Water Quality Monitoring Program Report 2006

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Acknowledgments

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Acronym List:

BUHS - Brattleboro Union High School
E.coli - *Escherichia coli*
EPA - Environmental Protection Agency
GIS - Geographic Information System
NO_x - Nitrates
QA/QC - Quality Control/Quality Assurance
QAPP - Quality Assurance Project Plan
SAC - Stream Action Committee (WRWA)
TNC - The Nature Conservancy of Vermont
TP - Total Phosphorous
TSS - Total Suspended Solids
USDA - United States Department of Agriculture
USFWS - United States Fish and Wildlife Service
VT DEC - Vermont Department of Environmental Conservation
WCNRCD - Windham County Natural Resources Conservation District
WRC - Windham Regional Commission
WRWA - West River Watershed Alliance

1.0 Introduction

1.1 Rationale

The West River Watershed Alliance (WRWA), a non-profit organization formed in 2001, recognized the importance of water quality monitoring on the West River. Since 2003 they have created and overseen a volunteer based program to perform long term water quality monitoring in the watersheds of the West, Williams and Saxtons Rivers, that form Basin 11. The data from this program has been incorporated into the Basin 11 Management Plan. The Basin 11 Management Plan is part of the rationale for the pursuance of long term water quality monitoring in the watersheds within Basin 11, and the data collected by the volunteer monitoring program plays an integral part of the Plan's implementation.

Data gathered by the WRWA volunteer monitors is currently being used by the Vermont Department of Environmental Conservation (VTDEC) Watershed Coordinator to designate Water Management Types to many of the rivers and streams in all three watersheds of Basin 11. The Water Quality Monitoring Program monitors a number of streams that the State does not have data on so the results reported to WRWA are the only source of information for those streams. The program also monitors many more sites, on a more regular schedule, than the State is able to. The data gathered serves to fill in a number of gaps in the VTDEC information database and allows Water Management Type recommendations to be made on quality data as well as observations. The volunteers have also brought local knowledge of the rivers to the basin planning process as a whole because of the intimate experience they have gained through the monitoring work.

The West River and its major tributaries were designated as a "special focus area - high priority" by the United States Fish and Wildlife Service (USFWS) because of its rare species, potential for Atlantic salmon restoration, and contiguous habitat type. Specific threats to the West River identified by USFWS and The Nature Conservancy of Vermont (TNC) are sedimentation and thermal modification due to riparian vegetation removal, flood control dams, erosion and flow alteration.

WRWA monitoring data is also being used to develop the biennial 303(d) List of Impaired Waters and the List of Priority Surface Waters which are required by United States EPA. These documents are the result of analysis of all data sources available from State, Federal and local sources.

1.2 Summary of the Program

The Stream Action Committee (SAC) of the WRWA in the fall of 2002 planned and developed a three-phased stream monitoring program. Phase 1 involves bi-weekly sampling of popular public swimming hole sites along the main stems and some tributaries of the three West, Williams and Saxtons Rivers. Phase 2 sampling monitors selected sites where little or no water chemistry information has been previously reported or where suspected problems might exist and long-term sampling would be required to determine actual impacts. Phase 3 program involves collecting macro-invertebrate samples and conducting habitat assessments at 8 sites located throughout the three watersheds.

During its fourth season in 2006, volunteers for the Phase 1 program sampled water quality bi-weekly at nineteen "high-use" swimming holes in the West, Williams, and Saxtons Rivers for *Escherichia coli (E.coli)*, total phosphorus (TP), nitrates (NO_x), total suspended solids (TSS), turbidity, conductivity, pH, and temperature. The swimming hole sampling and results reporting were coordinated with the current US Army Corps of Engineers beach sampling program. Phase 1 *E.coli* data results were published in the *Brattleboro Reformer* and were posted at kiosks erected at the Retreat Meadows and the Dummerston Covered Bridge.* The *E.coli* data in addition to other parameter data from the Phase 1 and 2 programs have been entered into the WRWA long-term database and, as in prior years, will be shared with state and local agencies (non-enforcement, ecological) and with other volunteer monitoring programs.

Volunteers for the Phase 2 program collected samples once monthly at sites in the West, Williams and Saxtons Rivers and their tributaries with analyses being conducted for all above-mentioned parameters except *E.coli*.

Phase 3 sampling did not take place in 2006, as the 2003 and 2004 samples are currently being processed. Once completed, species abundance of macro invertebrates and their population numbers will be analyzed to indicate impacts to water quality.** Stream habitat observations were also noted in concert with the benthic sampling.

*The public reporting of *E. coli* results was offered as a guide to making informed decisions about using certain swimming areas. It is understood by the WRWA that sampling conducted at mid-week does not accurately reflect bacterial levels occurring on the high-use weekend days. It was an integral part of the program that the public be duly educated about the limits of such reporting.

** Phase 3 macro invertebrate samples are currently being processed. Project description and sampling methods and for the 2004 macro invertebrate monitoring and habitat assessments were incorporated into the 2004 report. However, Phase 3 sampling results, habitat evaluation, and data summary will be drafted as an addendum once macro invertebrate sample processing has been completed.

1.3 Funding

All phases of the WRWA's 2006 water quality program were coordinated according to the Vermont Department of Environmental Conservation (VT DEC) protocols. Laboratory analysis was provided by the VT DEC through the VT DEC's Laboratory Assistance Grant that provided free sample analysis to volunteer monitoring groups across the state at the LaRosa Laboratories in Waterbury, Vermont. The WRWA also received grant awards from the Vermont Fish and Wildlife Grant and the Vermont Environmental Board's Supplemental Enforcement Project (SEP) funds to help organize the project, fund equipment purchases and train volunteers. Funding was also donated by the towns of Londonderry, Jamaica, Townshend, Brookline, Newfane, Brattleboro, and Wardsboro whose residents voted to contribute to funding for the volunteer monitoring efforts in their townships.

1.4 Location of Monitoring Program

As mentioned previously, the West River, Williams River and Saxtons River comprise State-designated Basin 11. The VT DEC's Basin 11 West, Williams & Saxtons Rivers Assessment Report describes the main stem of the West River as originating in the south part of Mount Holly, 2400 feet above sea level. The river flows generally south through the towns of Weston and Londonderry, then southeast through Jamaica, Townshend, Newfane, Dummerston, and Brattleboro to its confluence with the Connecticut River. The length of the main stem is 46 miles.

The Assessment Report further describes the three watersheds as follows:
The 423-square mile West River watershed is heavily forested with three percent of the land in agricultural use. Surface water comprises approximately 5 percent of the watershed area and transportation use comprises four percent. Wetlands and developed land each cover one percent of the watershed area according to the 1991-1993 satellite photograph analysis. The West's larger tributaries include the Rock River, Wardsboro Brook, Winhall River, Ball Mountain Brook, and Grassy Brook.

The Williams River originates at the eastern edge of the southern Green Mountains and flows easterly then southeasterly, through Southern Vermont Piedmont before joining the Connecticut at Herrick's Cove. The main stem of the Williams Rivers is 25 miles long, and the entire watershed covers 117 square miles. Much of the basin is rugged, hilly land with steep slopes and poor drainage. Similar to the West River, the Williams River is largely forested, with 82 percent coverage. A slightly higher percentage from that of the West River watershed is in agricultural use, and like its neighbors, roads and other transportation uses cover 4 percent of the Williams watershed area. The main tributary to the Williams is the Middle Branch. Lyman's Brook, Andover Branch and the South Branch are tributaries to the Middle Branch.

