

# Investigating Water Quality in the St. Francis Xavier Stream



CHESAPEAKE BAY FOUNDATION  
Saving a National Treasure

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## Abstract

The research question states: How does dissolved oxygen (D.O.), transparency, and temperature relate in the St. Francis Xavier Stream? The hypothesis states that when the transparency levels are lower the temperature will be higher because there are not as many particles to collect and scatter the light, therefore the water will be warmer because there is more light entering the water. Also, the D.O. levels will be lower because colder water dissolves more oxygen in the water, so if the water is warmer because of the transparency there will not be as much dissolved oxygen in the water. Water was collected from the stream on SFX property and tested either beside the stream or back in the classroom following GLOBE protocols. The data partially supports the hypothesis which states when the transparency levels are lower the temperature will be higher because there are not as many particles to collect and scatter the light, therefore the water will be warmer because there is more light entering the water. Also, the D.O. levels will be lower because colder water dissolves more oxygen in the water, so if the water is warmer because of the transparency there will not be as much dissolved oxygen in the water. Since D.O. is high and the temperature is low, it seems like the stream has good water quality, but more data will need to be taken and more variables will need to be measured.

**Keywords:** water, dissolved oxygen, temperature, transparency

## Research Question

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## Introduction

### Dissolved Oxygen (D.O.)

- amount of oxygen that is dissolved in the water
- fish use to breathe- if small amounts in water, the fish will start to die
- if the temperature is hot the less D.O. is in the water and the colder it is, the more D.O. is in the water
- the clearer the water is, the more D.O. is in the water and if it is clouded the less D.O. is in the water (GLOBE)

### Temperature

- shows whether it is hot or cold.
- keeps things functioning well
- D.O. transparency, and temperature all affect the life in the water (GLOBE).

### Transparency

- measures the amount of suspended particles in the water
- will decrease the amount of molecules that will absorb or scatter light
- the less transparency the less sunlight gets to the plants and animals at the bottom of the water body
- the less light that can enter the body of water, the cooler the water will be and the temperature will change
- if there are more particles in the water, there is less room for the D.O. molecules in the water and will prevent the animals from breathing (GLOBE).

## About the Experiment

The independent variable is the date of measurement. The dependent variables are D.O., temperature, and transparency. The controls are the location and way of testing. The hypothesis states that when the transparency levels are lower the temperature will be higher because there are not as many particles to collect and scatter the light, therefore the water will be warmer because there is more light entering the water. D.O. levels will be lower because colder water dissolves more oxygen in the water, so if the water is warmer because of the transparency there will not be as much dissolved oxygen in the water.

