The Influence of Transylvania Brook on the Pomperaug River

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Newtown High School -- Audubon Center at Bent of the River

What is a Tributary?

A tributary is a river or stream that runs into a lake or a larger river and can provide many ecosystem functions, such as carrying vital sediments and nutrients into the mainstream. This project will address why tributaries are so vital to the health of rivers and streams with regard to water quality, and how they influence and aquatic organism's habitat.

Study Area

- The Pomperaug River (PR) is located in a forested area and runs through Southbury CT (Figure 1).
- Transylvania Brook (TB) is a tributary that runs into the PR via a culvert. This confluence is the point of study in this project (Figure 1).
- The lower Pomperaug is a freshwater river that serves as a habitat for aquatic and wildlife along with providing recreational value and an industrial and agricultural water supply. It begins at the confluence of TB (CT DEEP, 2011).

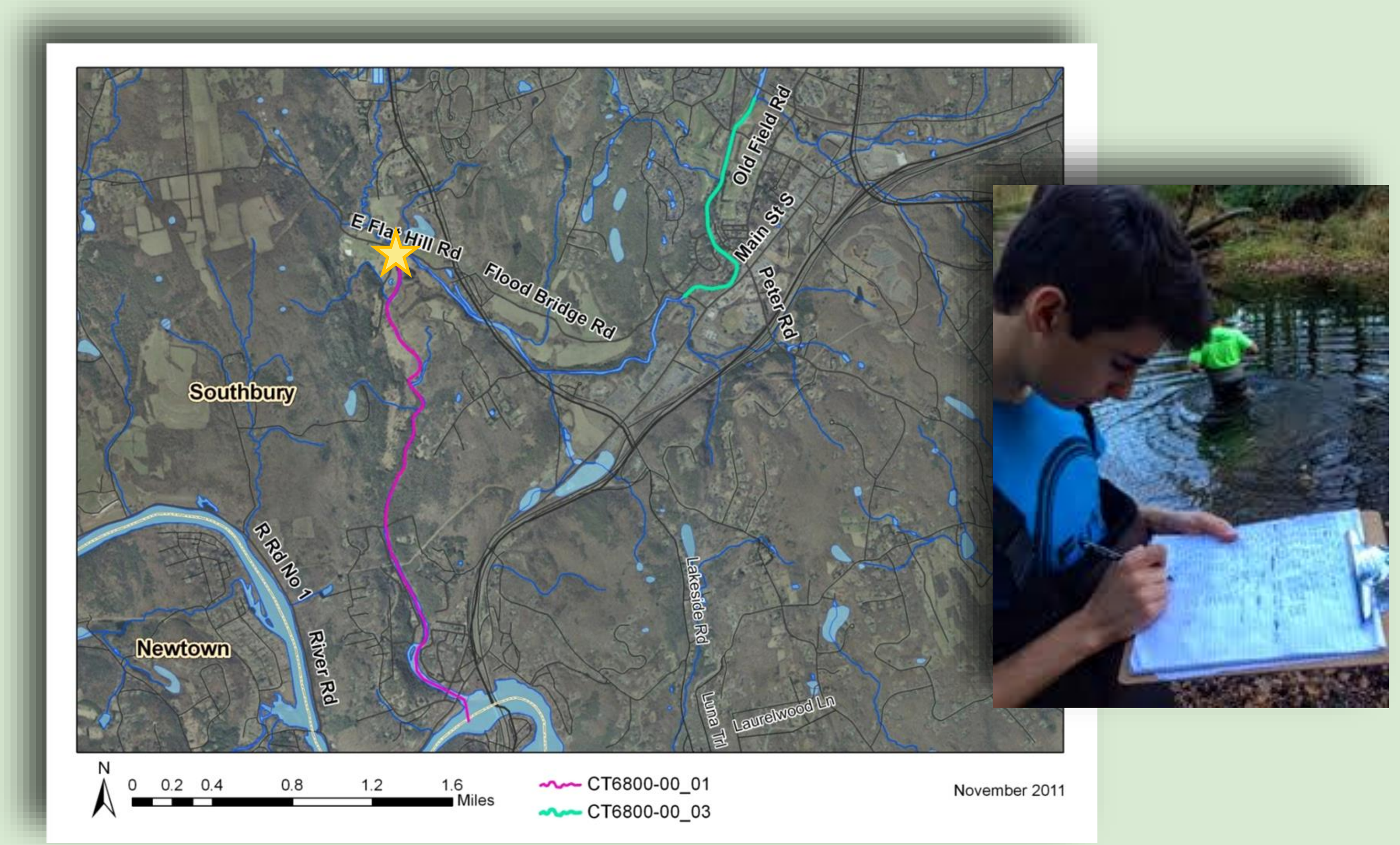


Figure 1. Left: Map of the upper Pomperaug River (green) and the lower Pomperaug River (purple) along with the surrounding area. The yellow star indicates where TB enters PR. We surveyed directly above and below this confluence. **Right**: Taking data on stream characteristics and water quality as community partner Glen Somogie wades in the Pomperaug River.