The Saxtons River rises on the eastern slopes of the southern Green Mountains in the town of Windham and flows 20 miles southeasterly across the Vermont Piedmont to the Connecticut River. The Saxtons River watershed drains an area of 78 square miles. This watershed is characterized by narrow steep gorges cut through rugged hilly uplands and outcropping bedrock offering poor drainage. Again at 82 percent, forests are the dominant land cover, with 4 percent of the area used for transportation activities. Its main tributary is the South Branch which joins the Saxtons River from the south at Grafton.

2.0 Methods

2.1 WRWA Quality Control and Quality Assurance (QA/QC)

The VT DEC required that all volunteer groups accepting the Laboratory Assistance Grant submit a Quality Assurance Project Plan (QAPP) to show that each group's sampling methods and procedures were aligned with the State's protocols. The WRWA QAPP was submitted and approved in May 2005, just prior to initiating the WRWA monitoring program, and was approved for use in the 2006 sampling season as well. Copies of the WRWA's QAPP are available upon request.

Quality Assurance procedures, described in the WRWA QAPP, were conducted throughout the sampling season, including such activities as collection of duplicate samples, review of field data sheets by the Program Director and Volunteer Field Assistant, field checks on volunteers, and equipment calibration checks.

Participation in the VT DEC's Laboratory Assistance program required the WRWA stream monitoring program to follow the State's quality assurance protocols. The LaRosa Laboratory personnel train representatives from the various volunteer monitoring groups in lab and sampling protocols annually. The WRWA Water Quality Monitoring Program Director and Volunteer Field Assistant received training in appropriate sampling procedures, proper handling of samples, chain of custody requirements, and proper procedures for sample delivery to the laboratory. To ensure the collection of valid water quality data, WRWA volunteers were trained and field checked applying rigorous QA/QC protocols at all stages of the program.

2.2 Volunteer Recruitment and Training

After a successful volunteer recruitment meeting held in Newfane on May 19 2006, two in-field training sessions were held later in the month to prepare volunteers for Phase 1 and 2 of the sampling program. Training covered step-by-step procedures for each sampling task. Sampling safety was discussed in detail. Two person sampling teams were encouraged and volunteers were allowed to choose their preferred sampling sites. Each team received sampling equipment kits and field manuals. Phase 2 sampling began on Sunday, June 04, 2006, and Phase 1 on Tuesday, June 06, 2006.

Adjustments continue to be made to the program to improve the efficiency and comprehensiveness of the protocols and methods. These program improvements included:

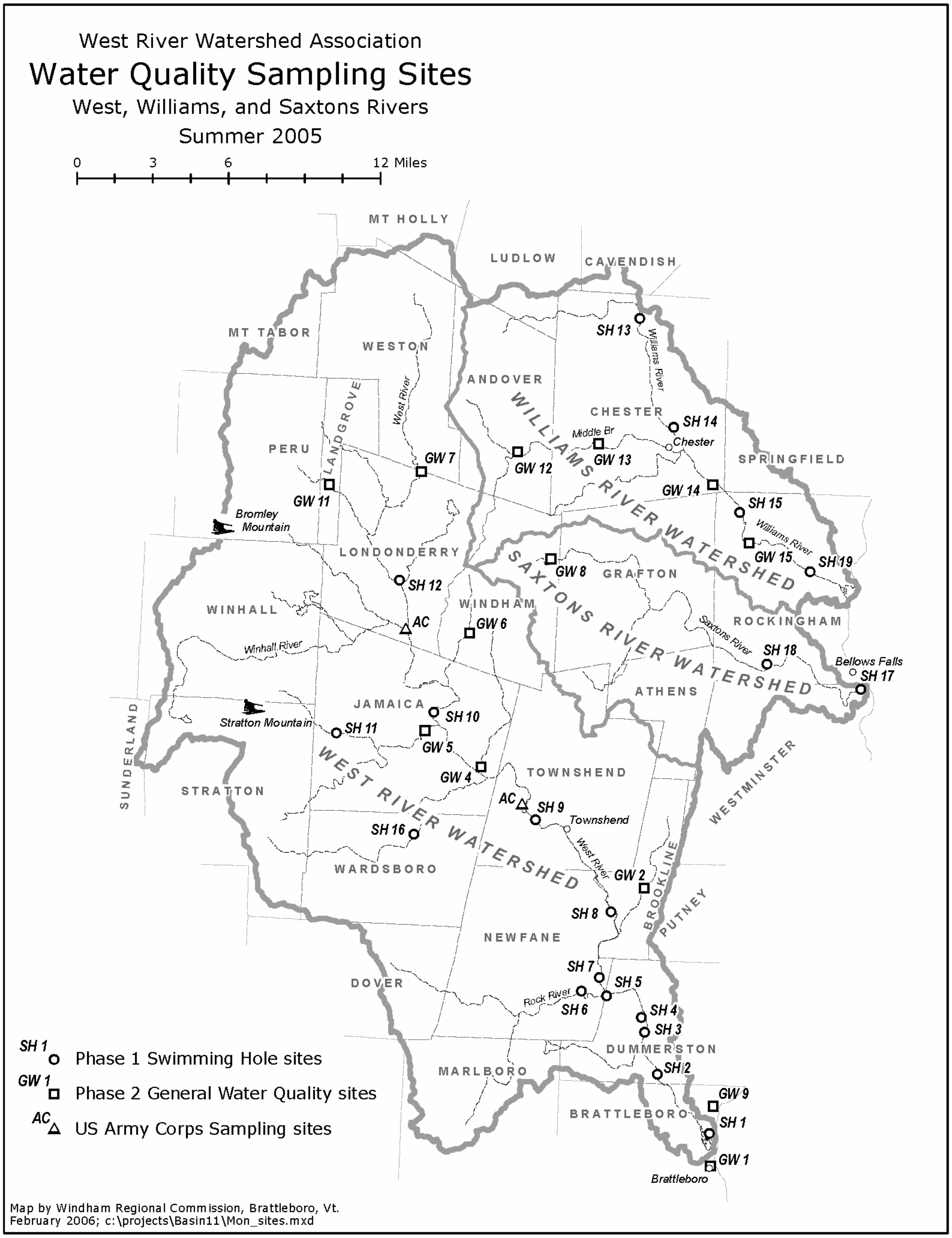
1) The creation of a volunteer sampling manual.
2) Online access to all sampling parameter results as they are reported, courtesy of LaRosa Laboratories.
3) Purchase of a new YSI pH100 meter.

2.3 The Three-Phased Monitoring Plan

2.3.1 Phase 1

Swimming Hole Monitoring, Sampling Sites

In 2003, members of the Stream Action Committee selected the 15 swimming hole monitoring sites that comprise Phase 1 of the WRWA program after consulting with staff from the VT DEC. In 2002 the Windham Regional Commission (WRC) conducted a study of West River public access sites and swimming holes using 604B funding. All public access sites were identified, characterized, mapped and incorporated into the WRC's GIS database. Generally, West River swimming holes designated as "high-use" were selected for the WRWA monitoring program. Sites along the Williams and Saxtons Rivers were selected based on visual inspection and local knowledge. Of the initial fifteen selected in 2003 the number of sites has since expanded. In 2005 sampling was being conducted at nineteen swimming hole sites along the three rivers, but due to the increase of demands on grant donations, funding through the DEC was only available to cover sixteen of those sites in 2006. Sites were then selected based on past years data while maintaining a presence within each watershed. The following sites were sampled in 2006:



Note that not all sample sites displayed were sampled for the 2006 sampling season. Please refer to the following list for currently sampled sites.