## Research Methods Planning Investigations

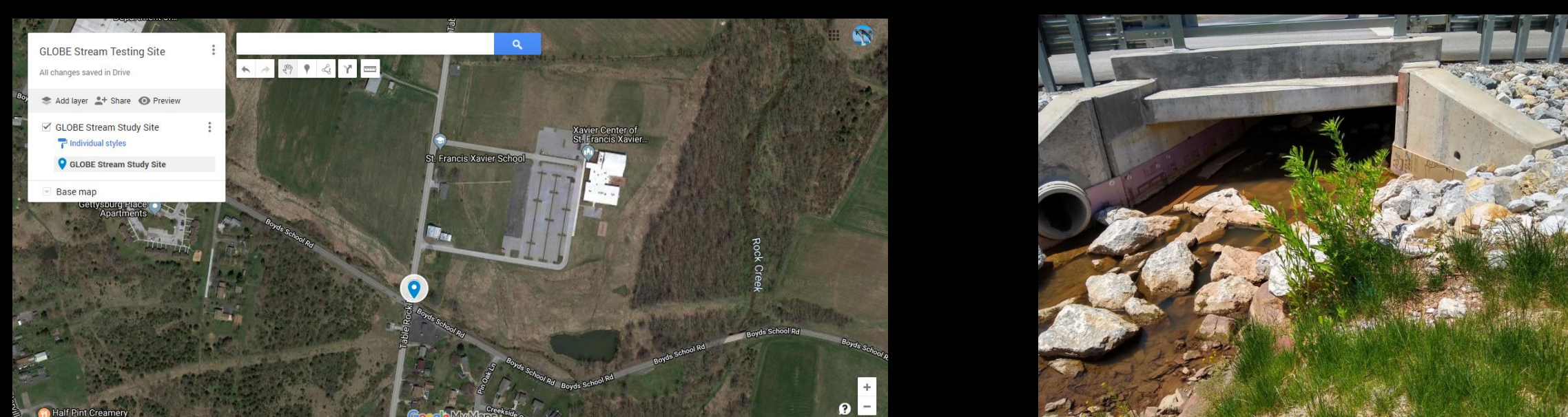


Image 1 and 2: These images show the stream study site. One is an aerial view and one is a photograph of the actual site.

- The site is at the edge of a bridge in an unnamed stream that joins Rock Creek beside our school. It is a rocky stream bed with unmowed, vegetated banks on our property. There are some areas close to mowed grass. Our school is in a rural area with farms and pasture land on the north and west sides, a small housing development on the south side, and a forested area with a creek to the east side. We experience a humid, continental climate. The coordinates of this site are 39.85728, -77.22855 with an elevation of 148.7m.
- GLOBE atmosphere protocols for cloud coverage will be used. GLOBE hydrosphere protocols for D.O., water temperature, transparency, pH, phosphate, and nitrate plan to be used
- Training on how to collect data with kits will be done in class
- Mr. Toth from NASA Goddard provided a LaMotte kit, so LaMotte kits were purchased so data is easy to compare between projects
- Data is to be collected once a week during class or after school at the Stream Study Site

## Materials

- Transparency Tube (DIY GLOBE version)
- Dissolved Oxygen Water Testing Kit-LaMotte Dissolved Oxygen Kit (5860-01)
- Vernier Water Temperature Probe
- Cloud Viewer (from UCAR)
- Clipboard/ Pen
- GLOBE Hydrosphere Data Sheet

## Carrying Out Investigations

- Molly, Sophia, and Gabe conducted water testing as often as conditions and scheduling permitted
- Samples tested during class with classmates, after school with 8<sup>th</sup> grade water students, and sometimes just the three of them
- GLOBE protocols for cloud, air temperature, D.O., water temperature, transparency, pH, and nitrates were followed to share data between all classes and research groups
- Phosphates were also tested (when reagents were available)
- Sometimes water was collected, clouds, air and water temperature, and D.O. was taken streamside and the rest of the protocols were followed indoors due to cold temperatures and precipitation
- Team members took turns, rotating through testing steps and recording data for each trial
- At times, the creek was inaccessible due to high waters

