

## PMNRCD 2014 Water Quality Monitoring Report

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### Introduction

The Poultney Mettowee Natural Resources Conservation District has been collecting water quality samples within the District for the past 11 years. The District first collected samples on the Poultney River in 2003, and then expanded to sites on the Mettowee River, Flower Brook, and Beaver Brook in 2005, corresponding with the first geomorphic assessment completed on the Mettowee Mainstem (reaches M04-M08) and several reaches on Beaver and Flower Brooks. The goal of monitoring is to prioritize areas for project implementation and to monitor the effectiveness of past projects. The District monitors for Turbidity, Total Phosphorus, and E. coli. In past years, we have also monitored for Nitrogen.

In 2012, the TMDL for Flower Brook was released, and concurrently, the District received an ERP grant to prioritize projects in the Mettowee Watershed. The project's advisory committee elected to focus our resources on the Flower Brook subwatershed and the District increased the sampling effort in that area. For years we had collected samples at Flower01, behind the Pawlet Town Offices, at Flower02, the Route 133 crossing, and at Beaver01, the 133 crossing. In 2013, we added Flower0.1c, Flower01.5, Flower03, Beaver02, and Beaver03, and in 2014, we added Beaver04. See Table 1 for new site locations.

*Table 1: Flower Brook monitoring sites added in 2013 or 2014.*

Site Name	Location	2013	2014
Flower0.1c	Just upstream of the confluence of Flower Brook and the Mettowee River	x	
Flower01.5	An old temp monitoring site behind the fire station	x	x
Flower03	Downstream of the Lilly Hill Road bridge	x	x
Beaver02	Near the old grange on Kelley Hill Road	x	x
Beaver03	Brimstone Road, downstream of the wetlands	x	x
Beaver04	Andrus Road		x

In addition to new sites in the Flower Brook watershed, we added some sites on Wells Brook. In 2013, we sampled two sites and had higher-than-expected E. coli and phosphorus results. In 2014, we added two sites and sampled a site that had been only partially sampled in 2013. Table 2 shows our Wells Brook sites.

*Table 2: Wells Brook monitoring sites added in 2013 or 2014.*

Site Name	Location	2013	2014
Wells01	Downstream of the bridge on Wells Brook Road, upstream of Tadmer Bk		x
Wells02	Upstream of the Martelle gravel bridge entrance	x	x
Wells03	Upstream of the South Street bridge in Well Village	x	x
Wells04	At the dry hydrants off of 30, South of Wells Village		x
Tadmer01	Between the bridge on Tadmer Hill road and the Wells Brook		x

The Mettowee Sites Mett01.5 (Fishing access of off Route 30 in Rupert), Mett02 (Fred Stone/Hulett ford), Mett02.25 and Mett02.5 (up and downstream of Flower Brook confluence), Mett03 (Hughes-Muse), and Mett03.9 (access at Mettowee Community School) were sampled in 2013 and 2014. The only new site was Mett03.9, which was added to replace Mett04 (near Button Falls) for safety.

## USGA Flow Data and Rutland Airport Rainfall Data

Streamflow and Rainfall data are important factors when considering nonpoint source pollution inputs to streams. Nutrients, fecal coliform, and excessive fine sediments in the water during periods of high streamflow may have originated through overland runoff and erosion associated with a rainfall event. Contaminants present in the water during periods of low streamflow may originate from groundwater, so high E. coli levels measured during low flow conditions may indicate seepage from septic systems. Rainfall data can help explain variations in streamflow, though rainfall in this area is localized. In 2013, the District collected rainfall data during the sampling season in Middletown Springs and used data from the nearest official weather gage at the Rutland Airport.<sup>1</sup> Unfortunately, in 2014, the District did not collect rainfall data in Middletown Springs and the Rutland Airport rainfall did not represent the turbulent summer that we experienced on the rainy side of the Taconic Mountains. For these reasons rainfall data is not represented in this report.

The following chart shows the streamflow, or discharge rate, of the Mettowee River as measured by the USGS gage station located near North Granville, New York<sup>2</sup>, for the 2014 sampling season. The sample dates are represented as green diamonds. The highest flow recorded during the sample season was 601 cubic feet per second (cfs) on July 9, 2014 (compared with the highest flow from 2013, which saw relatively high water levels in the early summer months, 1,490 cfs on July 6, 2013). This level is below bankfull flow (Q1.5), which according to VT DEC hydraulic curves for a stream this size is around 4,227 cfs<sup>3</sup> (Q2 is 4,560 cfs, Olsen, 2002, table 2<sup>4</sup>). Except for the storm samples collected on July 3 and July 28, the sample collection dates appear to fall during low flows. The highest flows sampled were 225 cfs on July 28, 2014.

In July, 2014, there were three severe thunder storms that caused high water flows, July 3, July 9, and July 28. Though the storms on July 3 and July 9 caused severe damage in Poultney due to high winds and rain, their severity was not recorded on the closest gage on the Mettowee River.

### Available Flow Data

Flow data from the Middle Granville USGS Discharge Gage (04280450), the only gage available on the Poultney or Mettowee Rivers. The regular sample dates are marked in green and the storm sample dates are marked in red. The gage is miles downstream of the sample locations, so the river flow peaks do not correspond exactly with the flow peaks that occur in the sample area. Arrows indicate estimated position on the flow peaks that may better represent flow at the sample collection times. The reader will need to similarly consider the position of the regular sample times on the flow curves as well.

