

Vermont Family Forest Project Summary

2021 Water Quality Monitoring of Isham Brook and Beaver Meadow Brook

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For Addison County River Watch Collaborative

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Background

In the summer of 2021, Addison County River Watch Collaborative (ACRWC) monitored two tributaries of the New Haven River in Lincoln, Vermont - Isham Brook and Beaver Meadow Brook. The sites were grab sampled on four days: June 8, July 6, August 3, and September 7. Samples were analyzed at Endyne Laboratories for concentration of *E. coli*, chloride, nitrate, total phosphorus, and turbidity. The New Haven River USGS gage was used to determine general flow conditions on each sampling date.

The Isham Brook watershed covers about 1,500 acres and Beaver Brook's watershed is roughly 6,800 acres in size. In contrast, the New Haven River (into which both of these tributaries flow) has a drainage area of over 74,500 acres. The Isham Brook watershed is roughly 2.7% developed and Beaver Brook's watershed is less than 2% developed.

This first year of data collection aimed to illustrate conditions of the streams prior to implementation of riparian and management practices and projects that are planned in the watershed.

Monitoring Data

Table 1. Complete raw dataset

Date	Time	Site Name	Site #	E. coli (MPN/100 mL)	mg/L			Turbidity (NTU)	Temp (°F)	USGS 04282525 Flow (cfs)*
					Chloride	Nitrate	TP			
6/8/2021	9:15	Isham	NHI 0.1	28	1.3	0.29	<0.005	<0.5	61	60.1
6/8/2021	9:00	Beaver Meadow	NHBM 0.1	42	5.3	0.2	<0.005	<0.5	61	60.1
7/6/2021	8:20	Isham	NHI 0.1	98	1.1	0.24	<0.005	<0.5	59	60
7/6/2021	8:05	Beaver Meadow	NHBM 0.1	22	2.9	0.21	0.005	<0.5	60.5	60
8/3/2021	7:40	Isham	NHI 0.1	22	4.2	0.11	<0.005	<0.5	55	133
8/3/2021	8:00	Beaver Meadow	NHBM 0.1	20	1.2	0.082	<0.005	<0.50	54	133
9/7/2021	8:00	Isham	NHI 0.1	43	1.7	0.29	0.009	<0.5	56	83.8
9/7/2021	7:45	Beaver Meadow	NHBM 0.1	68	3.2	0.12	0.007	0.75	58	83.8

**Flow conditions in the New Haven River on each sampling day were at or below median daily flow statistics for that site.*

