# Fire Leads to Chemical Spill: A Case Study in Understanding Water Quality

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## Abstract

The Upper Oconee Watershed Network (UOWN), has been monitoring creeks within the Upper Oconee watershed for 20 years in response to citizens' concerns about rapid population growth in the area. In 2010, a fire caused chemicals from a toilet cleaning plant to pollute the nearby creek, Trail Creek. The next morning Trail Creek was neon blue with floating fish. Ten years later, the creek has since rebounded and been declared clean. Looking at data collected by UOWN since 2000, a case study has been created to lead high school and college students through how continuous monitoring can be used to identify and quantify stream health, in addition to learning the importance of keeping our waterways protected and clean. The presentation will go through how the case study uses data that has been collected by UOWN over the years to monitor stream health and promote stream conservation and education.

## Introduction

Just like you need clean air to breathe, aquatic ecosystems need clean water to function. Throughout the country there are numerous watersheds, Watersheds are important because they improve water quality, allow for indigenous species to out-compete invasive species, they are better adapted to extreme weather patterns, and reduce drinking water treatment costs (Healthy Watersheds Protection, 2021).

There are countless watersheds in the world, but we will focus on a watershed in Georgia, called the Upper Oconee Watershed. A group of citizen scientist volunteers have been monitoring the Upper Oconee Watershed since 2000 in response to concerns from citizens about the rapid growth of the city of Athens and its surrounding area (UOWN Mission, 2017).

In downtown Athens, there is a little creek that meanders its way through Dudley Park and eventually empties into the North Oconee River. This creek is called Trail Creek and without knowing the creeks background, not many would guess it had an extreme ecological crisis in the past. In 2010, a fire broke out at J&J Chemicals, a company that mainly produces toilet-bowl cleaner. To put out the blaze, Athens firefighters dumped 700,000 gallons of water on the chemical company. This water mixed with the janitorial chemicals and carried it out into Trail Creek (Black, 2013). This mix of chemicals dyed the water bright blue and killed an estimated 15,000 fish and almost all wildlife that lived within the creek's waters.

Even before the 2010 incident, Trail Creek was not an extremely clean stream. It had had previous occurrences of sewage leaks and trash dumping, which impacted its waters. However, with the massive amount of chemicals dumped into Trail Creek, this stream went from decent water quality to extremely toxic to both animals and humans. The water turned bright blue, allowing the spill to be easily noticed.

What happened? What were the impacts of the event? How was the event recorded? Has the creek recovered from the event? In this study you will analyze water quality data collected to assess the impact and recovery of an impacted system that has experienced a colorful contamination event. In addition, long term water quality parameters between the impacted and a relatively pristine stream system can be evaluated.

## Materials

Teachers and Student: The case itself, with all necessary introductory and background information including basic terms and definitions. Videos produced explaining the basic terms.

Teachers: Case teaching notes that include the amount of time required for each component of the case study and a list of guiding questions, and the case study answer key.

Figure 1: Pictures of Trail Creek taken the day after the contamination event. Notice the neon blue water.

## Questions Asked in Case Study

Introduction Questions

1. What would you expect to see in a healthy stream?
2. How would you expect an impacted stream to look different than a pristine stream?
3. How would you expect a stream before a contamination event to look versus a stream after a contamination event?