West River

1) SH-1 Marina (Milkhouse Meadows) - Brattleboro
2) SH-2 Deyo's - Dummerston
3) SH-4 Dummerston Covered Bridge - Dummerston
4) SH-6 Rock River – Indian Love Call - Williamsville
5) SH-7 Newfane Swimming Hole - Newfane
6) SH-8 Brookline Bridge - Brookline/Newfane
7) SH-9 Scott Covered Bridge - Townshend
8) SH-10 Jamaica State Park - Jamaica
9) SH-11 Pikes Falls - Jamaica
10) SH-12 S. Londonderry - South Londonderry
11) SH-16 Wardsboro Brook - Wardsboro

Williams River

12) SH-14 North Bridge - Chester
13) SH-15 Bartonsville Covered Bridge - Rockingham
14) SH-19 Rockingham Trestle* - Rockingham

Saxtons River

15) SH-17 Bellows Falls Beach - Westminster
16) SH-18 Saxtons River Town Center - Rockingham

* Sites added in 2005

<u>Swimming Hole Monitoring Logistics</u>

Phase 1 sampling was conducted bi-weekly June 6 through September 26. Samples were collected on Tuesday mornings between 8 and 10 am and transported to the LaRosa Laboratory via volunteer courier to arrive by approximately 12:30 p.m. This timing allowed for all analyses to be conducted within the prescribed 6-hour holding time for *E.coli* analysis. Collection dates were preset, but meteorological conditions were considered. The main focus of this phase of the WRWA monitoring program was to inform the public of swimming hole bacteria levels by publicizing the *E.coli* results in the *Brattleboro Reformer* and posting it at two informational kiosks along the main stem of the West River, and reporting it to local municipalities via the town offices. To achieve this goal, it was requested for LaRosa Lab personnel to complete the *E.coli* analysis and send the results to the WRWA within 72 hours of sample receipt. Other parameter analysis results were made available to the WRWA online within a month of sample receipt. The 72 hour time frame for the reporting of *E.coli* proved to be unreasonable at times for LaRosa Laboratories, and the results were not reported until the following week. WRWA is continuing to address this issue for future sampling years.

Volunteers collected water samples in labeled, sampling bottles (provided by LaRosa Laboratories) within time frames specified. The WRWA Program Director and Volunteer Field Assistant measured pH and conductivity at the field drop-off point using an YSI pH100 tester and an YSI multi-meter for testing conductivity. The pH meter was calibrated using standardized pH buffers upon activation and was field checked using the same pH buffers within 24 hours of each sampling period. The YSI multi-meter, factory calibrated, was tested bi-weekly with deionized water. Field data sheets were filled out on site by volunteers and reviewed by the Program Director and Volunteer Field Assistant at the drop-off sites. Samples were collected and transported following Vermont State and EPA protocols.

Parameter	No. of Samples/event	Sampling Equipment	Sampling Method
E. coli	16	Lab Bottle	EPA guidelines; VT State protocols
Phosphorus	16	Lab bottle	EPA guidelines; VT State protocols
Nitrates	16	Lab bottle	EPA guidelines; VT State protocols
Total Suspended Solids	16	Lab bottle	EPA guidelines; VT State protocols
Turbidity	16	Lab bottle	EPA guidelines; VT State protocols
pH	NA	Lab Bottle	Probe
Conductivity	NA	Lab Bottle	Probe
Water Temperature	NA	Hand-held Alcohol Thermometer	In situ
Air Temperature	NA	Hand-held Alcohol Thermometer	In situ

2.3.2 Phase 2

Sampling Sites at Areas of Concern

The WRWA's initial 9 sampling locations were determined in consultation with the VT DEC staff. Over the past four years the number of sampling sites was expanded to thirteen as more extensive monitoring on the Williams and Saxtons Rivers indicated the need for additional sites where there was little known historical data. As with the Phase 1 sampling the number of sites tested in 2006 was affected by financial limitations and thusly only 5 sites out of the previous years' thirteen sites were able to be sampled in 2006. Sites were selected based on parameter data from previous sampling years. Sampled locations are listed below

West River

1) GW-1Whetstone Brook - Brattleboro
2) GW-5 Ball Mountain Brook - Jamaica
3) GW-6 Cobb Brook - Windham
4) GW-11 Flood Brook - Landgrove

Williams River

5) GW-15 William's Beach* - Rockingham

* Sites added in 2005

Monitoring Logistics

Phase 2 sampling was conducted once monthly on Sundays, June 4 through September 6. Similar to Phase 1 procedures, volunteers collected water samples in labeled, sampling bottles (provided by LaRosa Laboratories) within timeframes specified. Field data sheets were filled out on site and reviewed by the Program Director and Volunteer Field Assistant at the drop off point at Dummerston Covered Bridge. Phase 2 samples were stored in a refrigerator and maintained at 4°C until delivery to LaRosa Laboratories. These samples were transported to the lab with the Phase 1 samples the following Tuesday following state protocols. Phase 2 samples were analyzed for the same parameters as for those collected for Phase 1 with the exception of *E.coli.*

2.3.3 Phase 3

Macro invertebrate Sampling and Habitat Assessment

Most macro invertebrates are aquatic insects or the aquatic stages of insects that live in, crawl upon, or attach themselves to the bottom (or substrate) of the river. They also include such things as clams and worms. Whereas water chemistry analysis provides only a "snap-shot" of information at the time of sampling, most stream-bottom macro invertebrates remain in place over time, thus providing information about pollution over the long term. For instance, in a healthy stream, the stream-bottom community will include a variety of pollution-sensitive macro invertebrates. In an unhealthy stream, there may be only a few types of sensitive macro invertebrates present.

This phase of the program was not conducted in 2006 due to an overwhelming amount of data identification work left still to be completed from 2003 and 2004. The program is in the process of being restructured to avoid such problems in the future. Currently the priorities are to finish sorting all samples collected in 2003 and 2004 using trained volunteers sorting to Order and Major Family, then training further in order to identify samples to the Family level. Through relationships with local macro invertebrate experts and utilizing their skills to provide training and guidance to volunteers we hope to develop a consistent training program that can be utilized to streamline sample identification in future years of the Phase 3 program.