## GLOBE Badges

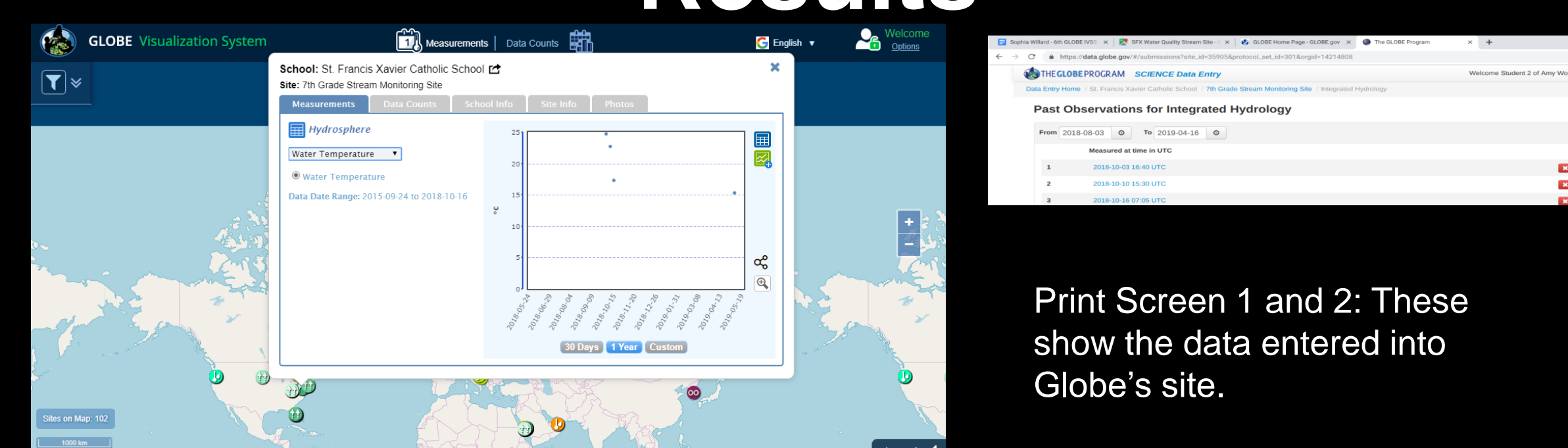
### Be a **Collaborator**

Each step and piece of this project was divided up so each group member was doing something for all parts of the project. We got this idea during the GLE when we tested the streams in Ireland. During testing, we took turns so all of us did each step at least once. The report and logbook was also divided up equally. We also shared our data with 8th grade students