*The Poultney Mettowee NRC would like to advocate for reinstatement of the Bette's Bridge USGS flow station...*

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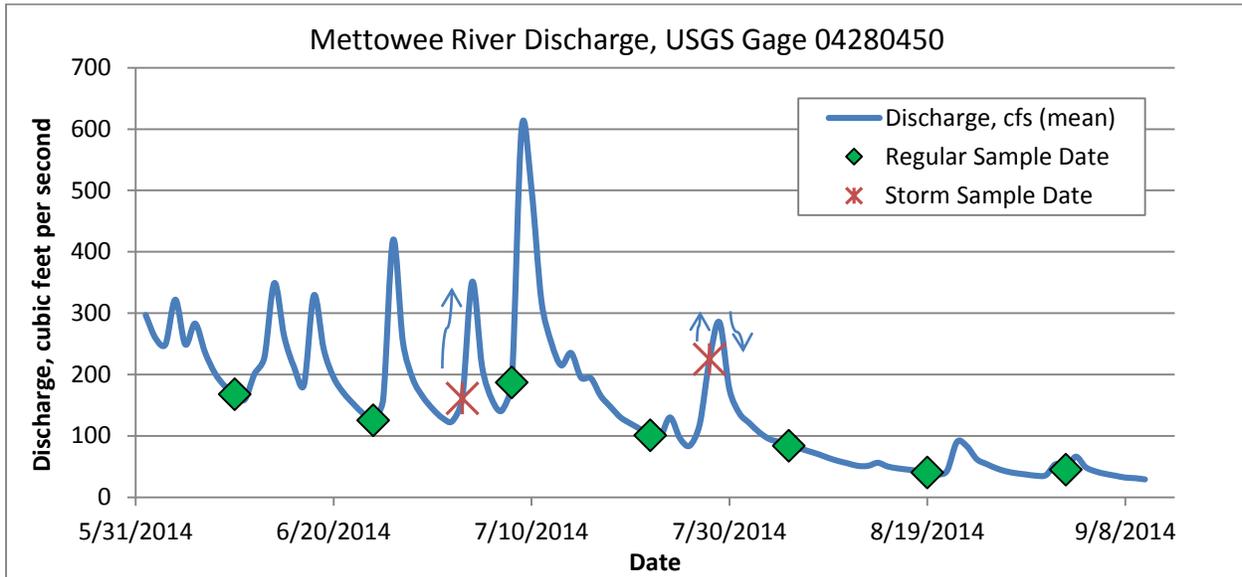
<sup>1</sup> Rainfall data from H. Solomon, private gage, Middletown Springs, and Weather Underground Historical Rainfall data (for the Rutland Airport gage): <http://www.wunderground.com/history>.

<sup>2</sup> USGS gage 0428450 Mettawee River near Middle Granville, NY: <http://www.waterdata.usgs.gov/usa/nwis>.

<sup>3</sup> Vermont Regional Hydraulic Geometry Curves, Vermont DEC, 2001

<sup>4</sup> Olsen, Scott, 2003, Flow-Frequency Characteristics of Vermont Streams, US Geological Survey Water Resources Investigations Report 02-4238. US Dept of the Interior, USGS. 47pp.

Chart 1: Mettowee River Flow data from the Middle Granville USGS Gage (04280450)



### Data Results by Subwatershed

The District has four long-term sites on the Mettowee River that are sampled nearly every year. These include Mett1.5 at the fishing access in Rupert, Mett02 at Stonebroke Farm in Pawlet, Mett2.5 just below the Flower Brook confluence in Pawlet Village, and Mett03 at the Hughes-Muse Farm (formerly Pillemers, near P. Helmetag's property) north of Pawlet. These sites have five to seven years of data each, including this year. Other long-term sites in the watershed include Flower01, on Flower Brook behind the Town Offices in Pawlet and Beaver01 at the Route 133 crossing over Beaver Brook (please refer to the attached map).

Last year, in order to further understand how certain areas or properties were contributing to pollution loads, the District chose to add eleven new sample locations in the Mettowee Watershed. The District was a named partner in the Flower Brook *E. coli* TMDL<sup>5</sup> and in 2013 was prioritizing phosphorus-reducing projects in the watershed, funded through a Vermont ANR Ecosystems Restoration Grant (ERP). In addition to the long-term sites, the District sampled at one new site and one rotational site (not used on an annual basis) on the Mettowee River, added three new site locations on Flower Brook and sampled at one additional rotational site, and added two new sites on Beaver Brook. In addition, the District added monitoring locations on the Wells Brook and Sykes Hollow Brook for the first time.