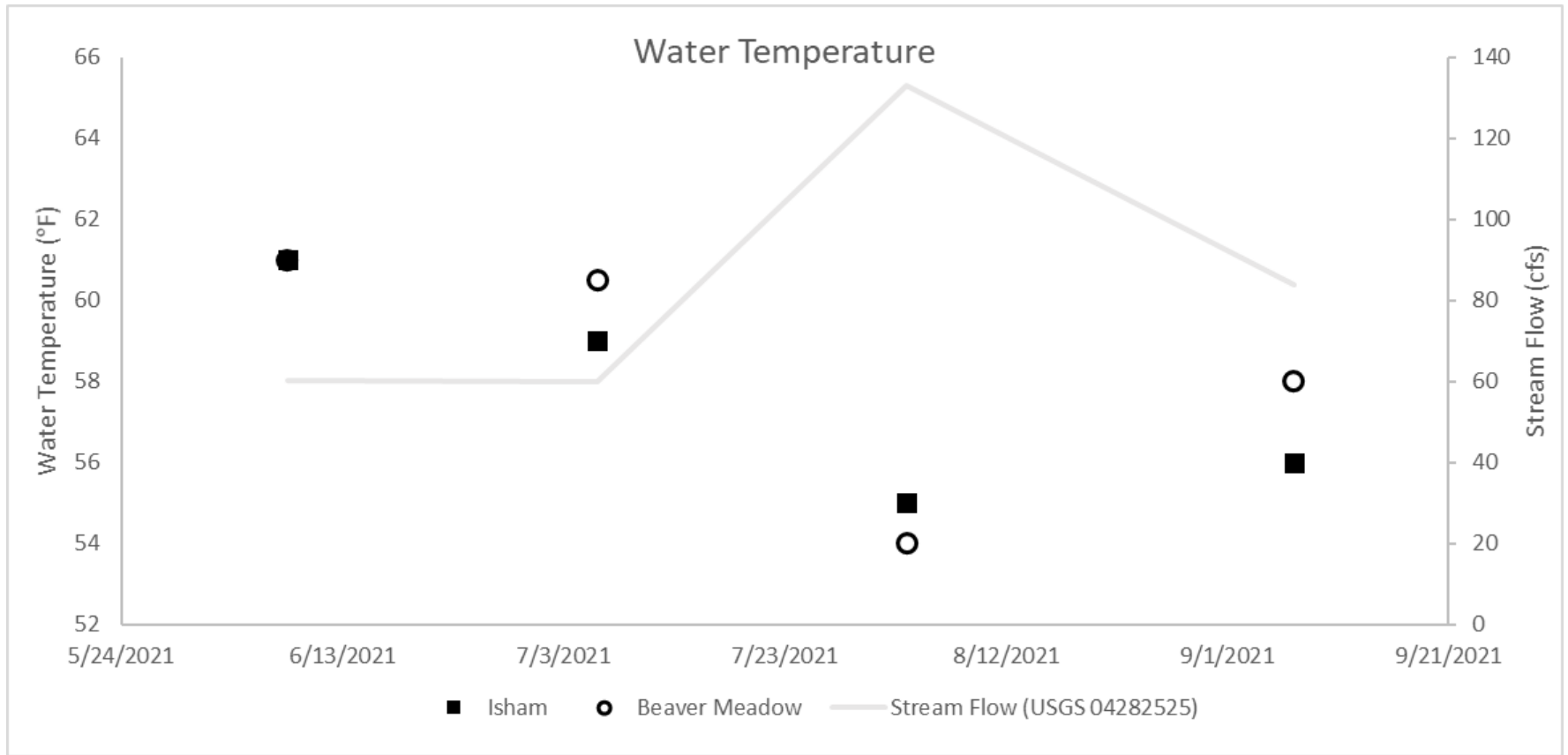


Figure 1. Water temperature and corresponding stream flow in the New Haven River at USGS gage 04282525. Note the drop in stream temperature corresponds with a spike in flow from a storm event.