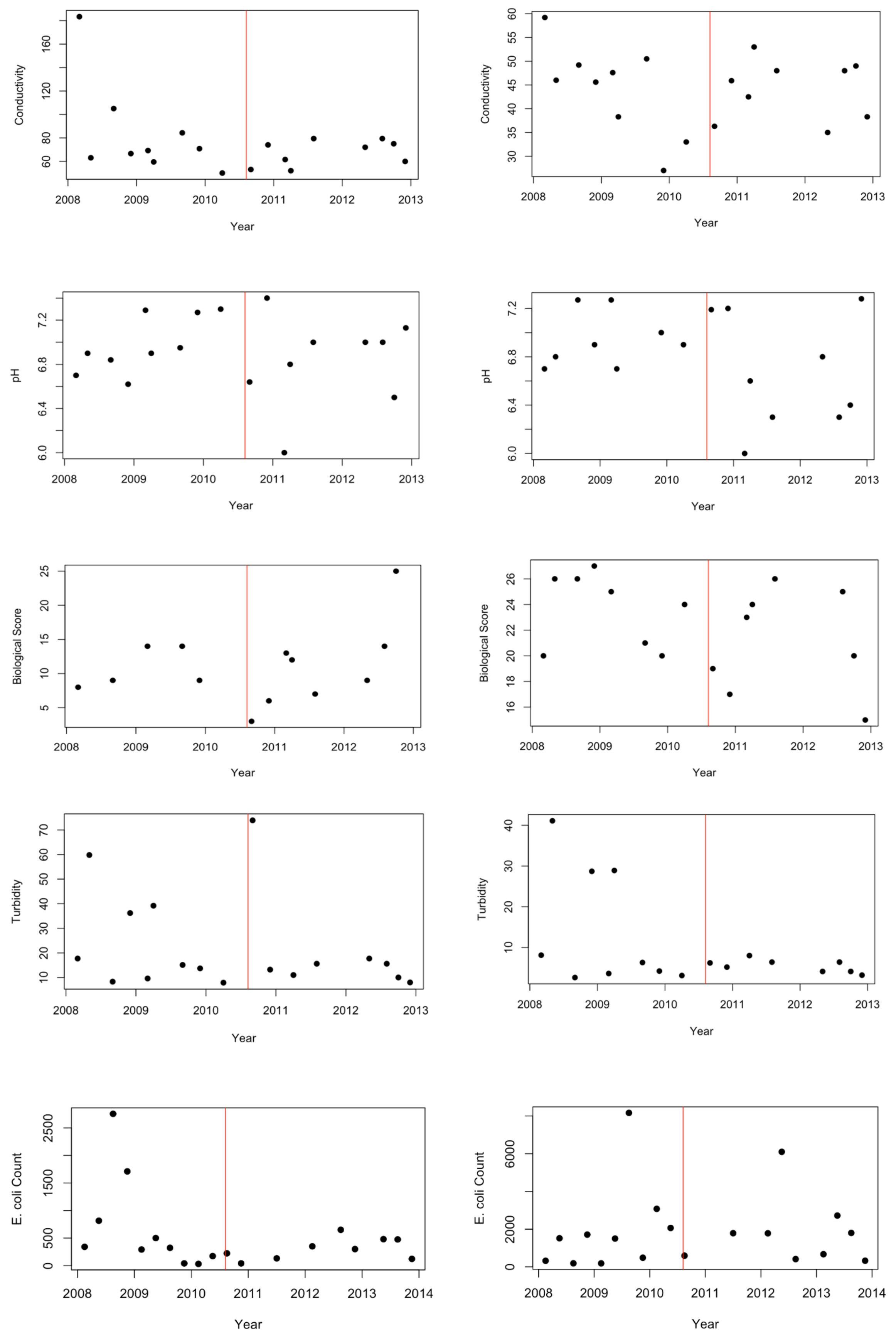
Questions after Methods

1. Given these indicators, what specific differences would you expect to see between pristine and impacted streams?
2. Given these indicators, what specific differences would you expect to see before and after a contamination event?
3. How long do you think it would take a stream to recover from a contamination event?
4. What factors would affect the rate of recovery?

Questions with Watershed Data

1. Observe the y-axis for each water quality indicator between the pristine and impacted stream, list the maximum and minimum values observed for each variable.
2. Which variables are higher for the pristine stream versus the impacted stream?
3. Which variables are similar between pristine and impacted stream?
4. Which variables are notably different in the impacted stream pre and post contamination event?
5. How quickly did the impacted stream recover from the contamination event?

## Results




| Variable | Normal Range | Trail Creek pre-spill | Trail Creek post-spill |
|---|---|---|---|
| Conductivity | 50 to 1500µS/cm | 50 µS/cm | 53 µS/cm |
| pH | 6 – 8.5 | 7.3 | 6.64 |
| Biological score | Less than 11 = poor<br>Between 11 - 16: fair<br>Between 17 - 22: good<br>Greater than 22: excellent | 14 | 3 |
| Turbidity | Less than 10 NTU<br>Drinking water: minimum less than 5 NTU | 7.9 NTU | 73.9 NTU |
| E. coli | Designated swimming areas: ≤235 CFU/mL<br>Moderate swimming areas: ≤298CFU/mL<br>Light swimming areas:≤ 410 CFU/mL<br>Infrequent swimming areas: ≤576 CFU/mL | 3075 CFU/mL | 2063 CFU/mL |

(Georgia Adopt-A-Stream, 2014)

## Conclusion

Water quality data collected by local volunteer organizations has significant merit on several fronts:

1. Monitoring frequently allows for the detection of short-term acute contamination events
2. Long-term monitoring allows for the detection of trends in water quality.
3. Monitoring at multiple locations allows for monitoring water quality throughout the watershed
4. Monitoring at good and poor water quality locations allows for comparison of water quality parameters between sites.
5. Water quality data can be used to educate students not only on water quality but also how to critically evaluate data and read graphs.
6. Surface water can recover quickly following a contamination event.

## Recommendations

The potential use of the UOWN data set in combination with the other resources available really is limitless, whether it's developing additional case studies for teaching purposes or using data to model surface water quality relationships with land use, population density, or any host of other factors.

Completed projects: 1) building permits, land use, and water quality, 2) monitoring sites, socioeconomic conditions, and water quality.

Future projects: 1) pinpointing contamination events, timing and locations, looking for trends and relationships, 2) cleaning data set to highlight dates and sights that have the most robust continuous data for further analyses.

## References

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