



BACKGROUND

The Hudson River Watershed consists of 11 major sub-watersheds, one of which is the **Mohawk River (MKR)**.¹ The **Schoharie Creek (SCH)** contributes 1,650 of the 4,086 river miles to the Mohawk River watershed, making it the largest contributor to the Mohawk.



https://en.wikipedia.org/wiki/Schoharie_Creek
<https://www.waterqualitydata.us/provider/BIODATA/USGS-NY/USGS-01349150/>

^{2,3} The **Cobleskill Creek (CBL)**, located in

Schoharie County, flows in the east-northeast direction to Schoharie Creek.⁴ The map shows how the bodies of water flow together to create a large watershed that provides active sites for recreational activities, such as fishing and swimming, across New York State. Since the Cobleskill Creek flows to the Schoharie Creek, which flows in to the Mohawk, the goal of this project is to assess common substances found in each of these rivers. The samples were analyzed to see whether or not these elements and compounds get carried from one body of water to the next due to their interconnected nature.

MATERIALS AND METHODS

Hach Kit Tests

Water samples were measured in the lab using the Hach DR/890 Datalogging Colorimeter with the PhosVer 3, SulfaVer 4, and NitraVer 5 methods.

Atomic Absorption Spectrophotometry (AAS)

Standards were used to create an external calibration curve, which was used to calculate the concentration of Ca^{2+} ions in the water samples.

Ion Chromatography (IC)

Samples were filtered and sent in triplicate to the Union College Geology Department to test for various anions and cations using the Dionex DX-500 Ion Chromatograph.

Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

Three samples of each water source were run on the PerkinElmer Elan 6100 DRC ICP-MS to quantify various metals in the water.

Alkalinity Tests

A titration with 0.02 N sulfuric acid was conducted on the water samples using methyl orange indicator.

Chloride Analysis by Ion Selective Electrode (ISE)

Standards of 10-, 50-, and 100-ppm Cl^- were used to create an external calibration curve to test for Cl^- in the water samples. The standards and water samples were measured using the Accumet Chloride Half-Cell Ion Selective Electrode with a silver-silver chloride probe.

pH Tests

The pH of each water sample was tested in the lab using the Fisher Scientific Accumet Basic pH probe.

