

Sandwich Water Quality Summary

- For the one (1) site tested at Cold River, Sandwich's water quality overall is good. All parameters tested fall within accepted NH and/or EPA standards for surface waters. However, we understand that we have a limited data set, with only one site in Sandwich, to base this off of.

Things that Sandwich do to help protect their water quality:

- 1) Encourage residents to get their septic systems checked
- 2) Continue to perform monitoring on lakes/ponds in Sandwich
 - Either from LL program (UNH) or VLAP program (NHDES)
- 3) Reduce salt usage in roadways, especially those near or around bodies of water
- 4) Maintain riparian habitats around bodies of water
- 5) Use best management practices (BMPs) for any home/business on or near surface waters
- 6) Monitor the effectiveness of culverts in your town and replace those that need them

Report respectfully submitted by J. Emerson and T. Millum, Water Quality Coordinator and Americorps Volunteer at GMCG



Water Quality Parameters: what are we testing for?

Dissolved Oxygen: The amount of oxygen contained in water is commonly expressed as a concentration in terms of milligrams per liter (mg/L), and/or as a percent (%) saturation. Accurate dissolved oxygen readings are dependent on temperature and atmospheric pressure. Gases, like oxygen, dissolve more easily in cooler water than in warmer water. Depletions in dissolved oxygen can cause major shifts in the kinds of aquatic organisms found in water bodies.

Turbidity: A measurement of the clarity of a fluid. The greater the turbidity, the murkier the water. High levels of suspended particles, which absorb heat from the sun, increases the water temperature. Suspended solids can clog fish gills, reduce growth rates, decrease resistance to disease and prevent egg and larval development of aquatic life.

Temperature: The metabolic rates of organisms increase with increasing water temperature. An increased metabolism increases the need for oxygen. Temperature also influences the amount of oxygen dissolved in water and the rate of photosynthesis by algae and larger aquatic plants.

Conductivity: a measure of the ability of water to pass an electrical current. Conductivity in water is determined by the presence of ions that carry a positive or negative charge. Conductivity in some areas, typically those near road, may have higher than average levels due to manmade issues such as road salting during the winter months. Conductivity is also influenced by temperature (warmer water has higher conductivity) and by flow volume.

pH: Water contains both hydrogen ions and hydroxyl ions. At a pH of 7.0 (neutral) the concentration of both hydrogen ions and hydroxyl ions is equal. When the pH is less than 7.0 (acidic) there are more hydrogen ions than hydroxyl ions. When the pH is greater than 7.0 (alkaline or basic) there are more hydroxyl ions than hydrogen ions. Generally speaking, the ability of aquatic organisms to complete a life cycle greatly diminishes as pH falls below 5.0 or exceeds 9.0.

Total Phosphorus: Of the two nutrients most important to the growth of aquatic plants, nitrogen and phosphorus, it is generally observed that phosphorus is more limiting to plant growth in freshwater systems. Phosphorus is primarily associated with human related activities within the watershed and is therefore important to monitor and control.

Water Quality Parameters Guideline

Parameter	Acceptable Limits
Dissolved Oxygen	Above 75% saturation; between 6-12mg/L*
Temperature	No standard
Turbidity	10 NTUs or lower; preferably in the 1 NTU range*
Conductivity	Below 500uS/cm in rural areas; 1500uS/cm in urban areas**
Total Phosphorus	Below 30ug/L**
pH	Between 6.5-8; usually around 6.5 unless naturally lower*

*NH Rev Stat § 485-A:8 (2016) Standards for Classification of Surface Waters of the State

**EPA recommendations

GS-1 Cold River

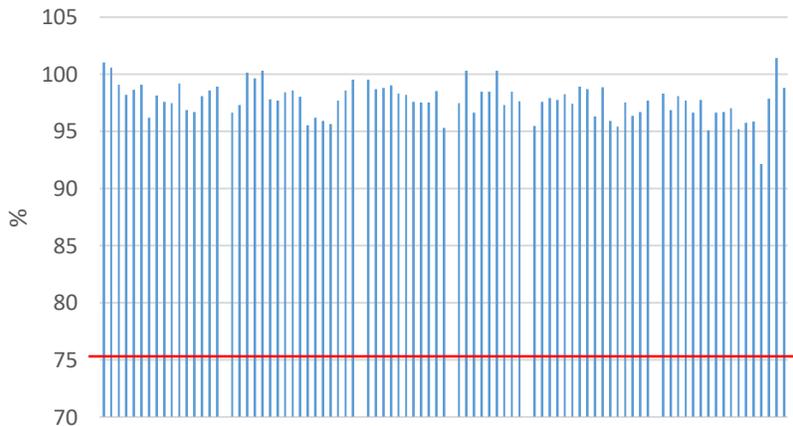
2015-2020 Snapshot
Monitored since 2002

Parameter	Rating	Explanation
pH	Stable	Low variability; no significant trends
Turbidity	Stable	Low variability; no significant trends
Total P*	Worsening	Largest numbers seen in last five years including multiple data points above acceptable limits

