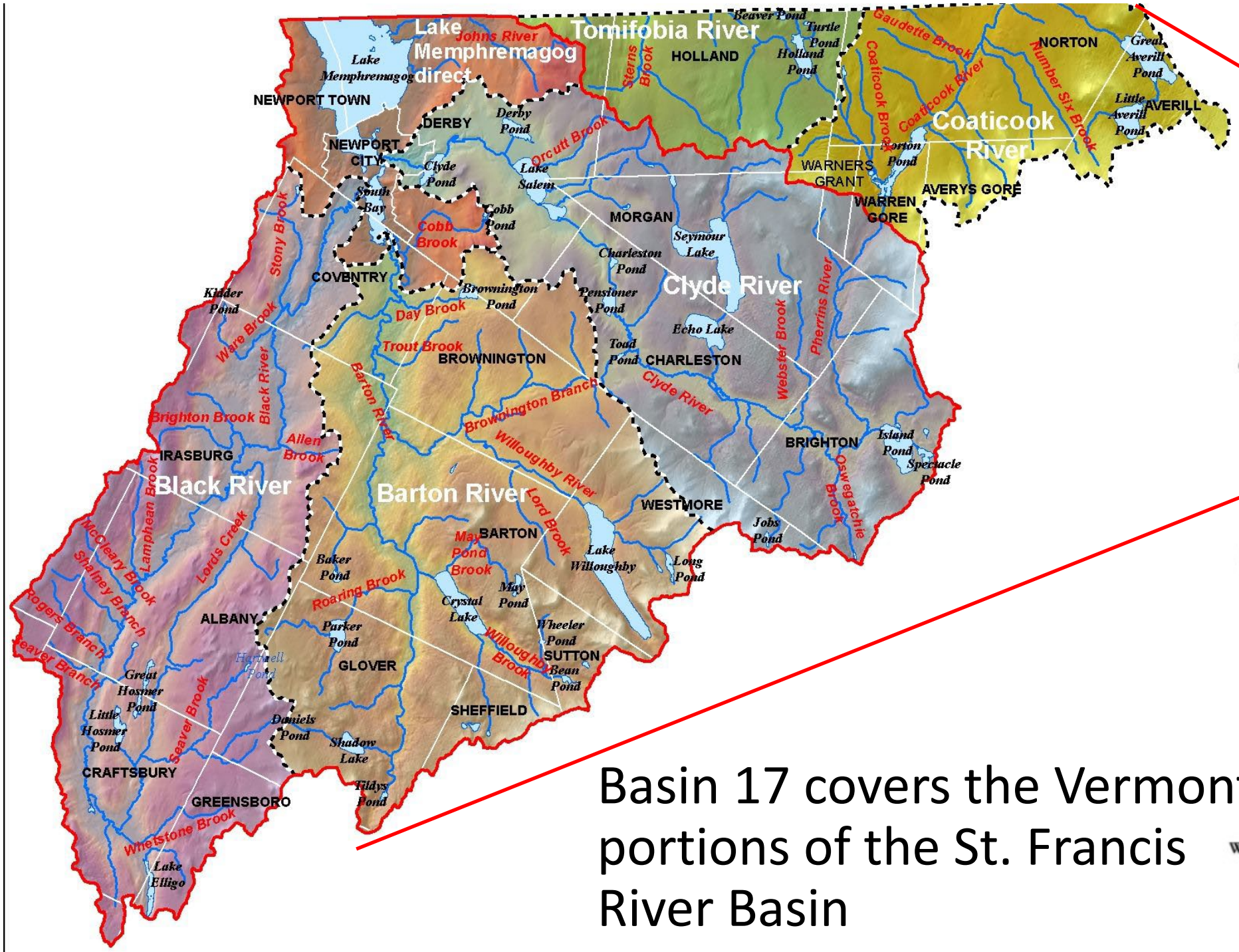
Table 2. Vermont Phosphorus Criteria for Lake Memphremagog and South Bay

Lake Segment / Waterbody ID	Total Phosphorus Criterion (ug/l)*
Lake Memphremagog / VT17-01L01	14
South Bay / VT17-01L02	25