RESULTS AND DISCUSSION

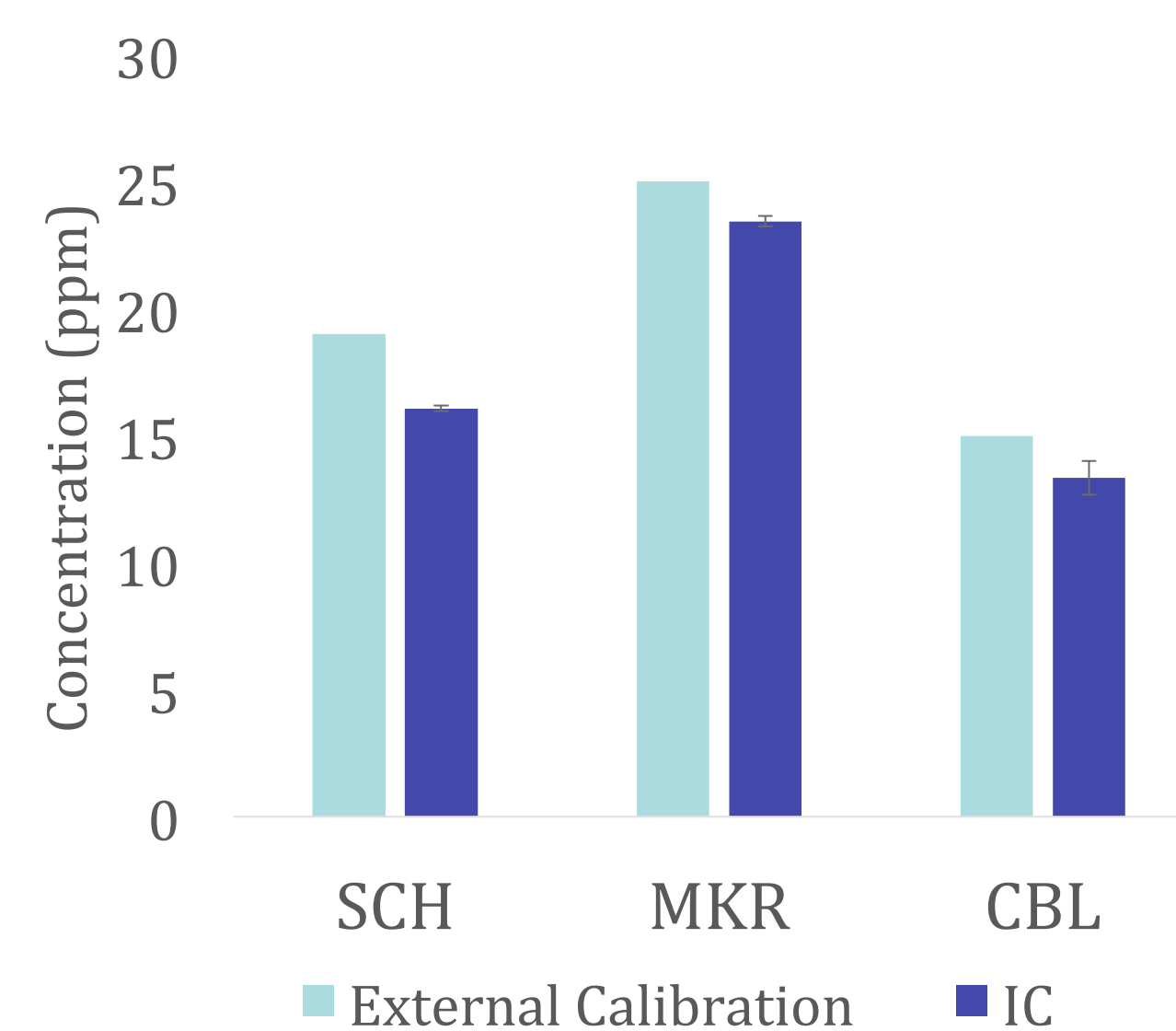


Figure 1. Graph of chloride analysis for each body of water. Light blue bars show data from external calibration, dark blue bars show data from IC. Chloride ions from CBL and SCH get carried to MKR, which has additional sources of chloride. The most likely source of chloride in water is road salt.

