

Comparison of Wilkins Creek and Spring Creek Stream Chemistries

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Abstract

A stream's chemistry and health can be affected by seasonal fluctuations, environment and land usage. Wilkins Creek and Spring Creek are tributaries of Conesus Lake located in Livonia, New York. The two streams flow through varying terrain. Wilkins Creek flows predominantly through wetlands, residential and agricultural land. Spring Creek runs through the village of Livonia. The different environments may result in altered stream chemistries. An analysis of water chemistry was taken at different points in Wilkins Creek and Spring Creek before they converged. Alkalinity, chloride, oxygen, pH, conductivity, and water temperature were measured at each location. Samples were collected and analyzed from the end of February and throughout the months of March and April. This allowed data to be collected before and after seasonal snowmelt and rainfall events. Our 2021 data is compared to past research done on Wilkins Creek and Spring Creek throughout March and April of 2019. The results may show natural seasonal and environmental variations that impact stream chemistry.

Introduction

Healthy streams can supply clean water for drinking, agriculture and industry. The environment through which streams flow impacts the water quality. The purpose of this study was to compare the water quality of Wilkins Creek and Spring Creek, which flow through differing environments before converging and flowing into Conesus Lake. Spring Creek flows through the Village of Livonia and presumably receives more runoff from impermeable surfaces before it converges with Wilkins Creek. The headwaters of Wilkins Creek flows predominantly through agricultural land and a wetland. Thus, Spring Creek and Wilkins Creek provide an opportunity to compare the impact of these varying environments on stream water quality.

Field Location and Methods

Wilkins and Spring creeks are located in Livonia, NY (Fig 1A). Samples were collected from Wilkins Creek near the Livonia high school. From Spring Creek, the samples were collected near the Livonia elementary school and a nearby 7/11 convenience store (Fig 1B).



Fig. 1. (A) The sampling site in Livonia with respect to Geneseo. (B) The five sample sites on a map of the town of Livonia. Sample sites are shown by the red dots.

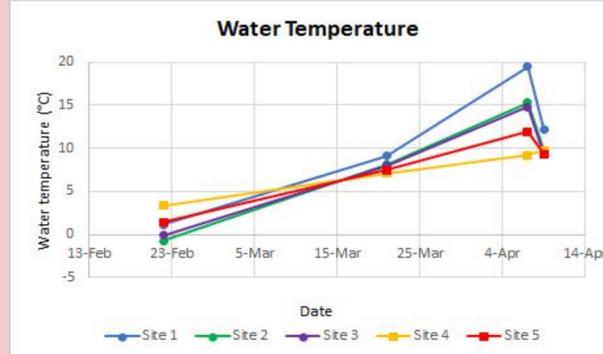
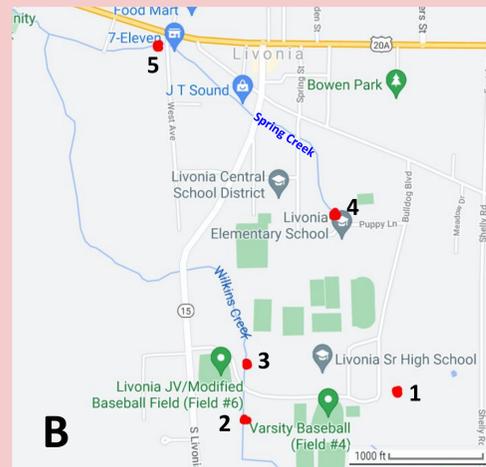
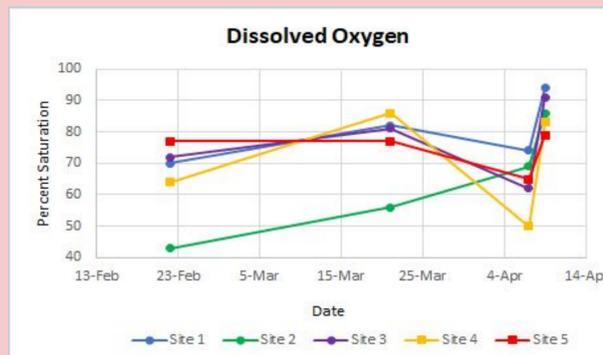
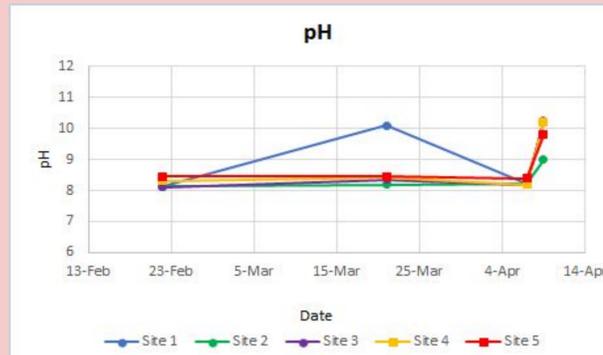
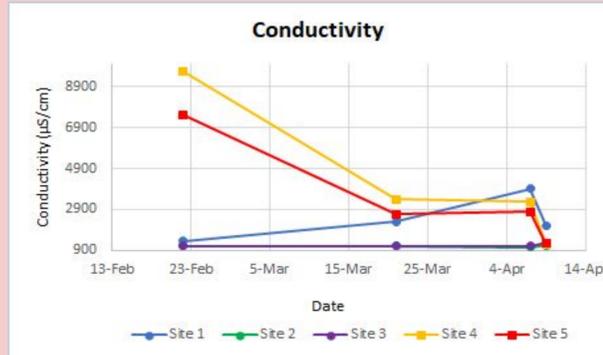