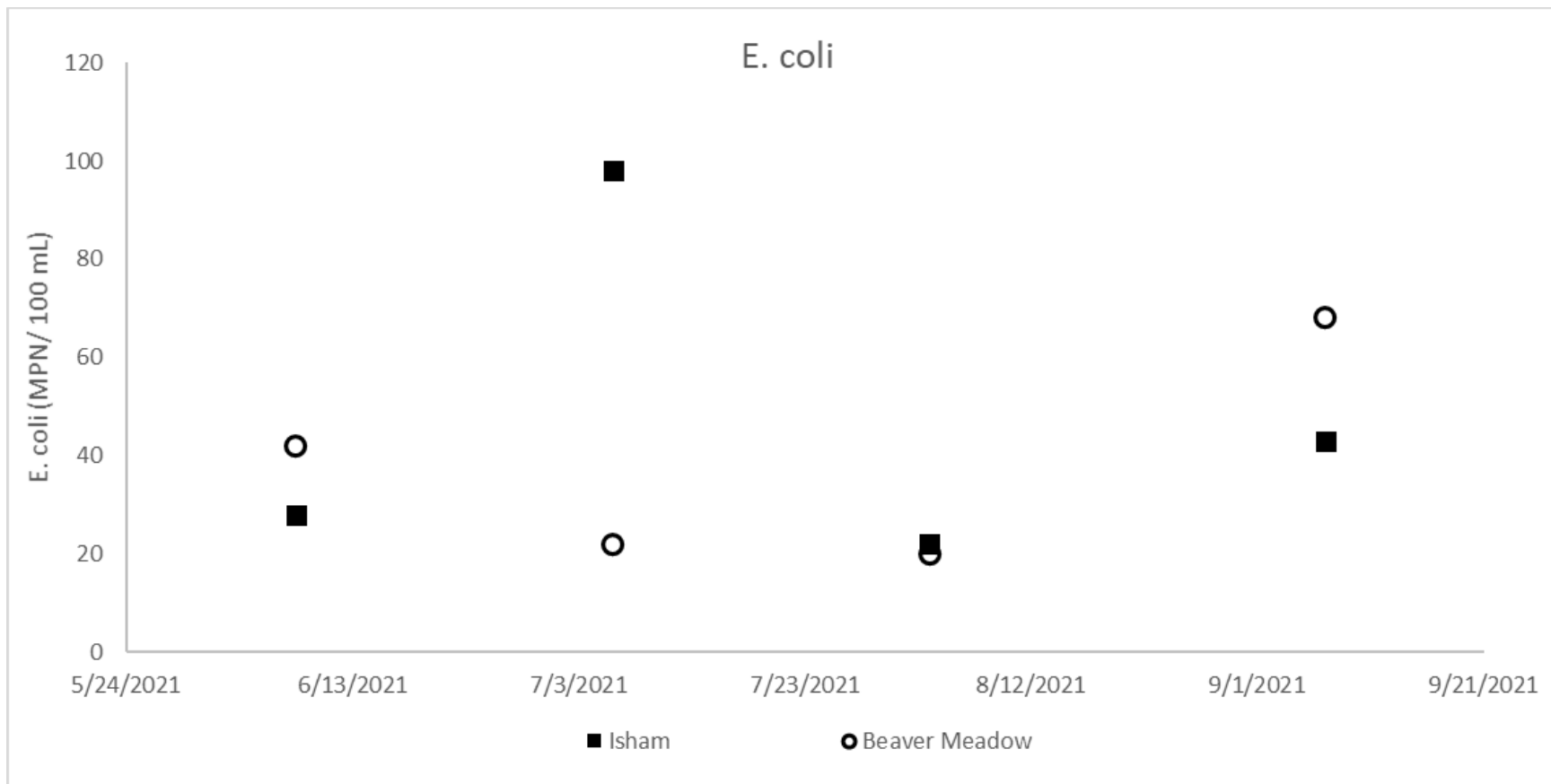


Figure 2. *E. coli* levels at both monitoring locations were below the state standard of 126 MPN/100 mL over a representative 60-day period and no more than 10% of samples above 235 MPN/100 mL. The highest concentration was 98 MPN/100 mL measured at Isham Brook in early July. This date coincided with the lowest flow of all the sampling dates.