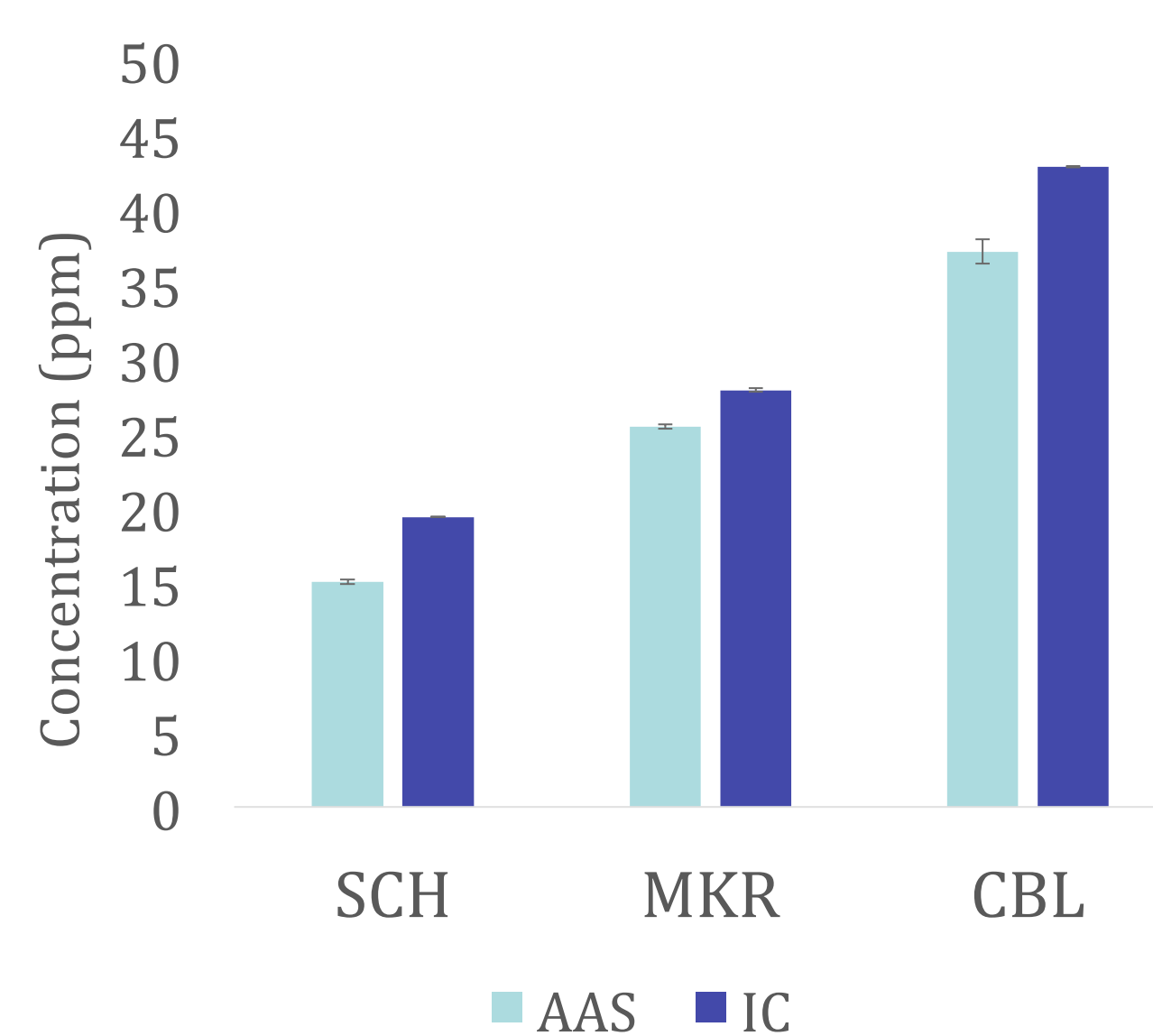


Figure 2. Graph of calcium ion concentration in each body of water as analyzed by AAS and IC. CBL has the highest concentration of calcium ions. This gets diluted in the other rivers. The most likely source of calcium is the dissociation of the underlying bedrock.⁵ See Table I for t-test calculations between AAS and IC.