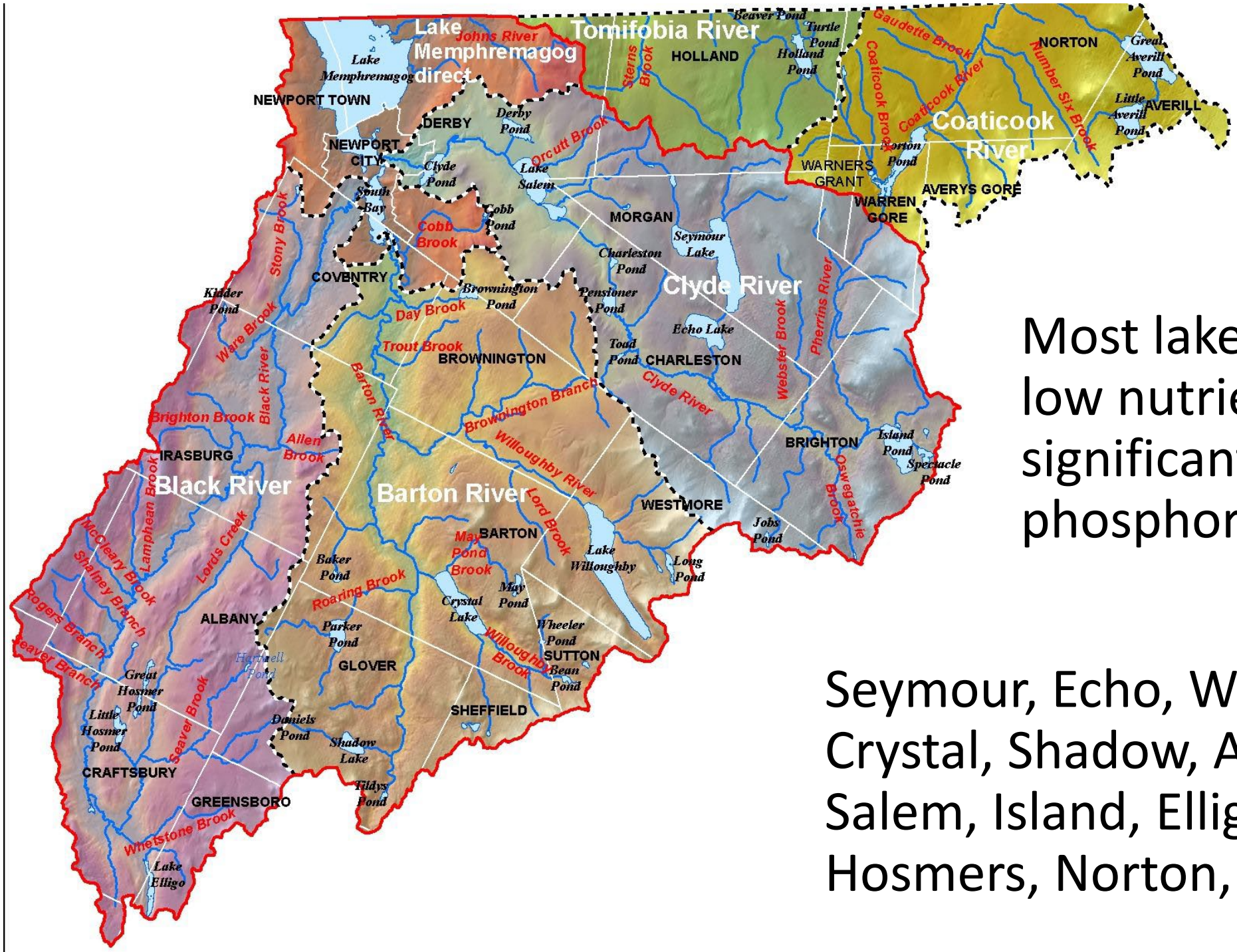


Future In-Lake Monitoring Efforts

- Lay Monitoring in Main Lake & South Bay
- Continue TMDL Monitoring Visits
- Train additional Cyanobacteria Monitors and VT Invasive Patrollers
- Participate in monitoring efforts led by new Observatory in Quebec; possibly install a monitoring buoy in the US