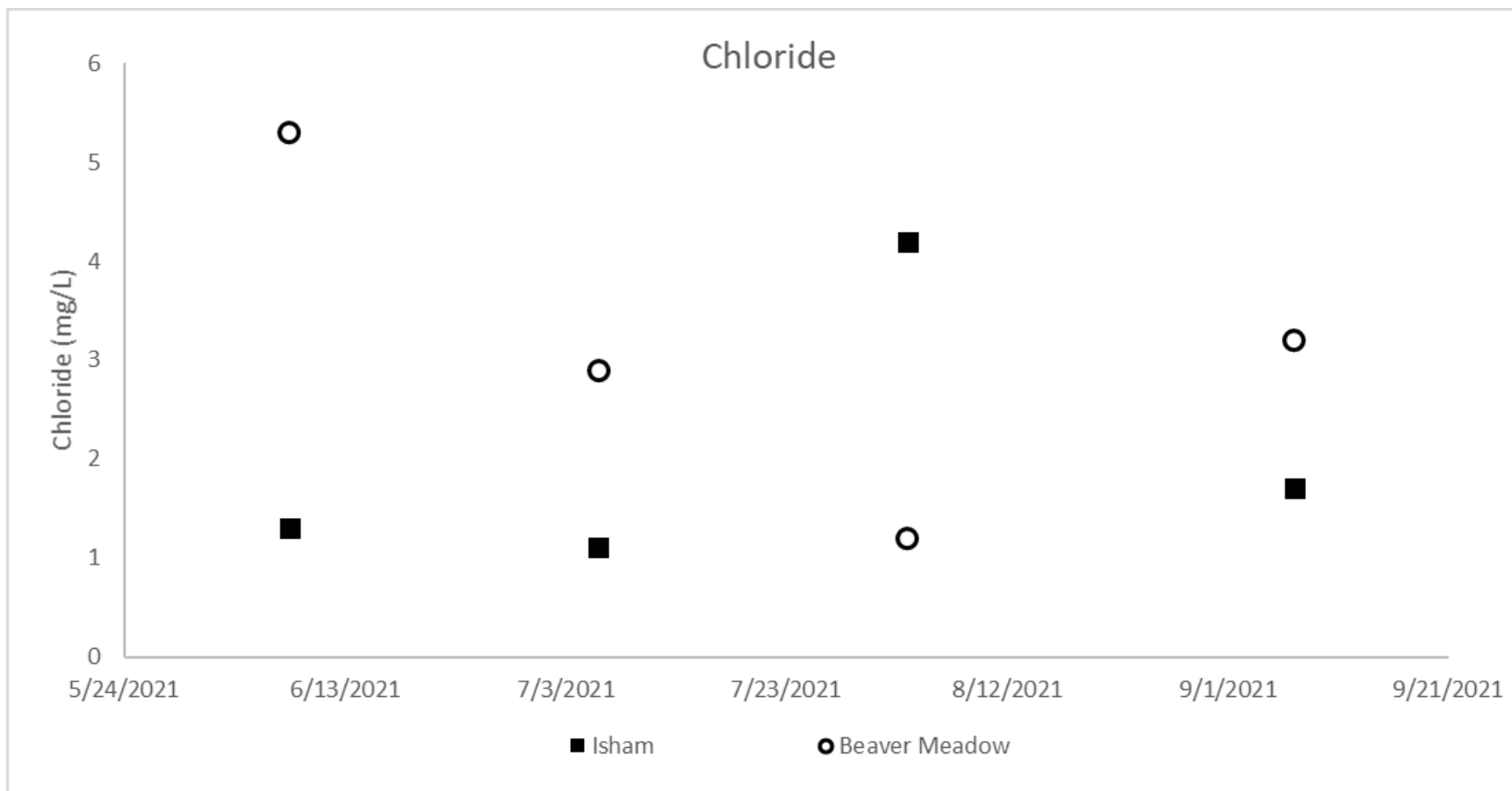


Figure 3. Chloride concentrations at both sites on all sampling days were very low. The state chronic toxicity standard for chloride is 230 mg/L not to be exceeded as an average in a 4-day period. The highest value recorded at these sites was below 6 mg/L.