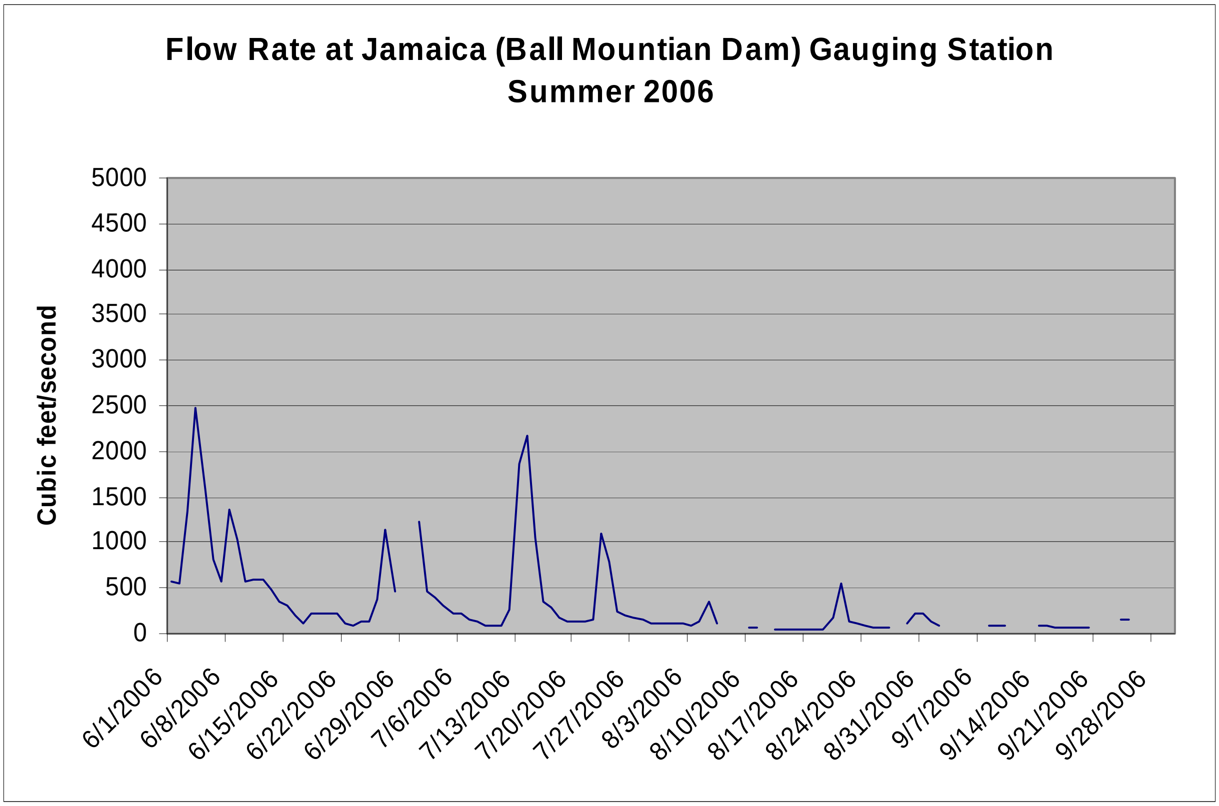
3.0 Summary of Results

The remaining sections of the WRWA's 2006 Water Quality report will provide background and rationale for the parameters sampled and summarize the results of the WRWA sampling analysis and selected in-field measurements*. Laboratory analysis was conducted on the samples to determine levels of *E.coli*, total phosphorous, nitrates in the form of $NO_{x,}$ total suspended solids and turbidity. Water and air temperature were measured in the field. Conductivity and pH were measured by the Program Director and Volunteer Field Assistant at the drop off point.

This being the fourth year of data collection, comparisons can begin to be made to identify sites that exhibit repeated seasons of high results. These sites can then be discussed with the towns involved and they can work to bring the analyzed parameters within state and suggested limits. No long-term trends will be determined at this time, however some recommendations will be made based on yearly analyzed data. In general, discussion will center on observations and comparisons to Vermont State Standards or EPA Standards, should they exist, for individual parameters. Similar to last year's results, there is an obvious relationship between the degree of concentration of the various pollutants, heavy rainfall and resulting higher flow levels prior to or during sample collection. To provide a point of reference, graphs of USGS stream flow data (shown in cubic feet/sec) collected at USGS Stream Gauge Stations below Ball Mountain Dam in Jamaica (West River), Townshend Dam (West River), Rockingham (Williams River), and at Saxtons River Center (Saxtons River) between June 01 and September 30, 2006 are shown on the following pages**.

*Parameter information from Background on Chemical Parameters, Earth Force GREEN: Global Waters Environmental Education Network: http://www.green.org/files.cgi/435_Chem_Parameters.html#Top

**Flow Rate Data available from the USGS National Water Information System at: http://waterdata.usgs.gov/usa/nwis/


Flow Rate at Jamaica (Ball Mountian Dam) Gauging Station
Summer 2006
Cubic feet/second
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
6/1/2006
6/8/2006
6/15/2006
6/22/2006
6/29/2006
7/6/2006
7/13/2006
7/20/2006
7/27/2006
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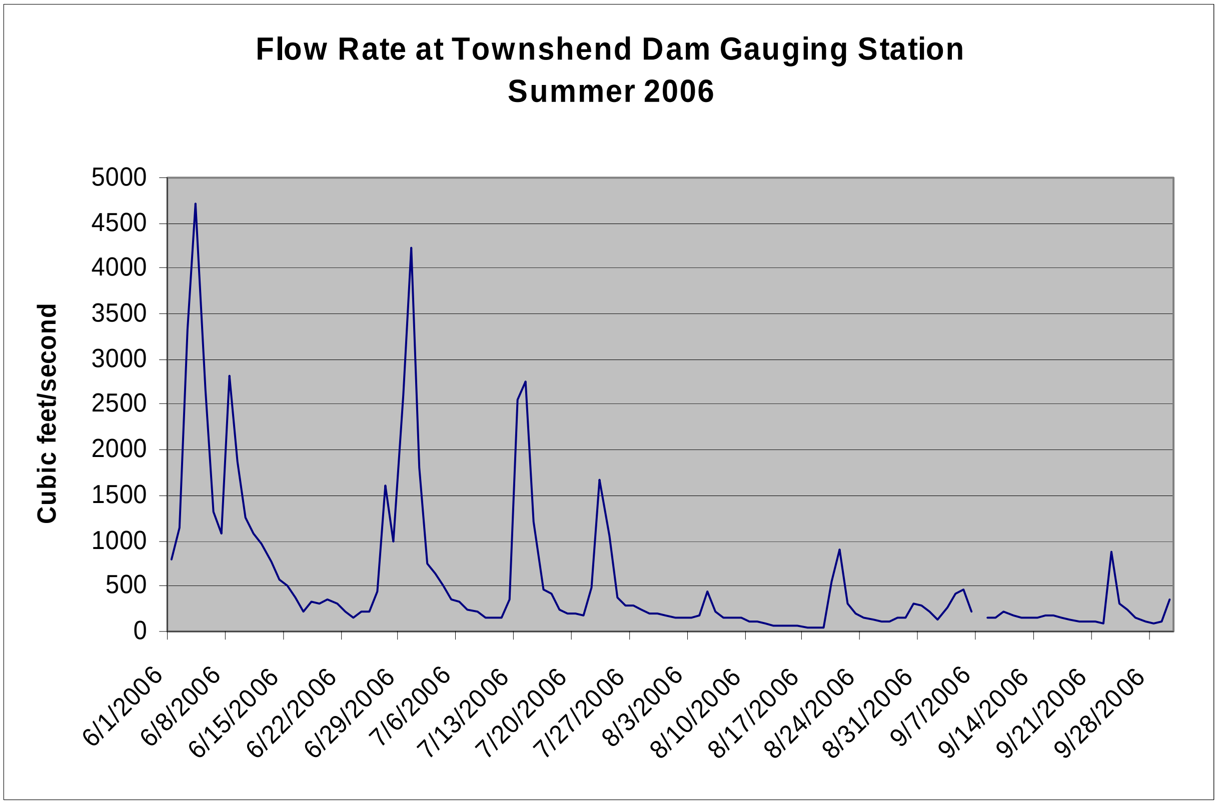
9/21/2006
9/28/2006