*TP Data available only through 2019

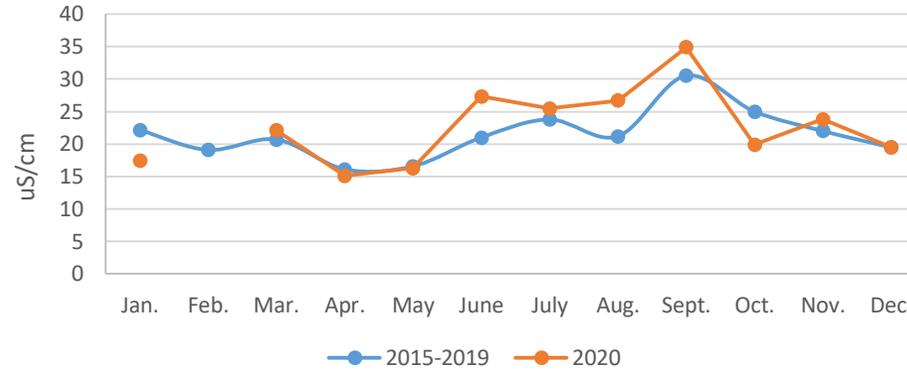
*TP concentrations increased drastically at points throughout 2019 when compared to previous years. This is something that will need to be monitored over time to see if those trends continue. Some of these measurements did rise above 30 ug/L in 2019 which is considered "nuisance levels."

Dissolved O₂ % Saturation



New Hampshire State DO standard for Class A waters is **above 75%** during the months GMCG tests.

Conductivity by Month

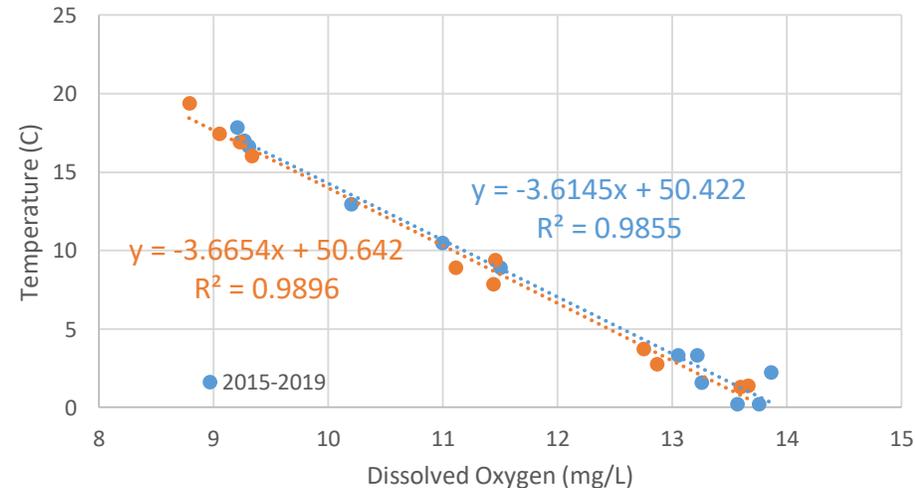


Conductivity shows little to no trend in 2020 from combined 2015-2019 median values. These data points at GS-1 do not rise above 40 uS/cm which indicates healthy water quality in terms of salt levels.

Site location



Dissolved O₂ vs. Temperature



Dissolved Oxygen (DO) has an inverse relationship with temperature: as temperature increases DO decreases. The R² values from 2020 (orange) show a similar value compared to combined 2015-2019 values (blue) which indicates a strong correlation. DO levels at GS-1 are high and indicate good water quality.

GS-1 Cold River

2015-2019 Snapshot
Monitored since 2002

Parameter	2015-2019 Evaluation
Ammonium	Stable; below detection limits
Nitrate	Stable
Total dissolved nitrogen	Stable
Dissolved organic nitrogen	Stable
Chloride	Stable
Sodium	Stable
DOC	Stable

2020 data currently unavailable

Overall, the chemical data analyzed between 2015-2019 at GS-1 indicates very high water quality which is a great sign. No parameters are even approaching levels that would be harmful for water quality at the moment.