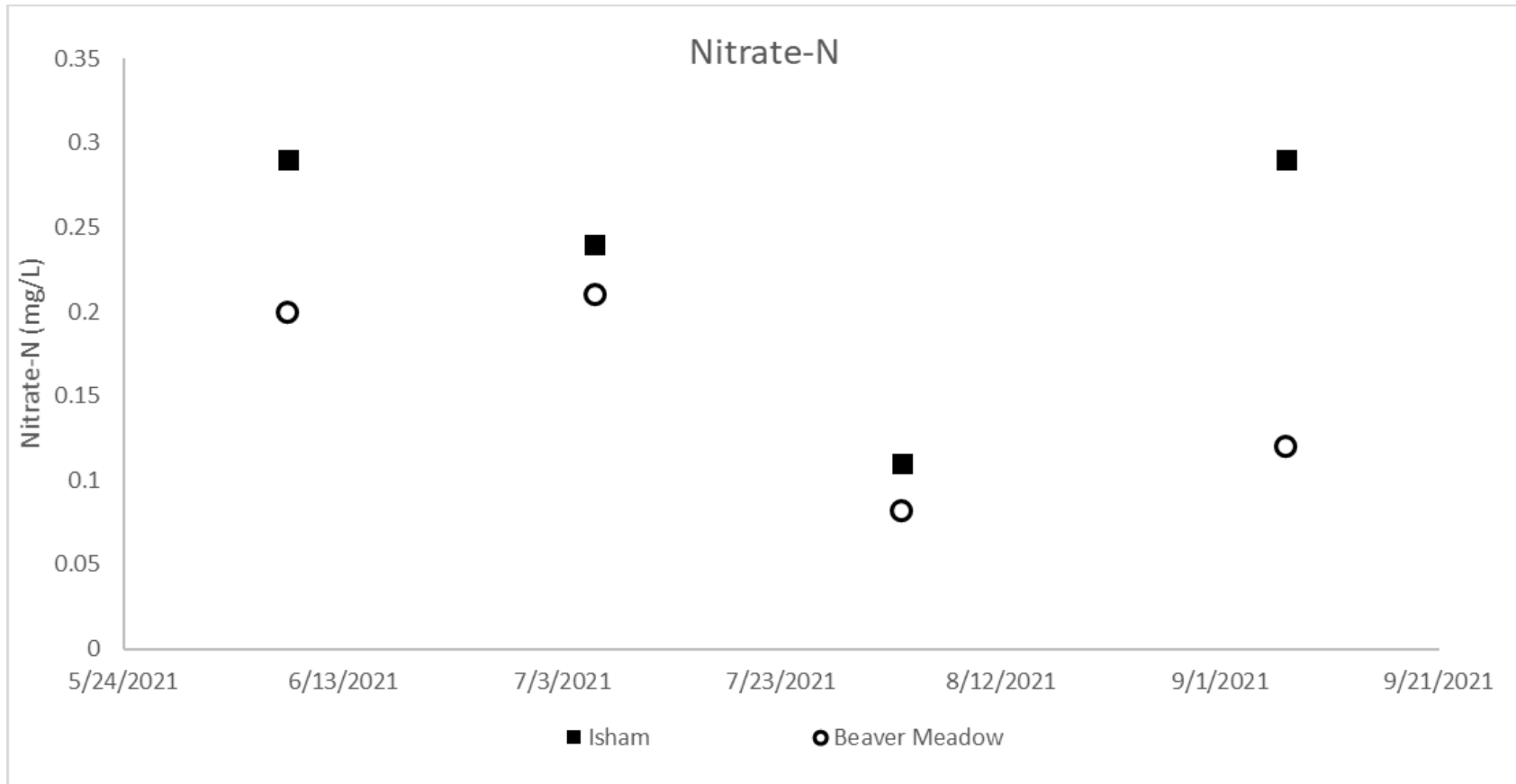


Figure 4. Nitrate at both sites on all sampling days ranged from 0.08 to 0.29 mg/L. State standards for nitrate are based on flow condition and waterbody classification. For Class A waters, nitrate shall not exceed 2.0 mg/L at flows exceeding low median monthly flows. The flow conditions present during these sample dates are not consistent with the water quality standards. However, measured nitrate was well below the water quality standard in these samples.