Flow Rate at Townshend Dam Gauging Station
Summer 2006
Cubic feet/second
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
6/1/2006
6/8/2006
6/15/2006
6/22/2006
6/29/2006
7/6/2006
7/13/2006
7/20/2006
7/27/2006
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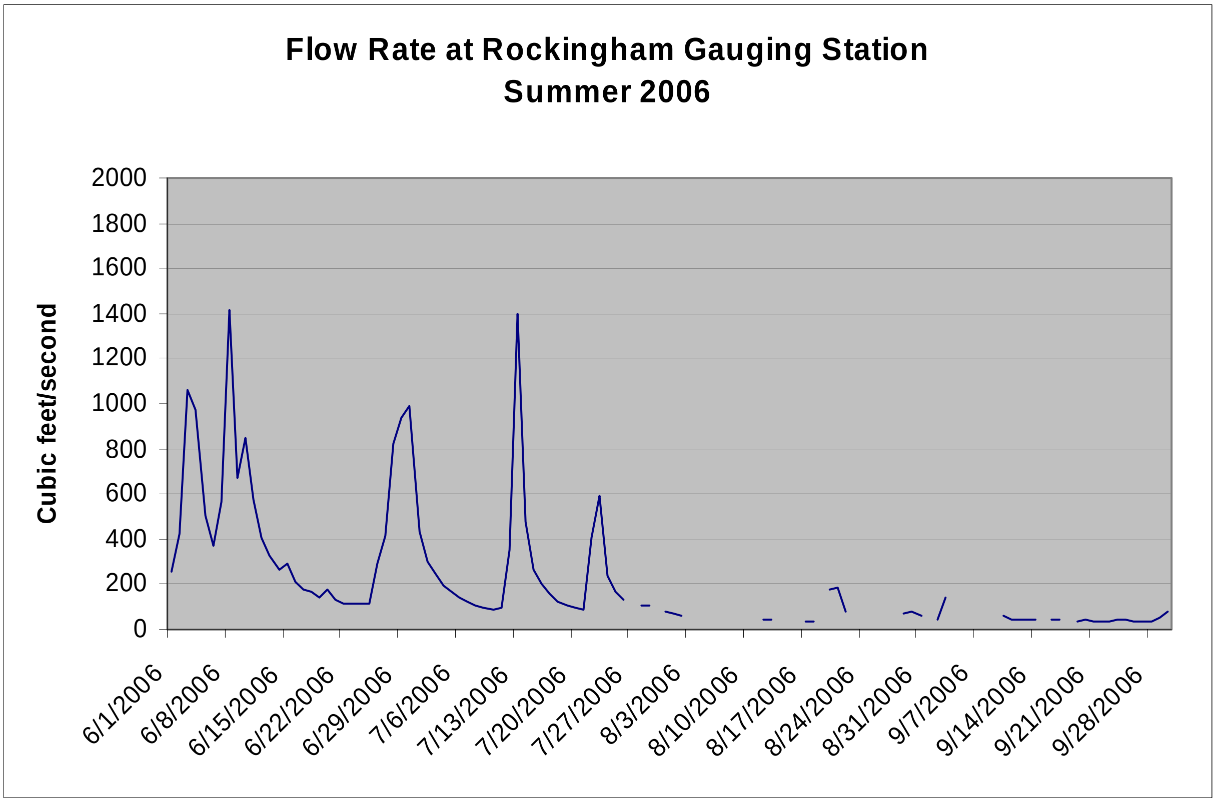
9/21/2006
9/28/2006


Flow Rate at Rockingham Gauging Station
Summer 2006
Cubic feet/second
2000
1800
1600
1400
1200
1000
800
600
400
200
0
6/1/2006
6/8/2006
6/15/2006
6/22/2006
6/29/2006
7/6/2006
7/13/2006
7/20/2006
7/27/2006
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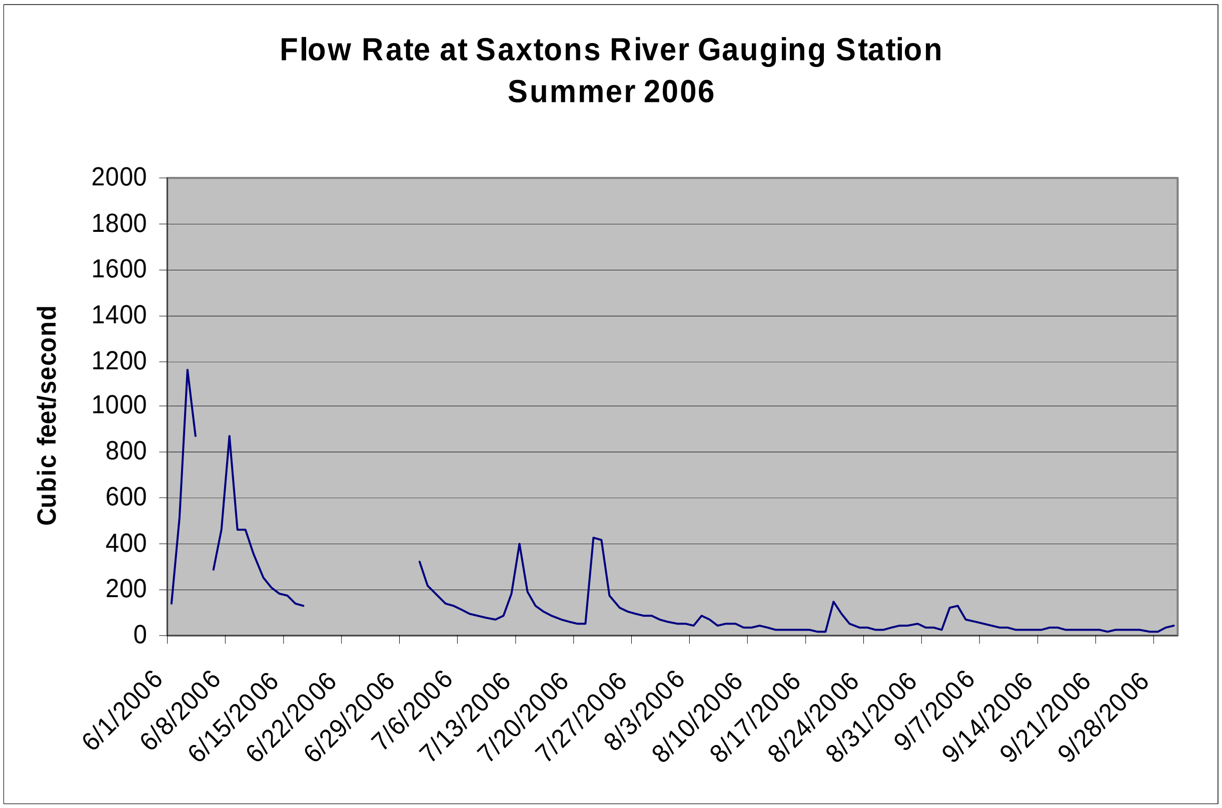
9/21/2006
9/28/2006


Flow Rate at Saxtons River Gauging Station
Summer 2006
Cubic feet/second
2000
1800
1600
1400
1200
1000
800
600
400
200
0
6/1/2006
6/8/2006
6/15/2006
6/22/2006
6/29/2006
7/6/2006
7/13/2006
7/20/2006
7/27/2006
8/3/2006
8/10/2006
8/17/2006
8/24/2006
8/31/2006
9/7/2006
9/14/2006
9/21/2006
9/28/2006

Laboratory QA/QC Notes
Laboratory analysis of field duplicates, field blanks and matrix spikes were consistently within acceptable ranges for precision and accuracy as prescribed in the WRWA QAPP. Laboratory analysis of the WRWA samples was conducted within prescribed parameter holding times.