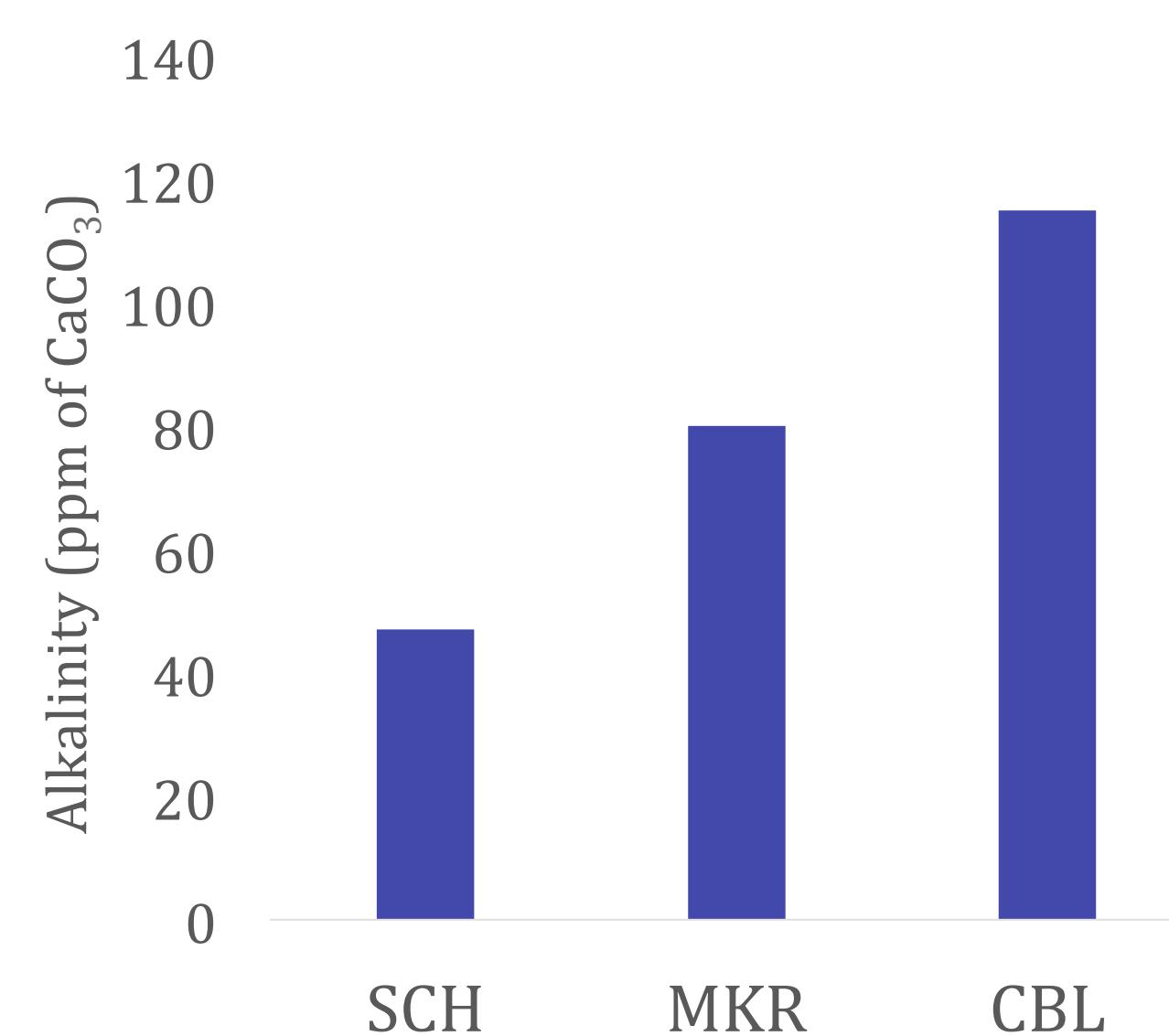


Figure 3. Graph of alkalinity in ppm CaCO_3 in each river. Alkalinity is determined by many basic ions in water. The high alkalinity of CBL is likely due to chemicals spread on the farm fields and road that are near the trail from where the sample was taken.⁵ Because SCH has a lower alkalinity compared to CBL, MKR likely has other sources that contribute to its alkalinity.