and worked with the entire 6th grade when we did our water tests.

### Make an **Impact**

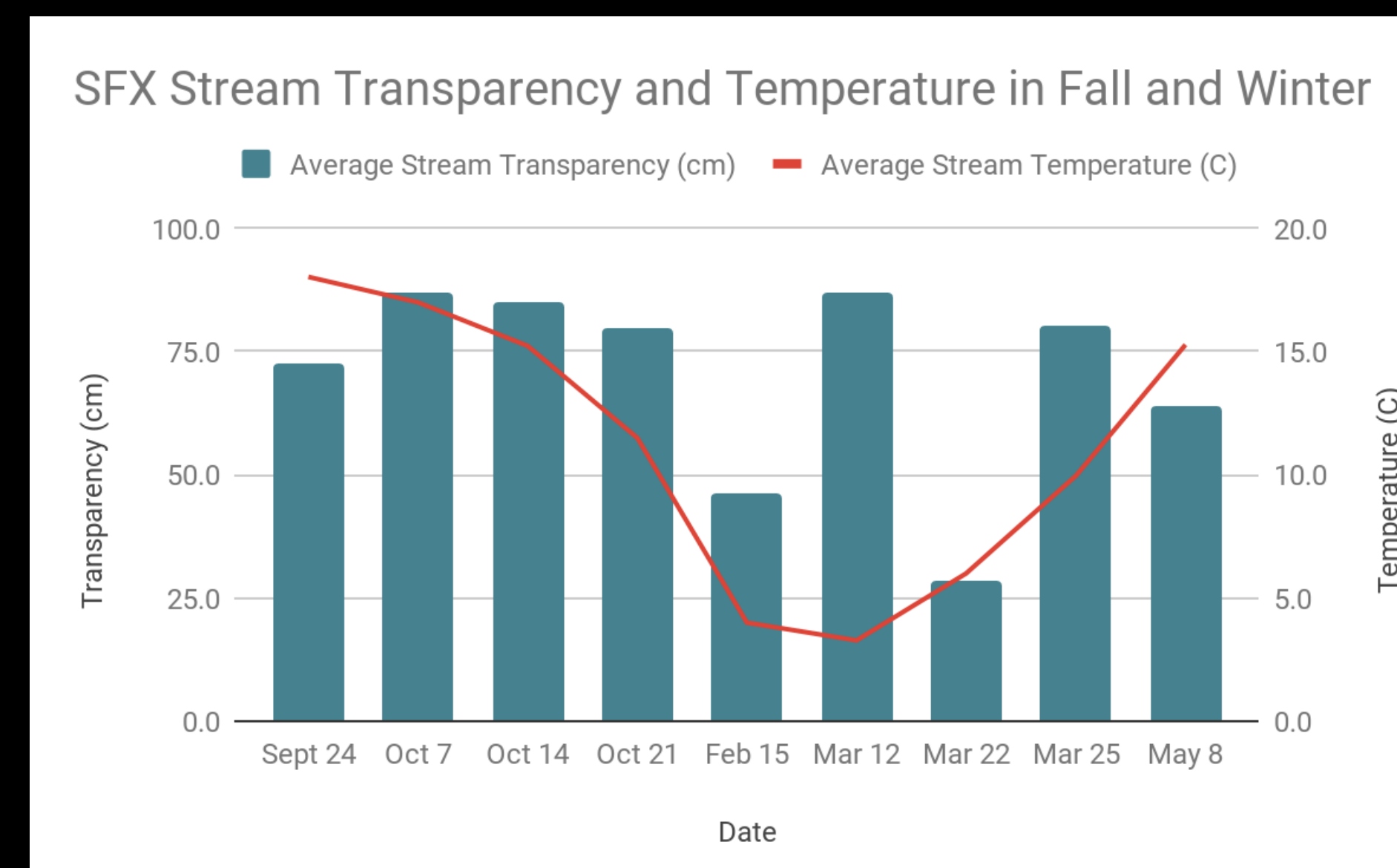
We hope that our research makes a community impact because we are continuing to monitor our stream and share our data with the Chesapeake Bay Foundation and the PA Department Conservation of Natural Resources to help show that Adams County is continuing to contribute healthy water down to the Chesapeake Bay.