3.1 *E.coli (Escherichia coli)*

Fecal coliform bacteria are found in the feces of human beings and other warm-blooded animals. Fecal coliform by themselves are generally not pathogenic. They occur naturally in the human digestive tract and aid in the digestion of food. Pathogenic organisms include bacteria, viruses and parasites that cause diseases and illnesses. When a human being or other warm-blooded animal is infected with disease, pathogenic organisms are found along with fecal coliform bacteria.

E.coli is a species of fecal coliform bacteria that is specific to fecal material from humans and other warm blooded animals. EPA recommends *E.coli* as the best indicator of health risk from water contact in recreational waters; some states have changed their water quality standards and are monitoring accordingly. The EPA standard for *E.coli* at swimming beaches is 235 colonies/100mL of sample water. The Vermont State Standard in Class B waters (the current classification of the West, Williams and Saxtons Rivers) is 77 colonies/100mL of sample water.

If *E.coli* counts are high (over 200 colonies/100 ml of a water sample) in a river or lake, there is a greater chance that pathogenic organisms are also present. Swimmers in public waters with high levels of *E.coli* have a greater chance of developing a fever, nausea or stomach cramps from swallowing disease-causing organisms, or from pathogens entering the body through cuts in the skin, the nose, mouth, or ears. Some examples of diseases and illnesses that can be contracted in water with high *E.coli* counts include typhoid fever, hepatitis, gastroenteritis, dysentery, and ear infections.

Fecal coliforms, which includes *E.coli* is monitored instead of pathogens for several reasons; Pathogens are relatively scarce in water, making it time-consuming and expensive to monitor them directly, *E.coli* is preferred due to the possible correlation between *E.coli* and the probability of contracting a disease from the water. *E.coli* are living organisms, unlike the other conventional water quality parameters. The fecal coliform bacteria multiply rapidly when conditions are good for growth and die in large quantities when they are not.

E.coli levels continued to fluctuate this sampling season in reaction to the periodic storm events that persisted throughout the summer months. Consistent rain for several days prior to the first bi-weekly sampling on June 6 resulted in the surrounding watersheds "flushing out" most excess bacteria and nutrients, resulting in low bacteria levels despite rain within twenty-four hours of sampling. Water levels remained high throughout the watersheds as indicated by the USGS flow data graphs. Both Ball Mountain Dam and Townshend Dam experienced the highest flow rates of the season between June 1 and June 8. A storm event within twelve hours of sampling on June 20 did cause E.coli levels to dramatically increase across the three watersheds. Volunteers recorded rainfall of 1 to 2 cm over a course of several hours. Forty-three percent of the sites sampled across the three watersheds had bacteria levels exceed the EPA standard of 235 colonies/mL, and seventy-five percent of sites sampled exceeded the Vermont State Standard of 77 colonies/mL. The Newfane Swim Hole site (SH 7) on the West River had the highest recorded bacteria levels at 687 colonies/mL, and the Rockingham Trestle site (SH 19) on the Williams River recorded bacteria levels at 649 colonies/mL. As a result of this dramatic event a letter of explanation indicating how the storm event was likely the primary cause of the bacteria level increase was written to local newspapers and posted at informational kiosks along the West River, continuing to correlate the relationship between large rain events and elevated pollutant levels.

Throughout the three watersheds during dry weather sampling *E.coli* levels remained below federal standards for the majority of sites sampled. Three sites exhibited results throughout the sampling season that were found to be in excess of Vermont State Standards greater than fifty percent of the times sampled. South Londonderry (SH 12) continually exceeded the State limit of 77 colonies/100mLs by significant amount, being out of compliance eighty-nine percent of the time, and exceeded the EPA limit of 235 colonies/mL thirty percent of the time. Bellows Falls Sandy Beach (SH 17) on the Saxtons River also was found to be out of compliance with State Standards eighty-nine percent of the time, and was out of compliance with EPA standards twenty-two percent of the time. On the Williams River the Bartonsville site (SH 15) was found to be in excess of State Standards sixty-seven percent of the time, and exceeded EPA standards twenty-two percent of the time. South Londonderry (SH 12) and Bellows Falls Sandy Beach (SH 17) are two sites that have exhibited non-compliance for multiple consecutive years and are potential sites of concern.

The elevated levels indicated in the data correspond to times of high water flow after rainfall, and suggest that the higher levels of bacteria are due to fecal material entering the river in stormwater runoff. Elevated levels found in South Londonderry (SH 12) during dry weather conditions are consistent with higher levels found in previous sampling years during dry weather conditions, and indicates an ongoing problem with a possible chronic septic system leak in the area, as presented in previous reports.

Yearly *E.coli* summary ratios: #samples out of compliance with the Vermont State Standard of 77 colonies/mL to total number of samples taken as reported to area Towns

West River Watershed	**2003**	**2004**	**2005**	**2006**
SH-12 South Londonderry - South Londonderry	*	7 of 7	7 of 8	8 of 9
SH-11 Jamaica - Pikes Falls	2 of 8	1 of 7	0 of 7	1 of 9
SH-10 Jamaica - Jamaica State Park	3 of 8	2 of 8	0 of 8	1 of 9
SH-16 Wardsboro - Wardsboro Brook	*	1 of 7	*	0 of 9
SH-9 Townshend - Scott Covered Bridge	2 of 8	2 of 7	1 of 7	1 of 8
SH-8 Brookline/Newfane - Brookline Bridge	5 of 8	2 of 8	4 of 7	1 of 8
SH-7 Newfane - Newfane Swim Hole	4 of 8	4 of 8	3 of 8	2 of 9
SH-6 Newfane - Indian Love Call	0 of 8	1 of 8	1 of 8	0 of 9
SH-5 Newfane/Dummerston - Williamsville Station	1 of 8	2 of 8	5 of 8	*
SH-4 Dummerston - Dummerston Covered Bridge	2 of 8	2 of 8	2 of 8	1 of 9
SH-3 Dummerston - Quarry Road	2 of 8	1 of 5	1 of 8	*
SH-2 Dummerston – Deyo's Hole	1 of 8	2 of 8	0 of 8	1 of 9
SH-1 Brattleboro - Milkhouse Meadows	6 of 8	5 of 8	4 of 8	3 of 7
Williams River Watershed				
SH-15 Rockingham - Bartonsville	5 of 8	4 of 8	5 of 8	6 of 9
SH-14 Chester - North Street Bridge	4 of 8	4 of 8	4 of 8	2 of 9
SH-13 Chester - Gassetts Talc Mine	1 of 8	2 of 8	2 of 6	*
SH-19 Rockingham - Rockingham Trestle	*	*	3 of 8	4 of 9
Saxtons River Watershed				
SH-18 Rockingham - Saxtons River Center	*	1 of 7	3 of 8	3 of 9
SH-17 Westminster - Bellows Falls Sandy Beach	*	5 of 7	7 of 8	8 of 9