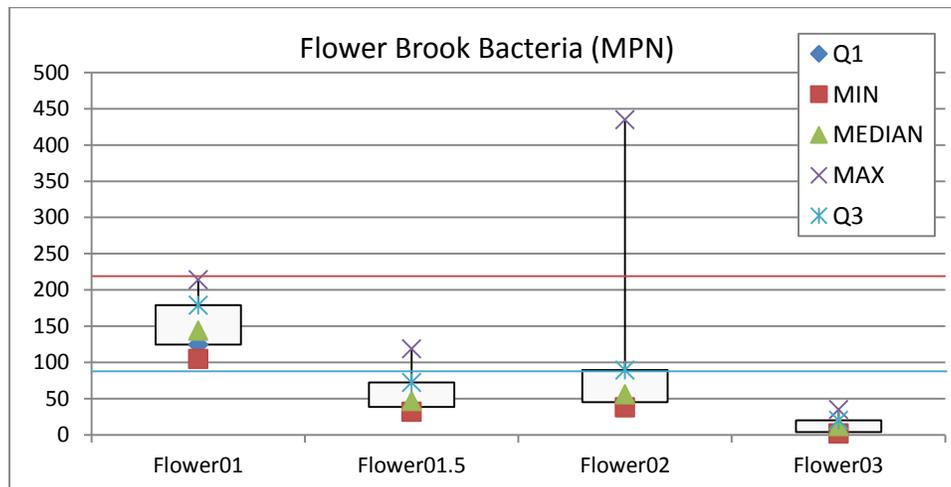
This year, the District added one site on Beaver Brook, Beaver04 at Andrus Lane, and sampled the five Wells Brook sites (including the Tadmer Road site) that were only randomly sampled in 2013.

<sup>5</sup> VT DEC, 2011, Statewide TMDL for Bacteria Impaired Waters, Appendix 1: Flower Brook, Mouth to RM 0.5, (prepared by FB Environmental Associates, Inc. Portland, ME).

## Flower Brook

*E. coli* bacteria- The District has been targeting the Flower Brook watershed with water quality improvement projects since 2012, when it received a TMDL for chronic *E. coli* exceedances.

Chart 2: 2014 *E. coli* concentrations in Flower Brook water samples



Flower Brook upstream of the Village met the *E. coli* water quality standard for the first time since the District began monitoring. In 2014, the water quality standard was increased from 77 MPN to 235 MPN to match the US EPA and Vermont Department of Health standard (the old standard is shown on the graph in blue and the new standard is shown in red). Even when compared to the old, more stringent standard, most of the results meet the standard. Please refer to the data tables in the back of the 2013 PMNRCD Water Quality Monitoring Report to see the vast decrease in *E. coli* levels in the raw data this year as compared to last year.

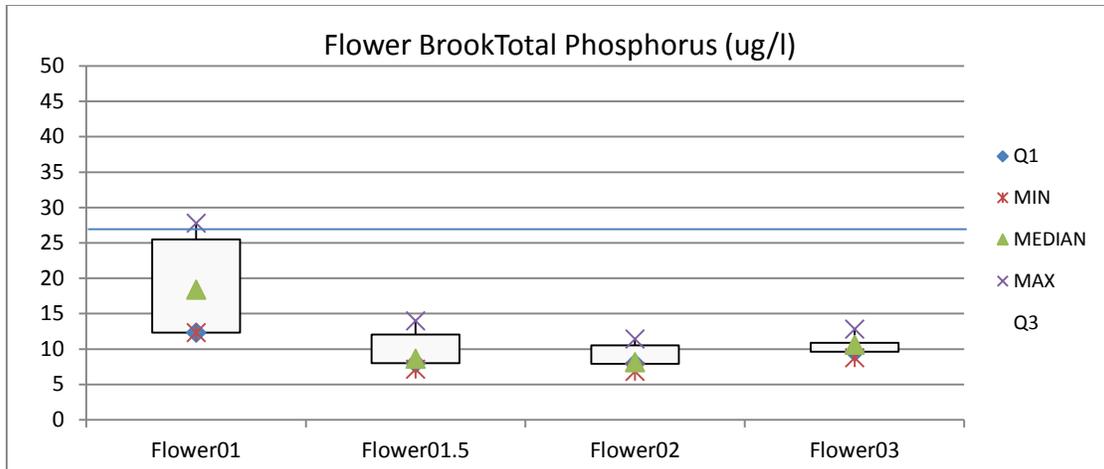
*Total Phosphorus Concentration*- The Vermont Water Quality Standards for phosphorus state that “in all waters, total phosphorus loadings shall be limited so that they will not contribute to the acceleration of eutrophication or the stimulation of growth of aquatic biota, in a manner that prevents the full support of uses (p. 21, 2011 WQS)<sup>6</sup>.”

The WQS for South Lake B is 0.054 mg/L (54 ug/l) (p. 22, 2011, WQS<sup>8</sup>), though the District expects that our results from samples collected a significant distance upstream of South Lake B to be far lower than that value. The Standard for coldwater medium-gradient streams (the streams measured in this study) was recently developed and is 27 ug/l.<sup>7</sup>

Chart 3: 2014 total phosphorus levels in Flower Brook water samples

<sup>6</sup> State of VT, 2011, Water Quality Standards VT Code R 12 004 052, Natural Resources Board, Water Resources Panel, Montpelier, VT, 54 pp. [http://www.anr.state.vt.us/dec/waterq/erp/docs/erp\\_wqs.pdf](http://www.anr.state.vt.us/dec/waterq/erp/docs/erp_wqs.pdf).