Fig. 3. Water temperature, conductivity, pH and dissolved oxygen content for the five sample locations from the end of February to mid-April 2021.



Methods

Samples were collected from five locations: three along Wilkins Creek (Fig 1B) and two along Spring Creek. At each site, water temperature, pH, conductivity and dissolved oxygen content were determined in the field using LaMotte water chemistry analysis kits (Fig 2). Samples were collected in 125 mL bottles and tested for chloride and alkalinity in the laboratory using a LaMotte alkalinity kit and a LaMotte chloride kit. For consistency, all field work was conducted between the hours of 2 and 5 pm.



Fig. 2. Recording the temperature of the water and dissolved oxygen content at location three, Wilkins Creek.

Results and Interpretation

Water Temperature

The water temperature changed with the air temperature at all sites (Fig 3). The temperature in Spring Creek increased less (~3°C to 10°C) compared to Wilkins Creek (~0°C to 15°C). Site 1, located immediately upgradient of the wetland and adjacent to the school road, experienced the greatest change in temperature. The variations in temperature are likely a reflection of the air temperature and time of day sampled. They are comparable to the temperatures of the same streams in mid-March of 2019 (1-9°C) when a similar study was conducted.

Conductivity

The conductivity of Spring Creek decreased from 8607 to 1217 µS/cm as water temperatures increased (Fig 3), whereas the conductivity of Wilkins Creek remain relatively constant (1115 to 1200 µS/cm). Within each stream, the water furthest upland (sites 1 or 4) experienced the greatest variability and overall change in conductivity. The conductivity of Spring Creek, however, was an order of magnitude greater than that of Wilkins Creek at the end of February. Conductivity is a measure of the dissolved solids in solution and the high conductivity in late February suggests the impact of road salt applied to the nearby school parking lot and roads. The decrease in conductivity throughout the month of March towards values seen in Wilkins Creek supports the decreasing influence of road salt. This trend is consistent with the observed chloride concentrations in Wilkins Creek during March 2019.

pH

The pH of both creeks remained fairly constant around 8.38, with a slight increase in April (Fig 3). Although this increase corresponds with the sudden drop in temperature and conductivity, an independent measurement should be taken to verify the accuracy of the pH probe. A pH of 8.30 is consistent with stream water in equilibrium with carbonate rocks and atmospheric CO₂.

Dissolved Oxygen

For both Spring Creek and Wilkins Creek, the percent of dissolved oxygen was variable, but showed an overall increase (Fig 3). The sudden increase in dissolved oxygen in April reflects the influence of the decrease in water temperature.

Acknowledgments

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