* Site not sampled

3.2 Total Phosphorus (TP)

Phosphates are a plant nutrient that can also be a pollutant. Excess phosphates in water contribute to the growth of algae, similar to nitrates. Adding phosphates to a body of water can accelerate plant growth and eventually damage an ecosystem by draining the oxygen levels when the plants decompose. Because phosphorous acts as a plant nutrient, it also causes eutrophication. Eutrophication is the enrichment of water with nutrients, usually phosphorous and nitrogen, which stimulates the growth of algal blooms and rooted aquatic vegetation. Eutrophication promotes more plant growth and decay, which in turn increases biochemical oxygen demand. Phosphates in excess amounts can have a significant impact on water quality.

The number of aquatic plants growing in a particular area is limited by the amount of phosphorous available. In an aquatic ecosystem, excess inorganic phosphate is rapidly taken up by algae and larger plants, resulting in algal blooms, increased biochemical oxygen demand and significant impacts on water quality. Phosphorous is introduced into the environment from human activities such as: human and animal wastes, fertilizers, industrial wastes and human disturbance of the land and its vegetation.

There is no Vermont State numerical standard for total phosphorous that can be specifically used to determine compliance in Class B waters. The General Policy states that "in all water, total phosphorous loadings shall be limited so that they will not contribute to the acceleration of eutrophication or the stimulation of the growth of aquatic biota in a manner that prevents the full support of uses. In addition to compliance with the general policy above, for all streams above 2,500 feet in elevation, total phosphorus shall not exceed 0.010 mg/I at Iow median monthly flow." River Network information* also asserts that phosphorous concentrations of 0.01 mg/L (10µg/L) or more may have measurable impact on nutrient poor upland streams in general, similar to those rivers and streams in Basin 11. Larger rivers could respond when concentrations approach 0.1 mg/L (100 µg/L). The LaRosa Laboratories have a testable minimum limit of 0.005 mg/L (5 µg/L).

Total Phosphorous levels for all sites tested in 2006 resulted in thirty-seven percent (51 out of 139) testing above the limit recommended by the River Network. Once again, over one third of the sites tested falling above the recommended limits. As with *E.coli*, results increased with high flow levels and rain events. The sampling on June 20 mildly mimicked the *E.coli* levels. There were two sites on June 6 where Total Phosphorous levels were significantly higher than the remainder of the sampling season. The Jamaica State Park site (SH 10) and the Scott Covered Bridge site (SH 9), both below large flood control dams, had Total Phosphorous results in excess of 40µg/L. Over four times the average result for Total Phosphorous at other sites. Both of these sites continued to show results over the recommended standard of 10µg/L, but not to the same magnitude. Scott Covered Bridge averaged 14µg/L, and Jamaica State Park averaged 13µg/L for the sampling season. Other sites averages varied between 7µg/L and 10µg/L. As with results from 2005 both Scott Covered Bridge and Jamaica State Park exhibit increases with Total Phosphorous levels that do not always coincide with large rain events or correlate with increases in *E.coli* or NOx results. The presence of the flood control dams above both of these sites, and delayed impacts from rapid increases or decreases in water supply and flow rates may be having an effect on the parameter results. According to USGS flow data from the dates surrounding the sampling date of June 6, the highest recorded flow from Townshend Dam was on June 4 at 4,710 cubic feet/second. The highest recorded flow from Ball Mountain Dam was also on June 4 at 2,470 cubic feet/second. Both dams were decreasing their flow on the testing date. The Total Phosphorous levels decrease as the flow continues downstream. Bartonsville Covered Bridge (SH 15) on the Williams River exhibited steadily increasing Total Phosphorous results from August 01 through September 26 without correlation to significant rain events. There have been previous thoughts that this site is possibly affected by discharge from a waste water treatment plant upstream, but no conclusions have been drawn at any time. This increase in Phosphorous levels did not coincide with increases in *E.coli* bacteria levels.

*Source: Testing the Waters- Chemical and Physical Vital Signs of a River, by Sharon Behar – River Network

3.3 Nitrate/Nitrite (NO_x)

Nitrate is the form of nitrogen available for plant growth and is found in nature in very small amounts because of the ongoing growth and decay process. When plants and animals die and decompose, ammonia is produced. Bacteria usually turn the ammonia into nitrate (NO_3). Pollutants such as sewage or manure however, contain much higher levels of nitrates. High levels of nitrate may get into groundwater or streams from fertilized fields, lawns, and golf courses, from septic system effluent, or from runoff of manure. Together with phosphorus, nitrates in excess amounts can accelerate eutrophication, causing dramatic increases in aquatic plant growth and changes in the types of plants and animals that live in the stream. This, in turn, affects dissolved oxygen, temperature, and other indicators.

Sources of nitrates include wastewater treatment plants, runoff from fertilized lawns and cropland, failing on-site septic systems, runoff from animal manure storage areas, and industrial discharges that contain corrosion inhibitors.

The natural level of ammonia or nitrate in surface water is typically low (less than 1 mg/L); in the effluent of wastewater treatment plants, it can range up to 30 mg/L. The Vermont Water Quality Standard for Class B waters states that NO_3-N concentrations shall not exceed 5.0 mg/L during certain flow conditions.

No samples collected in the 2006 season exceeded the Vermont Water Quality Standard for Class B waters. Consistent with previous data, the Bartonsville Covered Bridge (SH 15) again had the highest levels of nitrates of all sites sampled during 2006 with an average of .44 mg/L, less than the 2005 average of .70 mg/L, but still was well below the State standard. The Rockingham Trestle site (SH 19) reflected similar results to the 2005 season with an average of .36 mg/L over the 2006 sampling season. The West River main stem maintained results well below the standard. Similar to previous years the highest results for this river were at the Newfane Swim Hole (SH 7), which reached an average of .16 mg/L. Pikes Falls on the Ball Mountain Brook tributary to the West River (SH 11) showed higher results than in previous years with an average .16 mg/L compared to the 2005 average of .12 mg/L. Rain events surrounding the August 15 sampling yielded an increase in nitrate concentrations across all three watersheds. USGS Stream Gauge station data indicates increased flow the day prior to sampling followed by a steady decrease for the following two days.

3.4 Total Suspended Solids (TSS)

The amount of total suspended solids found in water serves to determine its relative clarity. Suspended solids in the water which create turbid (murky) conditions reduce the transmission of light. Suspended solids may come from organic sources such as leaves, silt, plankton, and industrial waste and sewage. Other sources come from runoff from urban areas, road salts used on street during the winter, and fertilizers and pesticides used on lawns and farms.

Water loses its ability to support a diversity of aquatic organisms, becoming warmer as suspended particles absorb heat from the sunlight and cause oxygen levels to fall. Photosynthesis decreases because less light penetrates the water, resulting in even further drops in oxygen levels. The combination of warmer water, less light and oxygen depletion makes it impossible for some forms of aquatic life to survive.