<sup>7</sup> Kamman, Neil, 2012, VT DEC Monitoring and Planning Program, Personal Communication



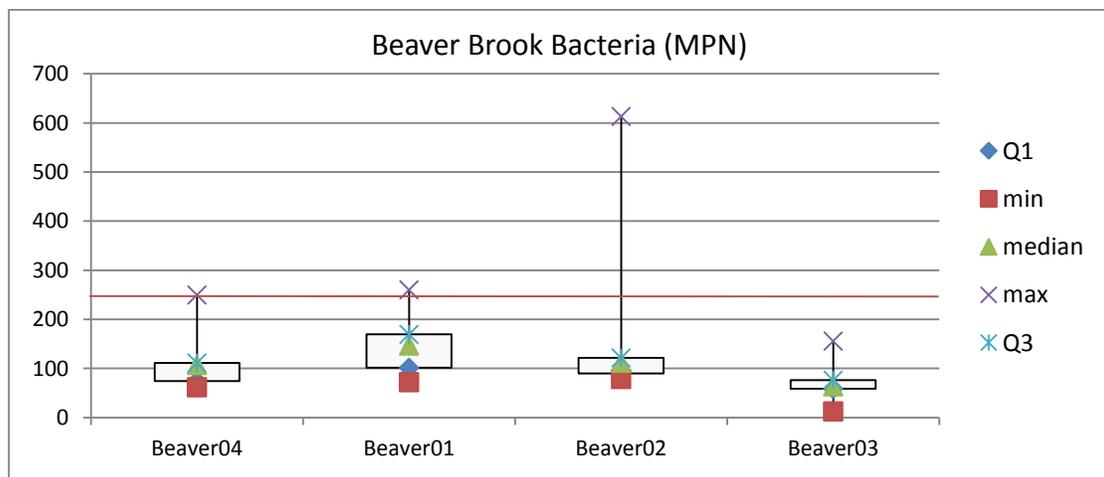
The results of the phosphorus samples collected in Flower Brook showed relatively low phosphorus concentrations, though the site located in Pawlet Village is roughly twice as high as the sites above the village.

### Beaver Brook

Beaver Brook is one of the main tributaries to Flower Brook, entering the brook in the valley upstream of the Pawlet Village.

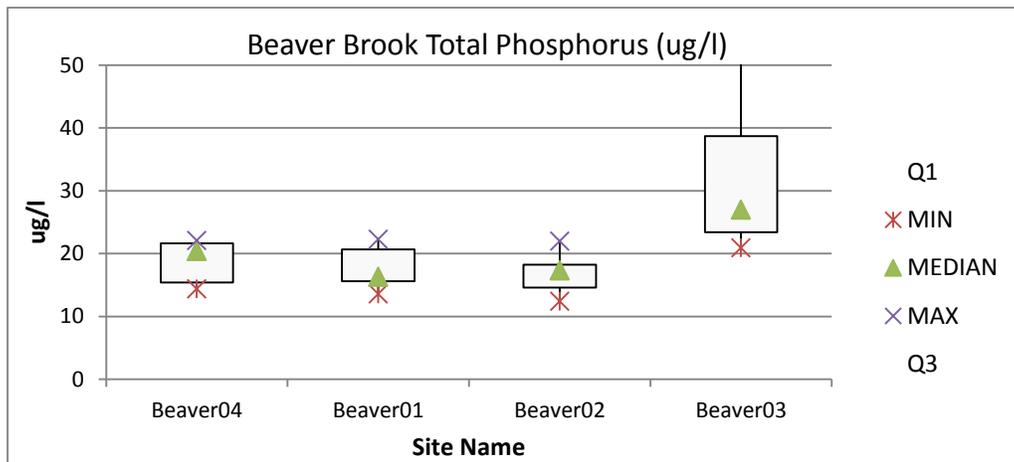
The District collected samples at four locations on Beaver Brook during the 2014 sample season. Beaver04 is a new site and the most downstream sample location, on Andrus Road. This site is downstream of two dairy farms where the District and many of our partners are working together to implement water quality improvement practices and structures. This site is an important location that will allow the District to understand the impact of our projects on concentrations of fecal bacteria in the water. Beaver01 is a 'sentinal' sample location, measured every year (that the District sampled) since the District began collecting samples in the Mettowee watershed in 2005. Beaver02 and Beaver 03 are upstream sites and have been sampled for the past two years.

Chart 4: Beaver Brook E. coli concentrations (2014) in Most Probable Number (of colonies).



Beaver04 and Beaver03 showed relatively low E. coli concentrations. Beaver01 was slightly higher, but still largely within the limits of the Vermont Water Quality Standards (recently raised to 235 colonies per 100 ml of water from 77 colonies per 100 ml of water or MPN). Beaver02 had the highest number of fecal bacteria in a sample at 613 MPN. There were only two other measured E. coli concentration exceedances in the Beaver Brook subwatershed, Beaver01 (260 MPN) and Beaver04 (250 MPN) on July 8, 2014. Due to impaired status of downstream Flower Brook for fecal bacteria, the District has targeted this subwatershed with ACAP, livestock exclusion, and ERP projects. The results of this year's water quality monitoring program indicate that the projects are improving the water quality in this watershed.

Chart 5: Total Phosphorus concentrations measured in Beaver Brook (2014) ug/l.