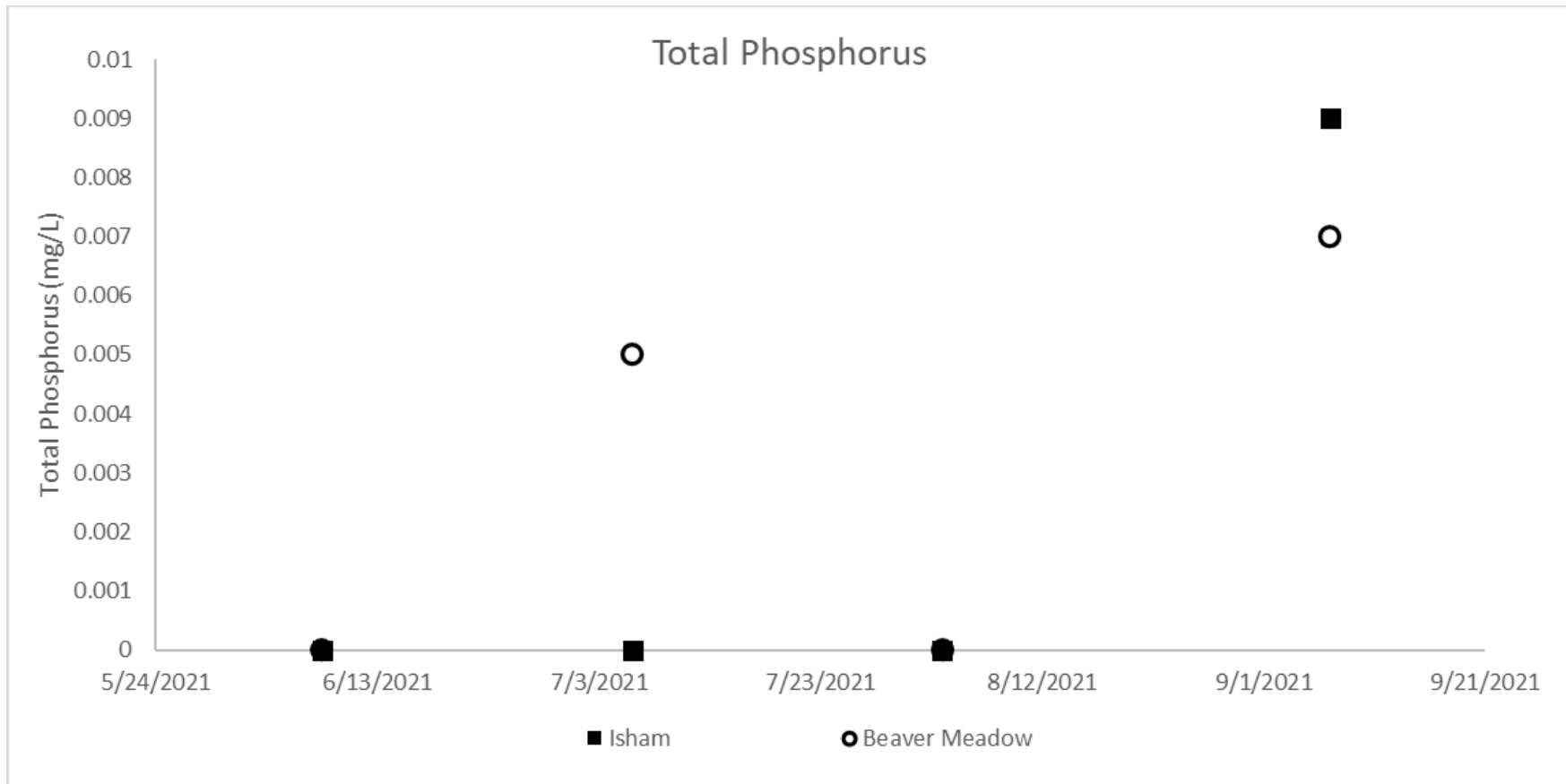


Figure 5. Total phosphorus was below detection limits for most sample days. Those that were measurable were at or below 0.009 mg/L – the Vermont phosphorus standard for Class A(1) medium, high-gradient streams.