Project Goals

- Through sampling the PR and TB, this study seeks to show how characteristics, such as stream temperature, water quality and streamflow are major factors of a healthy river, and how water quality and stream characteristics can vary seasonally.
- By studying these characteristics, findings will help to better understand the impact TB has on PR.

Water Quality Standards

According to the Ubante Total Dissolved Solids (TDS) meter:

Table 1. Water quality standards for TDS

	Ideal, Pure Water	Good	Fair	Marginally Acceptable	Barely Sufficient	U.S EPA Max Contaminant Level
TDS (ppm)	0-50	50-100	100-200	200-380	375-490	490
Example	Distilled Water	Mountain Springs	Hard Water	Average Tap Water	High Tap, Mineral Springs	Water With Many Contaminants

MATERIALS AND METHODS

Water quality assessments:

- On Sep 21, 2017 (early fall), October 10, 2017 (late fall), and January 28, 2018 (winter), measurements on stream characteristics and water quality were taken above and below the confluence of the Pomperaug River (PR) and Transylvania Brook (TB) in Southbury CT (Figure 1).
- Using the Ubante TDS meter, temperature, conductivity, and dissolved solids were calculated by averaging 3 data points along the width of the PR (Figure 2) .
- The width was determined by spanning twine across the stream attached to wooden stakes on either bank and measured with a measuring tape. This was done at two places 20 feet apart along the length of the river.
- Depth was determined by dividing each width evenly and taking depth readings at those points using a measuring stick. These readings were then averaged to find the final depth.
- Streamflow was calculated by using the two sets of widths (twine attached to stakes spanning the river), 20 feet apart. An orange was released in the river beneath one string of twine and the current carried it downstream to the other. The time was recorded. This was repeated two more times and averaged.
- All measurements were conducted at two different sites along PR: one upstream and one downstream of the confluence of TB.

Figure 2. Left: Hammering a stake into the ground in order to attach string to span across river for width and stream flow measurements. **Top right:** Recording data in Epicollect on conductivity, dissolved solids, and temperature found by using a TDS measurement device. **Bottom right:** Conducting depth measurement above the entry of Transylvania brook.

Epicollect5 Application:

- Prior to the data collection at PR, a form was created in Epicollect5 app allowing us to enter data for each measurement described above as well as location, weather, date, and time.
- While at the river conducting measurements, data were recorded in the form I created (Figure 3).

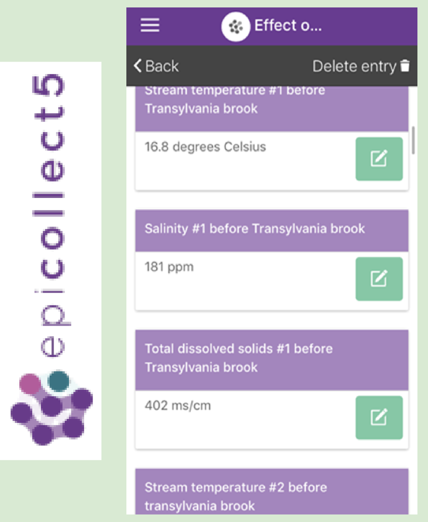
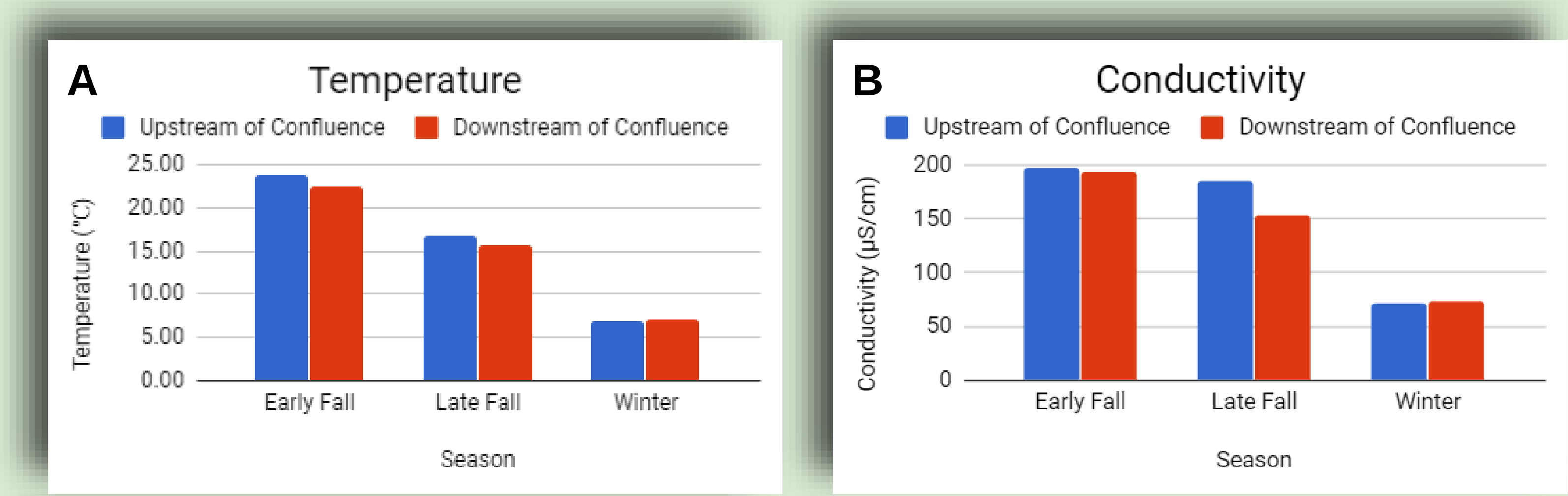