## Results

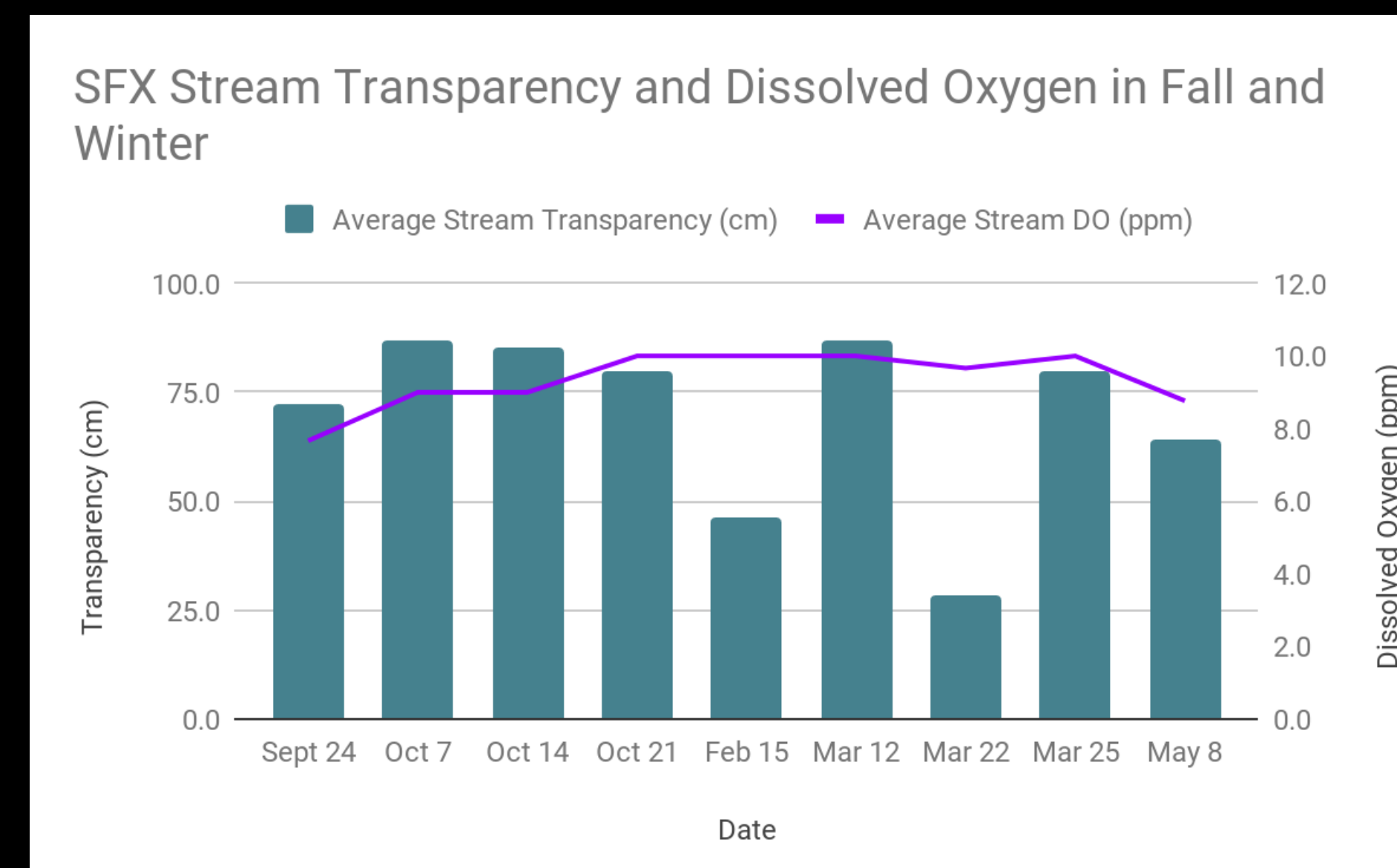


Print Screen 1 and 2: These show the data entered into GLOBE's site.