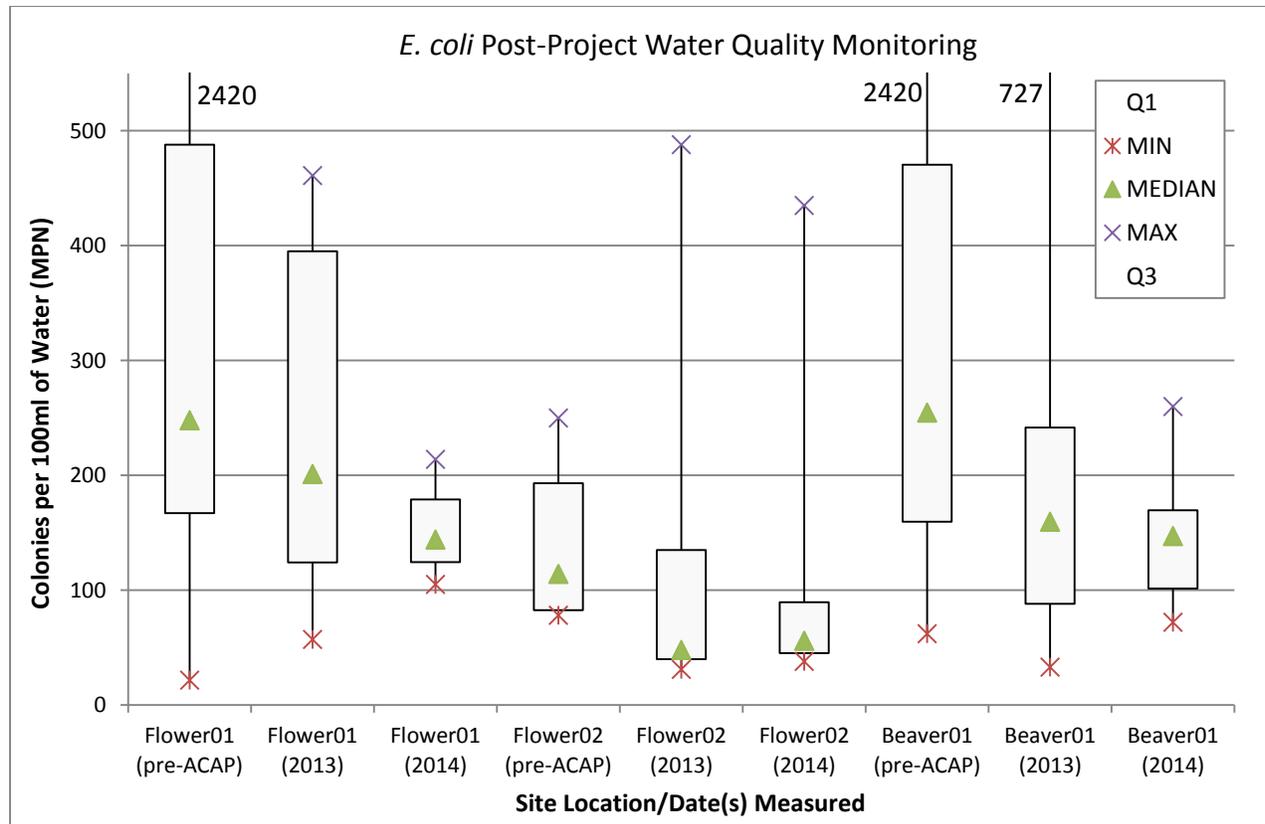
The 2014 results from Beaver Brook show higher phosphorus concentrations than the sample locations on Flower Brook. The Flower Brook results average 10 ug/l, while the Beaver Brook results average roughly 18 ug/l. Beaver Brook, site 3, which is located just downstream of a wetland, had the highest results, with an average total phosphorus concentration of roughly 30 ug/l.

The District explored the higher phosphorus concentrations at Beaver03, but no explanation, such as logging or other land clearing was found. The wetland is a possible source of nutrients, but the District does not have enough information to confidently link the higher nutrients concentrations to the proximity of the wetland. Wetlands are commonly thought of as nutrient sinks, but questions were raised as to whether with their rich and complex life and nutrient cycling, wetlands can also act as nutrient sources.

## Agricultural Projects Post-Project Monitoring Data

Chart 6, below, shows the improvement between pre-ACAP *E. coli* concentrations and those measured after the District began to focus its efforts on the Flower Brook subwatershed. Three sites are graphed; Flower01, Flower02, and Beaver01. The boxplots show pre-ACAP data, 2013, and 2014 data. Though results can vary from season to season, the trend appears to indicate that the ACAP projects have been quite effective in decreasing *E. coli* levels in Flower Brook.

Chart 6: Post-ACAP *E. coli* monitoring in the Flower Brook watershed.



Charts 7 and 8 (next page) show the total phosphorus results for the Flower Brook watershed (separated by Flower Brook and its tributary, Beaver Brook). The total phosphorus results do not show the same decreasing trend that is seen in the *E. coli* data. Instead the phosphorus concentrations appear to increase each year. Rick Hopkins, with the Agency of Natural Resources, postulated that higher-than-expected phosphorus results were the effect of Tropical Storm Irene and the scope of the disturbance, still stabilizing and sorting stream materials in the several years past the storm event.