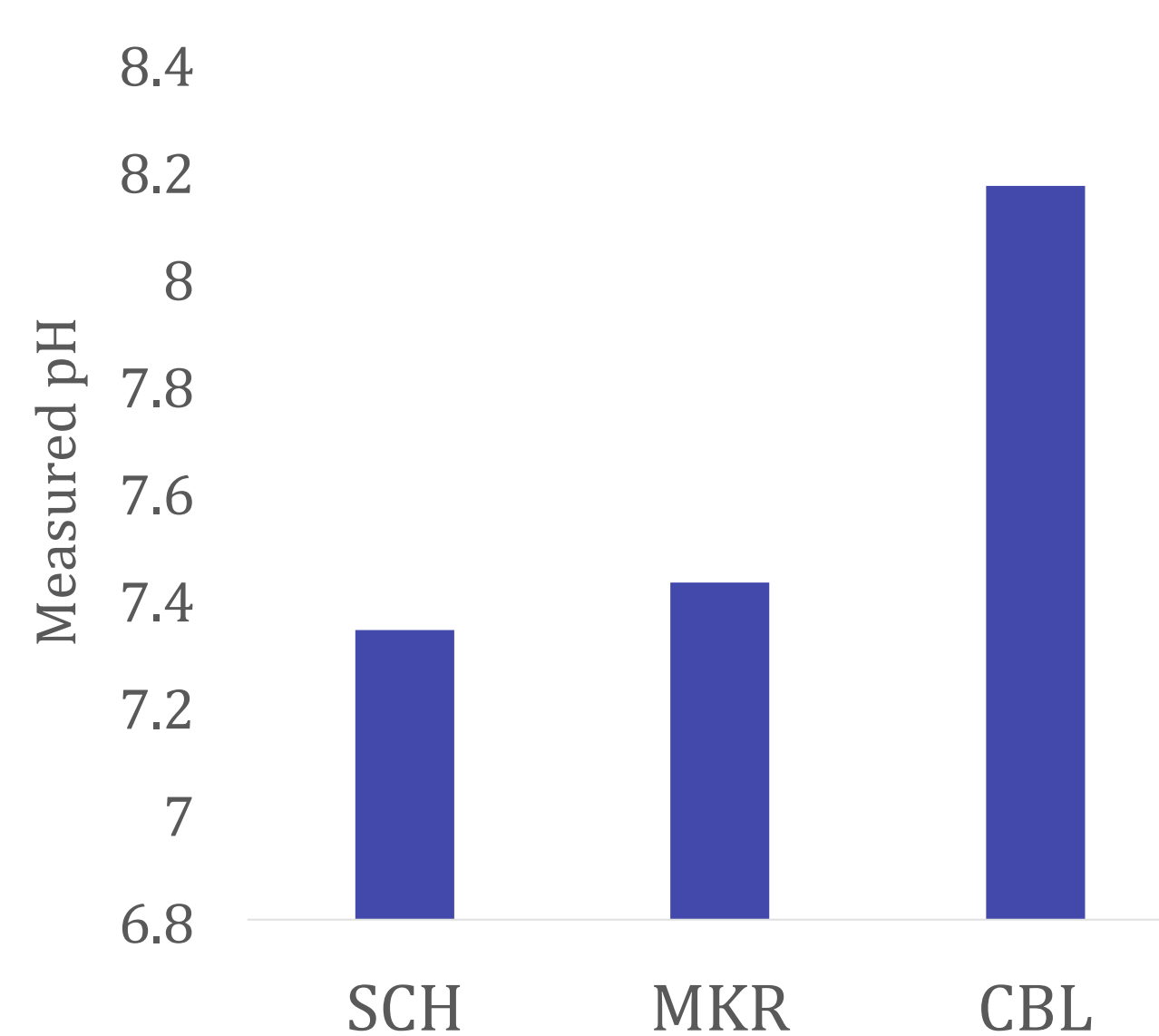


Figure 4. Graph of pH for each body of water. The higher pH of CBL corresponds to its relatively high alkalinity as compared to the other samples. It is likely that the alkaline substances of CBL get diluted before the water reaches the point where the SCH sample was taken, as the pH of SCH is lower (see Figure 3). MKR might also have other sources contributing to its pH, as it is slightly higher than that of SCH.

RESULTS AND DISCUSSION

t-test data	t_{calc}	t_{table}^6	significantly different?
CBL	10.36	4.303	yes
SCH	36.3	4.303	yes
MKR	0.77	2.776	no

Table I. Table of t-test values comparing AAS to IC at 95% confidence for calcium concentration in each water sample. CBL and SCH values are statistically significantly different. Because these values all trend together, there is greater confidence that both methods are probably accurate.

Sample	NO_3^-	PO_4^{3-}	SO_4^{2-}
CBL	0.3 ± 0.1	0.06 ± 0.02	2 ± 0
SCH	0.1 ± 0.1	0.02 ± 0.02	2.3 ± 0.6
MKR	0.53 ± 0.06	0.08 ± 0.02	6 ± 0

Table II. Table of Hach kit test values in ppm for NO_3^- , PO_4^{3-} , and SO_4^{2-} ions in each water sample. These ions were below the lowest standards measured for IC, so data using this method is unavailable. For reference, the maximum level of NO_3^- in drinking water recommended by the EPA is 10 ppm and SO_4^{2-} is 250 ppm⁷. For PO_4^{3-} in streams and rivers, it should be less than 0.1 ppm.⁸ While it is not recommended that people drink from these waters, the samples all fall under the recommended limits.

CONCLUSIONS

- ❖ Calcium ions and alkaline sources in CBL get diluted before they reach SCH, which indicates that MKR has sources of calcium and alkalinity that do not come from SCH and CBL.
- ❖ Chloride ions accumulate from CBL and SCH in MKR, which partially attributes to MKR's higher chloride concentration in the water samples that were analyzed.
- ❖ There is a correlation between measured alkalinity and measured pH in the three water samples, implying that higher pH corresponds to higher alkalinity.
- ❖ AAS and IC are not significantly different in determining calcium concentration for MKR, but are significantly different in determining calcium concentration for CBL and SCH, which prompts further investigation into more accurate detection of these ion concentrations.
- ❖ Interferents in Cl^- solution using ISE could be mistaken for Cl^- , but in IC the ions get separated out from one another, so there are no interferents in that data. This accounts for the slightly higher values for Cl^- using external calibration as compared to IC.

REFERENCES

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ACKNOWLEDGEMENTS

Professors Lou and MacManus-Spencer
Union College Chemistry Department
Union College Geology Department

Schoharie River Center
Schoharie County Trail Association
CHM 240 Lab Students