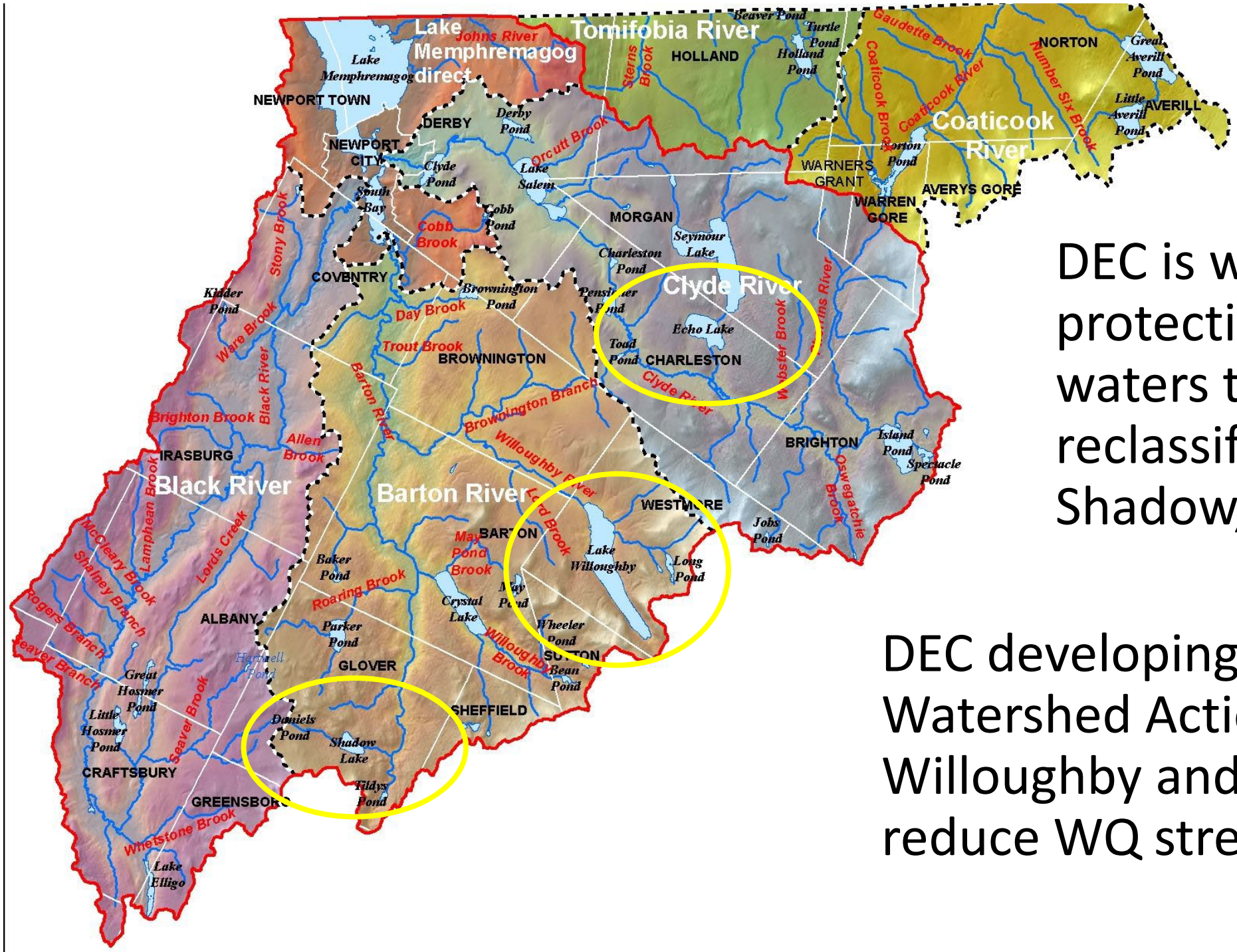


Basin 17 covers the Vermont portions of the St. Francis River Basin



Most lakes in the basin are low nutrient but have significantly increasing total phosphorus concentrations