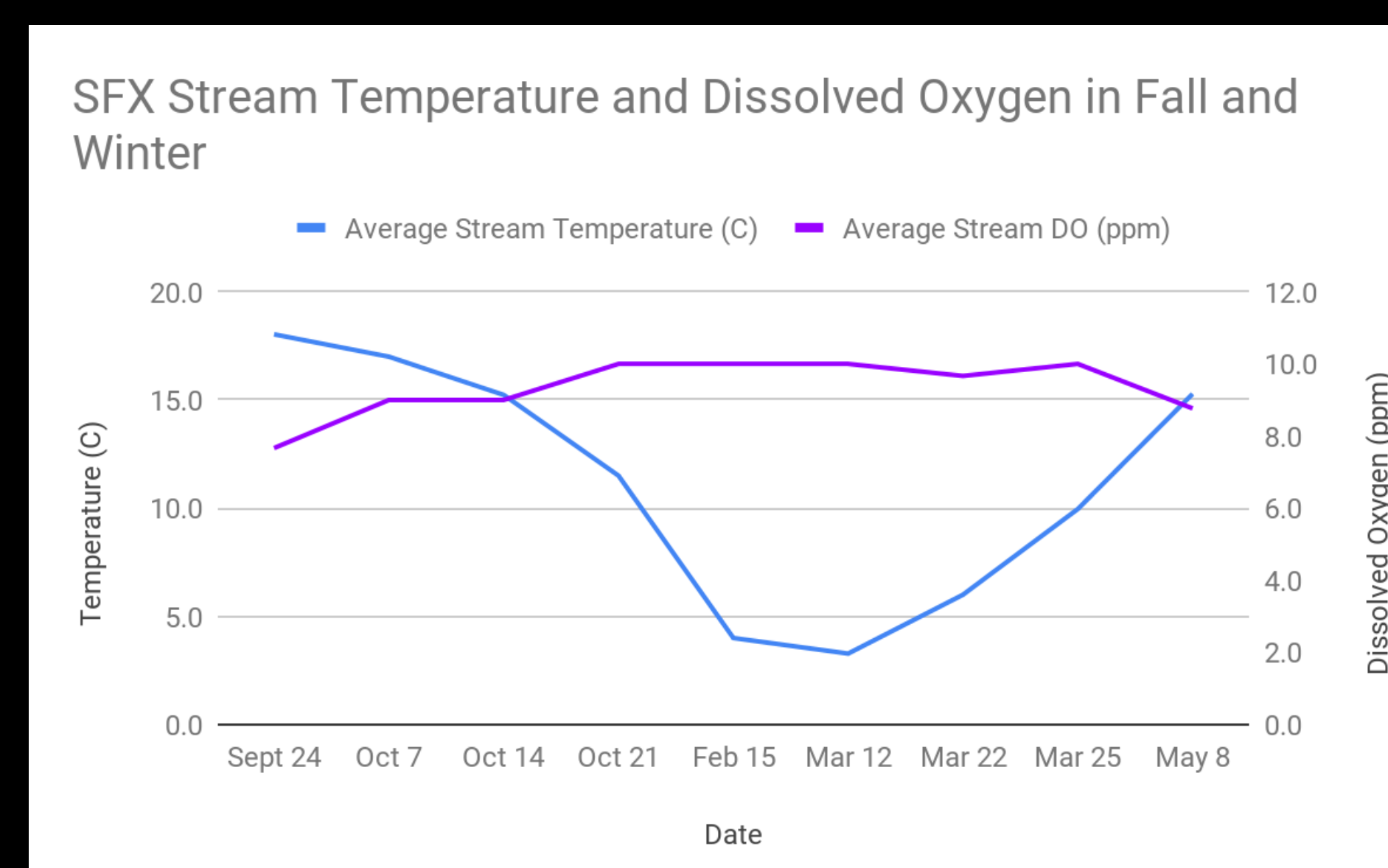
## Analyzing Data



Graph 1: This figure shows that when the transparency decreases, the temperature decreases as well.



Graph 2: This figure shows that it is unclear how transparency and dissolved oxygen relate.



Graph 3: This figure shows that it is unclear how transparency and dissolved oxygen relate.



Picture 1: This shows testing done back in the classroom due cold air temperatures outside.

## Discussion Interpreting Data

- When the transparency decreases, the temperature decreases as well.
- It seems unclear how transparency and dissolved oxygen relate without more data.
- When the temperature decreases, the dissolved oxygen increases.
- This partially supports the hypothesis.
- It would have been easier to see the relationship if we had more data over more weeks.
- Water quality is important for the animals and plants living in that water and to any humans who might use that water or those animals and plants downstream. It is important to understand how all the parts of water quality work together to understand if the stream is healthy.
- Possible sources of error are adding too much or too little of the chemical in the different kits, incorrectly entering data and making a mistake in averaging in the trials. The group tried to check each other to keep the errors from occurring.



Picture 2: We are using our new temperature probe to collect water temperature before finishing the rest of the tests back inside because it is cold outside.



Picture 3: This is our entire collecting data for all water quality parameters streamside during warm weather.

## Conclusions

### Drawing Conclusions & Next Steps

- If this experiment could be repeated more data would be collected and more research would be gathered. On Tuesday, May 14, 2019 we went to Strawberry Hill, Fairfield for our Trout release. While we are there, we hoped to take water samples, but were only able to do a macroinvertebrate study, which did indicate good water quality.
- Next year we will also be able to take samples from other locations such as the Susquehanna River and eventually the Chesapeake Bay to help compare and get a better understanding.
- Water Quality is important because it tells us whether this water that we are testing is good for aquatic plants and animals or harming them.
- In the future, other protocols like pH of the soil and trees would be studied as well as the rest of the chemical and biological water quality protocols.

## References

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