Figure 3. A screenshot of the Epicollect form I created for this study.

RESULTS



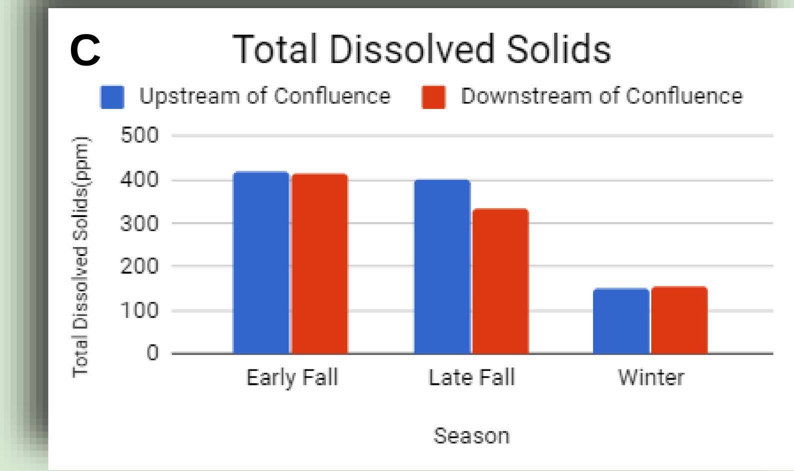


Figure 4.

- **Graph A** shows the relationship between temperature of the PR and the season.
- **Graph B** shows the relationship between conductivity of the PR and the season.
- **Graph C** shows the relationship between total dissolved solids in the PR and the season.

Temperature, conductivity, and total dissolved solids (TDS) all decreased from early fall to winter. Conductivity and TDS levels were lower downstream after the influences of Transylvania Brook in the late fall, but were of similar levels during early fall and winter.

Table 2. Stream characteristics of PR upstream and downstream of TB confluence

	Average Depth Above Confluence	Average Depth Below Confluence	Average Width Above Confluence	Average Width Below Confluence	Average Streamflow Above Confluence	Average Streamflow Below Confluence
Autumn	1'2"	3'5"	46'11"	47'8"	53.1 seconds	191.3 seconds
Winter	2'6"	4'10"	58'9"	55'5"	12.7 seconds	15.6 seconds

In the winter, PR water levels were higher and depth, width, and streamflow both upstream and downstream of the confluence were far greater than in the autumn. The streamflow decreases below the confluence of TB.

CONCLUSIONS

- These results show that overall the water quality was better in the winter. This is likely due to high water levels and heightened streamflow, which creates increased turbulent diffusion of oxygen into the water because faster moving water hits obstacles in the river more violently causing increased contact between atmospheric oxygen and the water molecules as they spray into the air, (Water On The Web, 2008). With more oxygen dissolved in the water, aquatic organisms have plenty of oxygen to breathe. Also, temperature, conductivity, and TDS were lower during the winter.
- Based on the findings, TB contributes more water, causing an increase in volume and a decrease in streamflow below the confluence of TB.

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