Seymour, Echo, Willoughby, Crystal, Shadow, Averills, Salem, Island, Elligo, Hosmers, Norton, Derby, etc

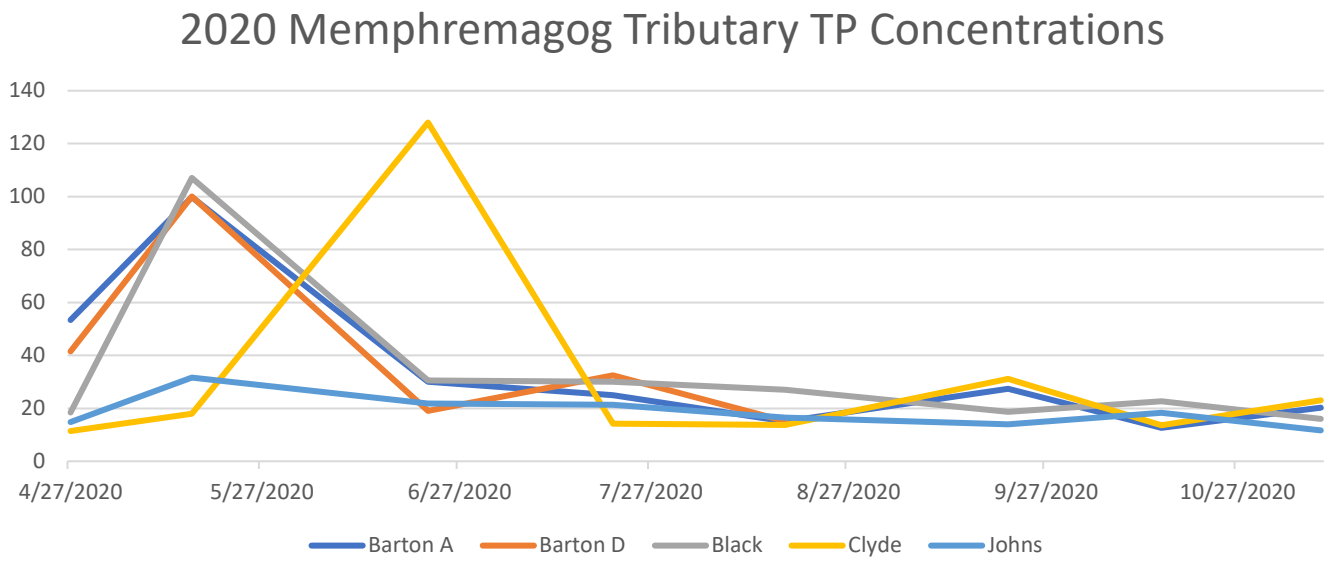


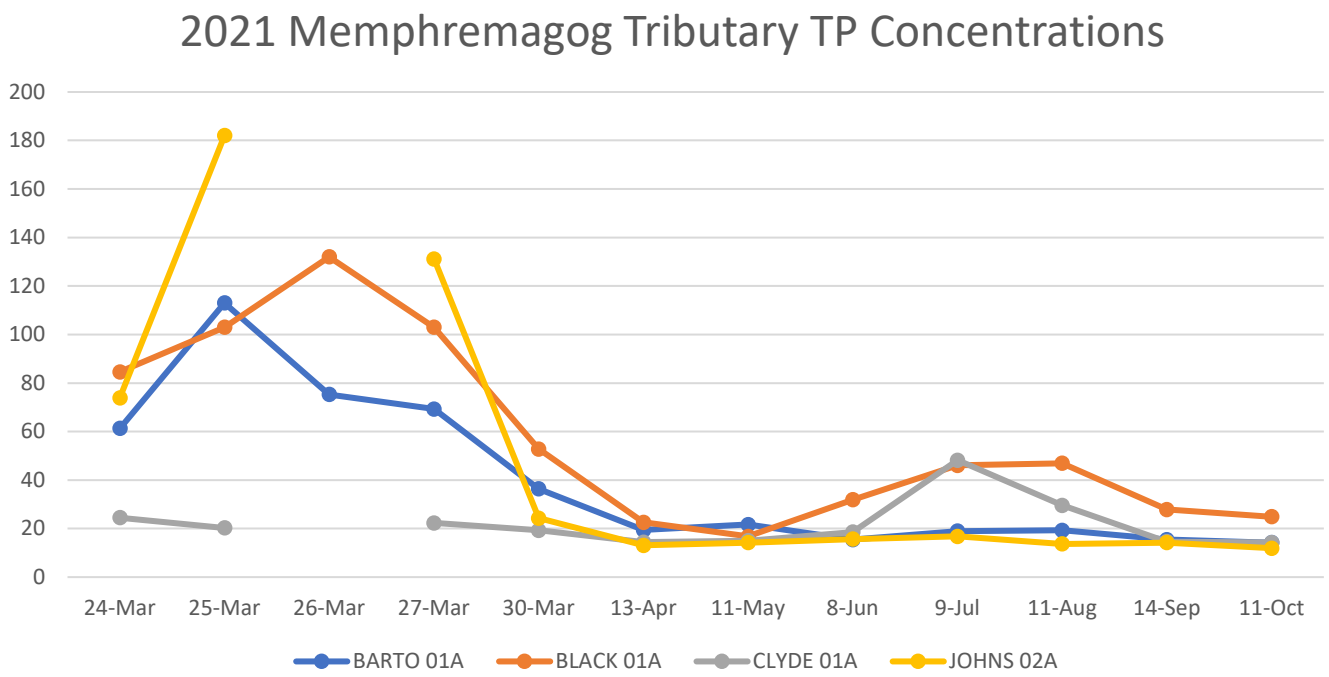
DEC is working to increase protections for high-quality waters through reclassification (Echo, Shadow, Willoughby)

DEC developing Lake Watershed Action Plans for Willoughby and Shadow to reduce WQ stressors

Major tributary sampling program (Black, Barton, Clyde and Johns Rivers)

- Orleans County Natural Resources Conservation District collecting samples for 2020 and 2021
- We try to capture 8 monthly phosphorus samples plus 10 high flow samples per yr to estimate loading
- We missed spring sampling in 2020 due to COVID so we can't compare 2020 data to other years.
- This winter we hope to have enough data (200 samples + 10 years) to estimate loading using the Weighted Regression on Time, Discharge, and Season (WRTDS) program.
- This program is used to estimate flow normalized tributary phosphorus loading to Lake Champlain and has much more power to identify trends over time.





Memph Tributary Data:

- 2020 values peaked around 100 ug/L
- 2021 Values peaked at 180 ug/L
- Highest concentrations come around spring snowmelt / runoff and precipitation events, suggesting that majority of external TP loading occurs between March and May
  - BMPs targeting high flows?