Chart 7: Flower Brook 2014 Total Phosphorus data graphed with historical TP data

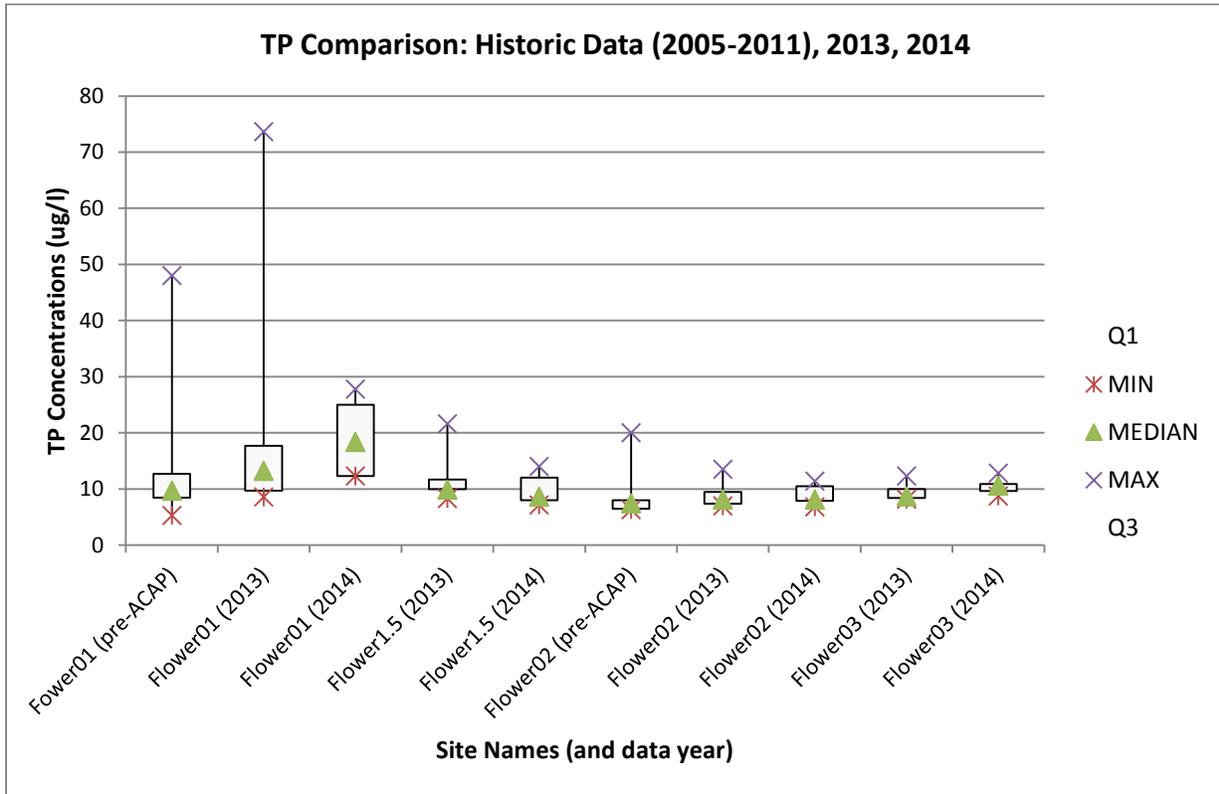
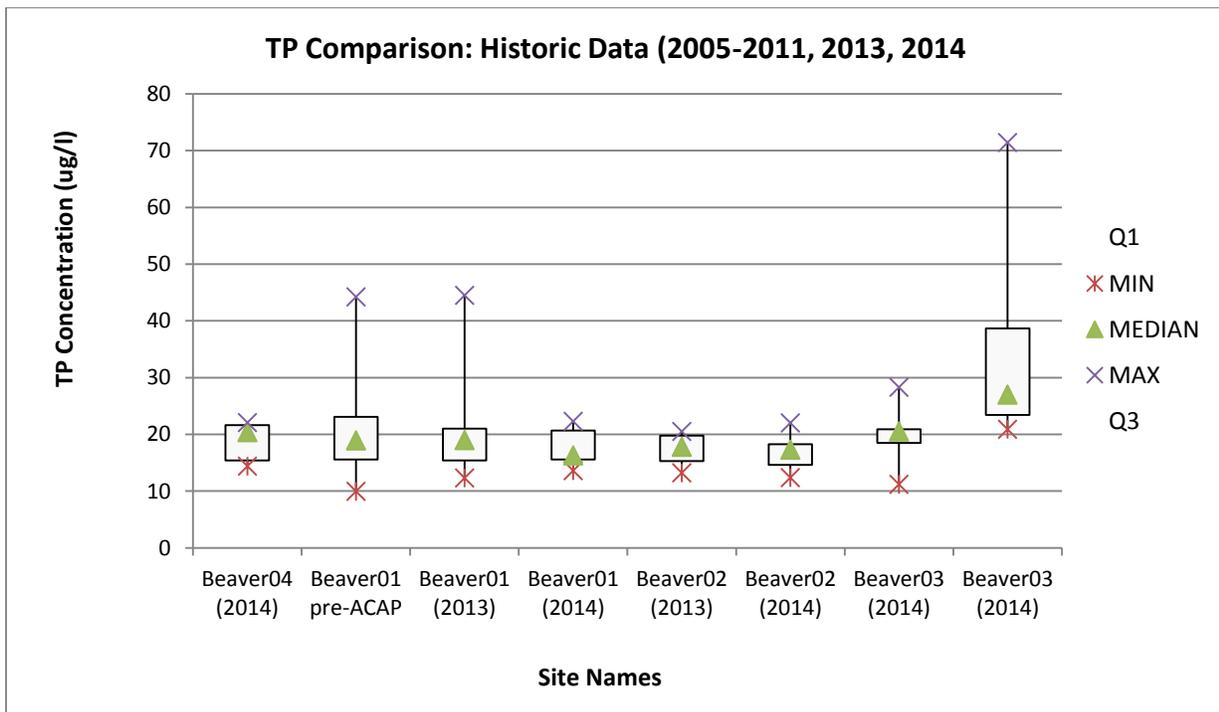


Chart 8: Beaver Brook 2014 Total Phosphorus data graphed with historical TP data



## Mettowee River

The following charts represent the 2014 data collected for the Mettowee River and several tributaries, including Wells Brook and Tadmer Brook.