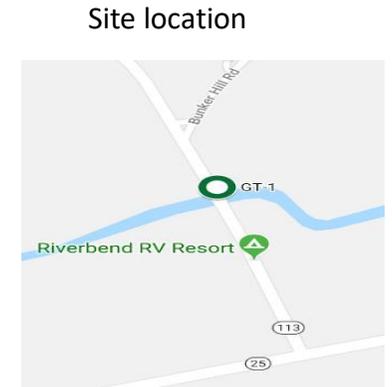
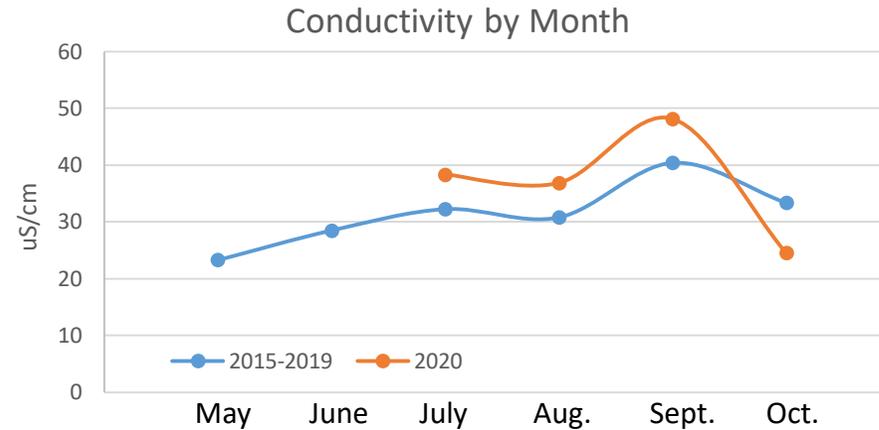
GT-1 Bearcamp River 2015-2020 snapshot

Monitored since 2002

Parameter	Explanation
pH	Worsening; most pH measurements in 2020 were below 6
Turbidity	Worsening; highest levels seen in the last 5 years; higher than most sites, but still considered within acceptable limits
Total P*	Worsening; with a few data points above nuisance levels in 2019.

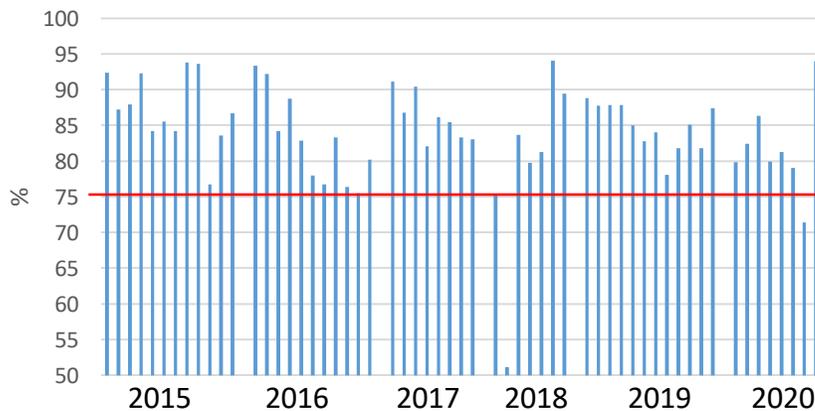
*TP Data available through 2019

*Summer field sampling began in July 2020 due to complications with COVID-19



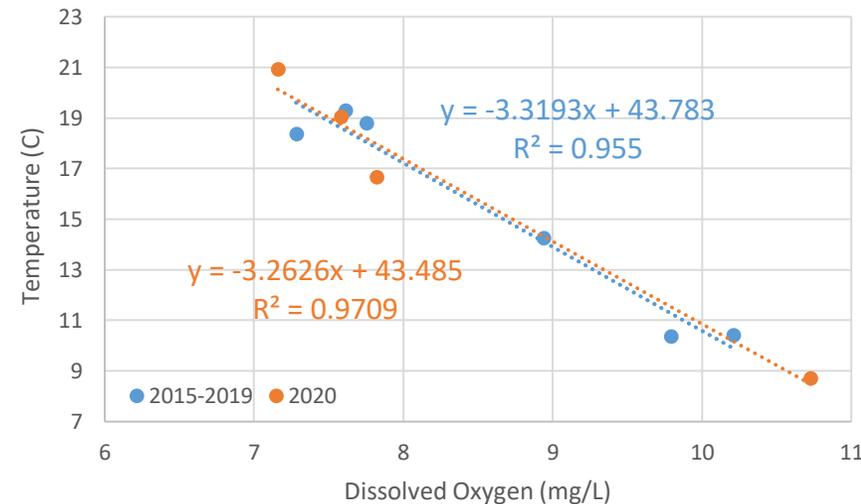
Conductivity increases slightly in 2020 from combined 2015-2019 median values. However, these data points at GT-1 do not rise above 50 uS/cm which indicates healthy water quality in terms of salt levels.

Dissolved O₂ Saturation



New Hampshire State DO standard for Class A waters is **above 75%** during the months GMCG tests.

Dissolved O₂ vs. Temperature



Dissolved Oxygen (DO) has an inverse relationship with temperature: as temperature increases DO decreases. The R² values from 2020 (orange) show a similar value compared to combined 2015-2019 values (blue) which indicates a strong correlation. DO levels at GT-1 are stable and point to good water quality.