- Johns River has highest 2021 values, 2020 value is flagged as suspect
- By June, summer and fall values range between 20 and 40 ug/L

Aquatic Invasive Species Program

Memphremagog Zebra Mussel Surveys

- Analysis of the plankton net tow samples for Zebra mussel *(Dreissena polymorpha)* surveys from 2021 found no evidence of veligers (within a mile of ZM found in Canada)
- Results from earth metal tests for Calcium ranged in 18.2 mg/L – 19.9 mg/L (below the threshold of 20.0 mg/L); in 2022 will sample closer to shorelines and in bay areas.
- AIS Program Team met with Quebec representatives to share results and discussed how to assist each other if needed for the continuation of surveys in 2022.
- VTDEC will complete eDNA, plankton net tow, and physical surveys along a shoreline transect in 2022

Aquatic Invasive Plants and Other Species

- DEC met with Lake Champlain Basin Program and Vermont Housing Conservation Board to discuss a potential funding mechanism to support decontamination units at the boat launches in Memphremagog, still in the works
- A VT Public Access Greeter Program will be stationed at the Newport Center in 2022
- In 2022, DEC developed a Vermont Invasive Patroller for Animals Program, and will be presenting on-line workshops and an in-person training in Newport

Vermont
Invasive
Patrollers
for
Animals

VERMONT
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Merci pour votre attention!