Chart 9: Mettowee River Bacteria Concentration Data (MPN)

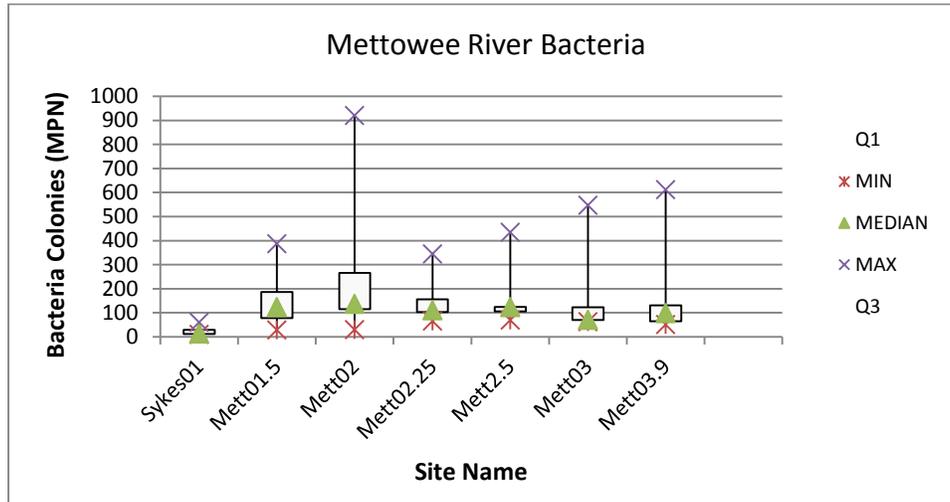
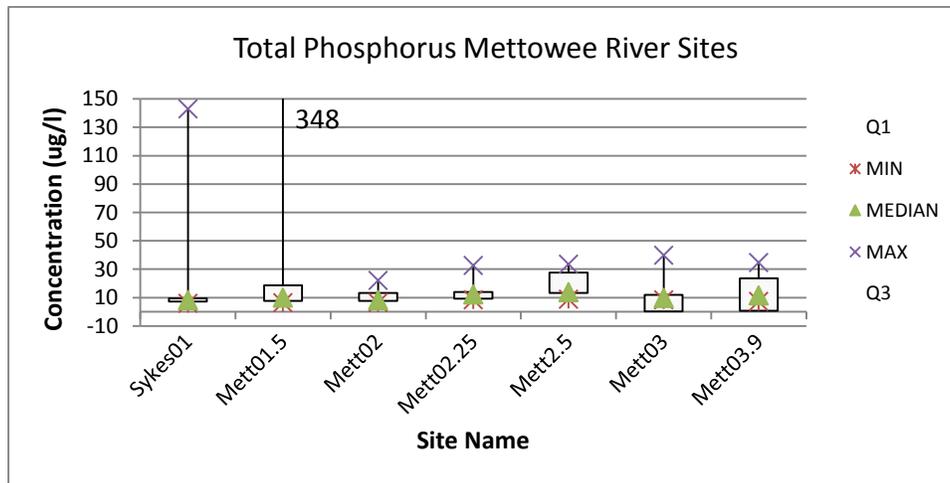


Chart 10: Mettowee River Phosphorus Concentration Data (ug/l)



The Phosphorus data for the Mettowee River includes two storm dates for Sykes01, Mett01.5, and Mett03.9. As seen in the chart above, the sample location Mett3.9 had lower concentrations of phosphorus during storm events than the farther upstream sites Sykes01 and Mett01.5. This is likely due to dilution from tributaries in the forested Mettowee Reach 02 area.

## Wells Brook

Chart 11: Wells Brook Bacteria Concentration Data (MPN)

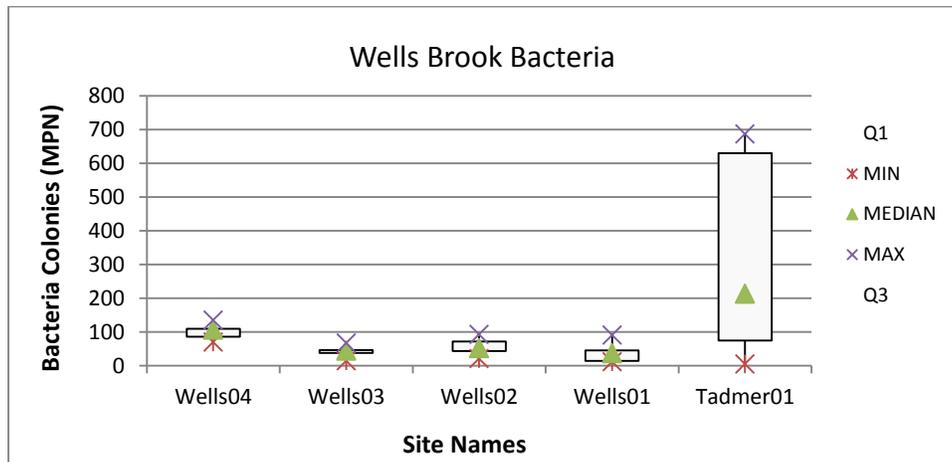
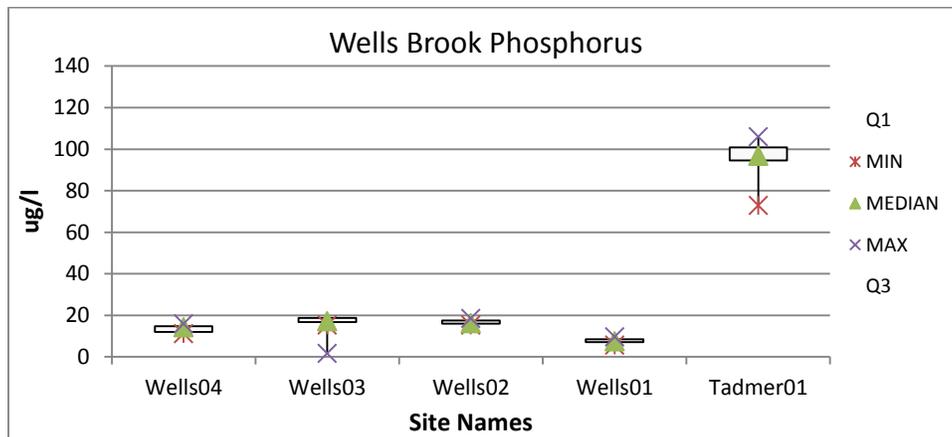