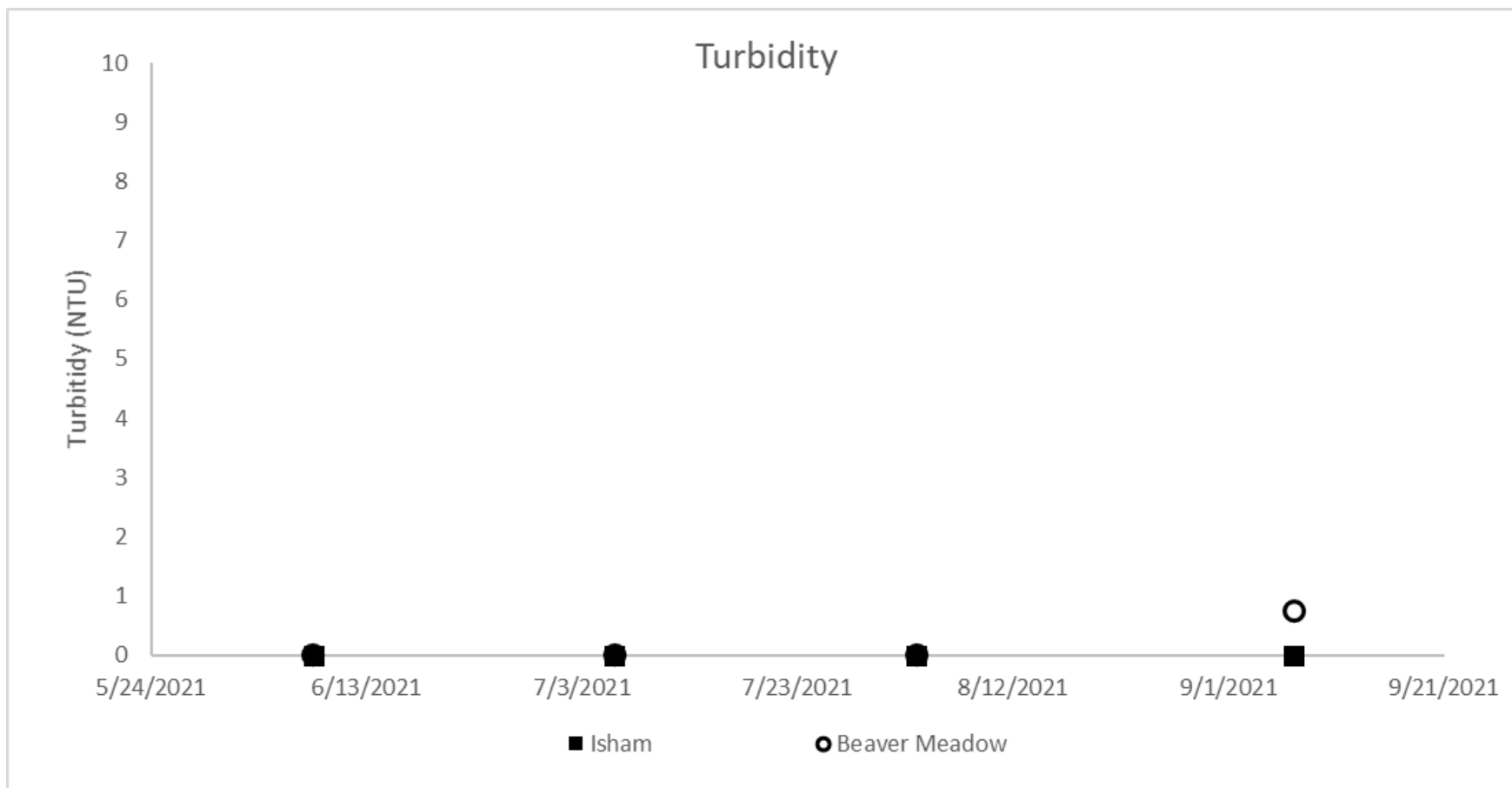


Figure 6. Turbidity levels were below detection on all but the last day of monitoring at the Beaver Meadow site. The state standard for turbidity in Class A(1) and A(2) waters is not to exceed 10 NTU as an annual average in dry weather base-flow conditions.

Discussion

Concentrations of all analytes were quite low at the two sites of interest and do not indicate that there are water quality standard exceedances. In order to get a more fulsome assessment of the water quality conditions in these streams, sampling during rain events and during the early part of storms (the “rising limb”) could provide additional information regarding movement of pollutants from the land.

Some analytes may not be necessary to continue to monitor – specifically if the goal of this effort is to show improvement over time as a result of riparian plantings. Chloride appears to be present at such low concentrations that it is not a concern and could be eliminated from additional monitoring efforts.

Because riparian plantings can influence stream temperature over time, continuing or expanding the temperature monitoring may be illustrative. Turbidity measurements were also very low during all sampling days. Because turbidity is directly influenced by stream flow and can be a marker of sediment transport from the larger watershed, sampling for turbidity during storm events may add some nuance to the understanding of pollutant movement dynamics in these watersheds.

E. coli was the one parameter where a single slightly elevated measurement indicates reason for follow-up. It is recommended that *E. coli* be included in subsequent monitoring efforts, particularly in higher flow scenarios, to track its change over time and by site.

As these data are limited (just four grab samples at each site) and they indicate very low values of most analytes, finding a meaningful way to compare this “before” condition to an “after” condition following project implementation will likely be challenging. Based on these data, the water in these streams already appears to be of high quality and in some cases measures below detection limits which will not allow for a measurable reduction following riparian plantings. More frequent temperature measurements taken at the same time of the day may be the best approach for allowing a pre-post comparison following establishment of a riparian buffer. Note that temperature decreases in the stream won’t likely be impacted by plantings until those plantings are at a size sufficient to provide shading to the stream.