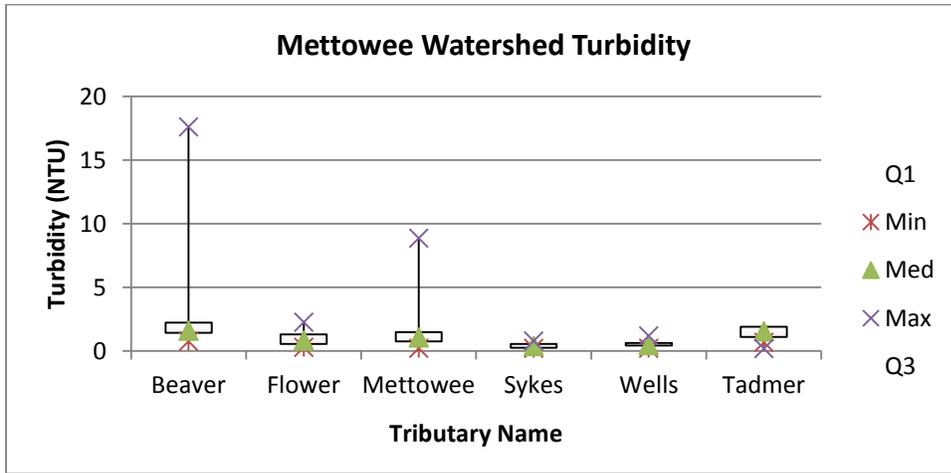
Chart 12: Wells Brook Phosphorus Concentration Data (ug/l)



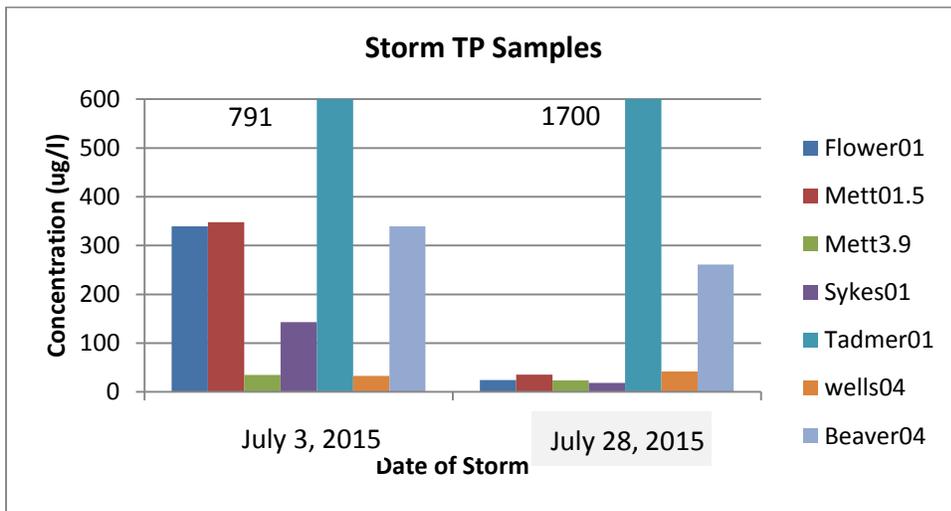
The bacteria and total phosphorus concentrations for the Wells Brook sites were relatively low. The concentrations measured at the Tadmer Brook location were much higher and may indicate that the high phosphorus concentrations are linked to an animal operation. This data represents low-flow data; storm sample results for phosphorus are reported in a following section.

Turbidity Data for the Mettowee Watershed

Chart 13: Mettowee Watershed Turbidity Data (NTU)



Except for one sample event, the turbidity values for all of the monitoring sites were relatively low. Sample results below 5 NTU are generally thought of as low turbidity levels. Storm TP Data



Tadmer Brook Data

This brook presents as a silty, polluted stream after rainfall events. Even when turbidity levels are low, the stream is very high in phosphorus and the sample analysis showed high bacteria concentrations for most of the sample dates.

Tadmer01	6/10/14	6/24/14	7/3/14	7/8/14	7/22/14	7/28/14	8/5/14	8/19/14	9/2/14
E. coli	613	114		649	214		36	5	687
TP	73	93.1	791	96.9	95.9	1700	98.8	106	103
Turbidity	2.11	1.7		2.18	1.38		1.53	0.68	0.82