Suspended solids affect aquatic life in other ways as well. Suspended solids can clog fish gills, reduce growth rates, decrease resistance to disease and prevent egg and larval development. Particles of silt, clay and organic materials settle to the bottom, especially in areas of a river or stream that are slow moving. These settled particles could smother the eggs of fish and aquatic insects, as well as suffocate newly hatched insect larvae. Material that settles into the spaces between rocks makes these microhabitats unsuitable for mayfly and stonefly nymphs, caddisfly larvae and other aquatic insects living there.

Similar to other sampled parameters, marked increases in TSS levels occurred during the high flow conditions of the June 06 and June 20 rain events. However, during dry weather conditions all TSS levels in all watersheds were very low – usually less than or equal to 1 mg/L. A slight overall increase was observed at the Scott Covered Bridge site (SH 9), an average of 2.71 mg/L possibly due to outflow from the flood control dam directly upstream. Both the Scott Covered Bridge (SH 9) and Jamaica State Park (SH 10) sites showed dramatic increases in Total Suspended Solid concentrations on the June 6 sampling, at 25.5 mg/L and 26.4 mg/L respectively. These levels correspond to increased levels of TP and Turbidity parameters for the same locations on that date. As stated earlier this may be due to the location of flood control dams upstream of these sites and the high levels of flow reported in the days prior to sampling. No mass failure events were reported during this time to indicate other reasons for this marked increase in TSS concentrations, however both of the flood control dams are bottom releasing, and may have been the cause of these high concentrations. Bartonsville Covered Bridge (SH 9) also indicated increased TSS concentrations from August 15 through September 26 correlating to the increased Total Phosphorous levels discussed earlier. The reasons for the increase in TSS levels here is unknown as it did not coincide with any marked rain event or dam release.

Note: There are Vermont State criteria and guidance on acceptable levels of turbidity, but none found for TSS. TSS is similar to turbidity with regard to determining water clarity where turbid conditions do correspond to high levels of TSS. However, TSS measured in mg/L and turbidity measured in NTUs, cannot be quantitatively compared.

3.5 Turbidity
Turbidity is a measure of the relative clarity of water: the greater the turbidity, the murkier the water. Turbidity increases as a result of suspended solids in the water that reduce the transmission of light. Suspended solids are varied, ranging from clay, silt and plankton, to industrial wastes and sewage. Similar to Total Suspended Solids, with higher levels of turbidity, water loses its ability to support a diversity of aquatic organisms. The water also becomes warmer as suspended particles absorb heat from the sunlight and cause oxygen levels to fall. Photosynthesis decreases because less light penetrates the water, resulting in even further drops in oxygen levels.

Vermont State Standards for turbidity in class B waters vary depending on the determination if the area tested falls under cold or warm water fish habitat criteria. For areas determined to be Cold Water Fish Habitat waters turbidity levels are “not to exceed 10 NTU.” For areas determined to be Warm Water Fish Habitat waters, turbidity is “not to exceed 25 NTU.”

As with other parameters tested, Turbidity levels increased in reaction to rainfall events, and increased stream flow. Sample dates, such as June 6 and June 20, that exhibited high results corresponded with high levels of *E.coli*, TSS and Total Phosphorous. The Scott Covered Bridge (SH 9) and Jamaica State Park (SH 10) both showed dramatic levels of Turbidity on the June 6 sampling date, correlating with the TSS and Total Phosphorous data. Both sites exhibited an overall higher level than the surrounding sampling sites possibly also in relation to the flood control dams.

3.6 Water Temperature
The rates of biological and chemical processes depend on temperature. Temperature affects the oxygen content of water (oxygen levels become lower as temperature increases); the rate of photosynthesis by aquatic plants; the metabolic rates of aquatic organisms; and the sensitivity of organisms to toxic wastes, parasites, and diseases.

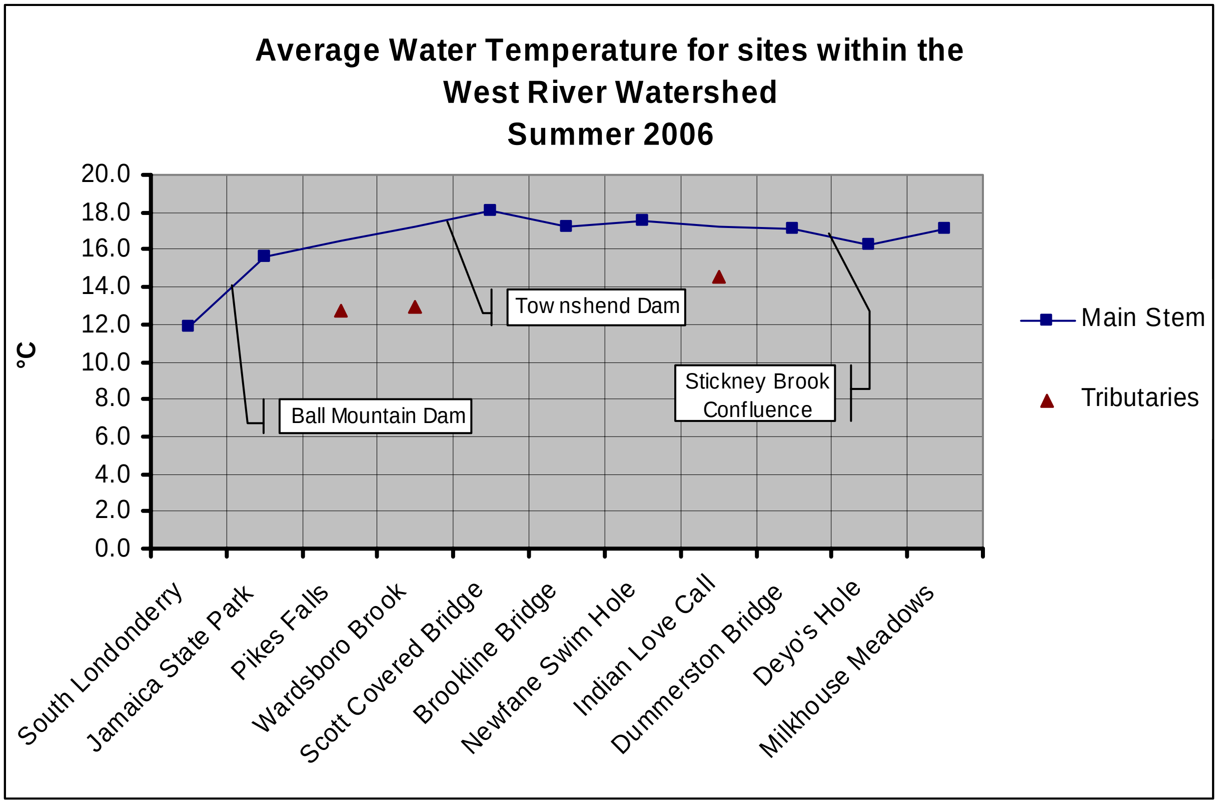
Causes of temperature change include weather, removal of shading stream bank vegetation, impoundments (a body of water confined by a barrier, such as a dam), discharge of cooling water, urban storm water, and groundwater inflows to the stream.

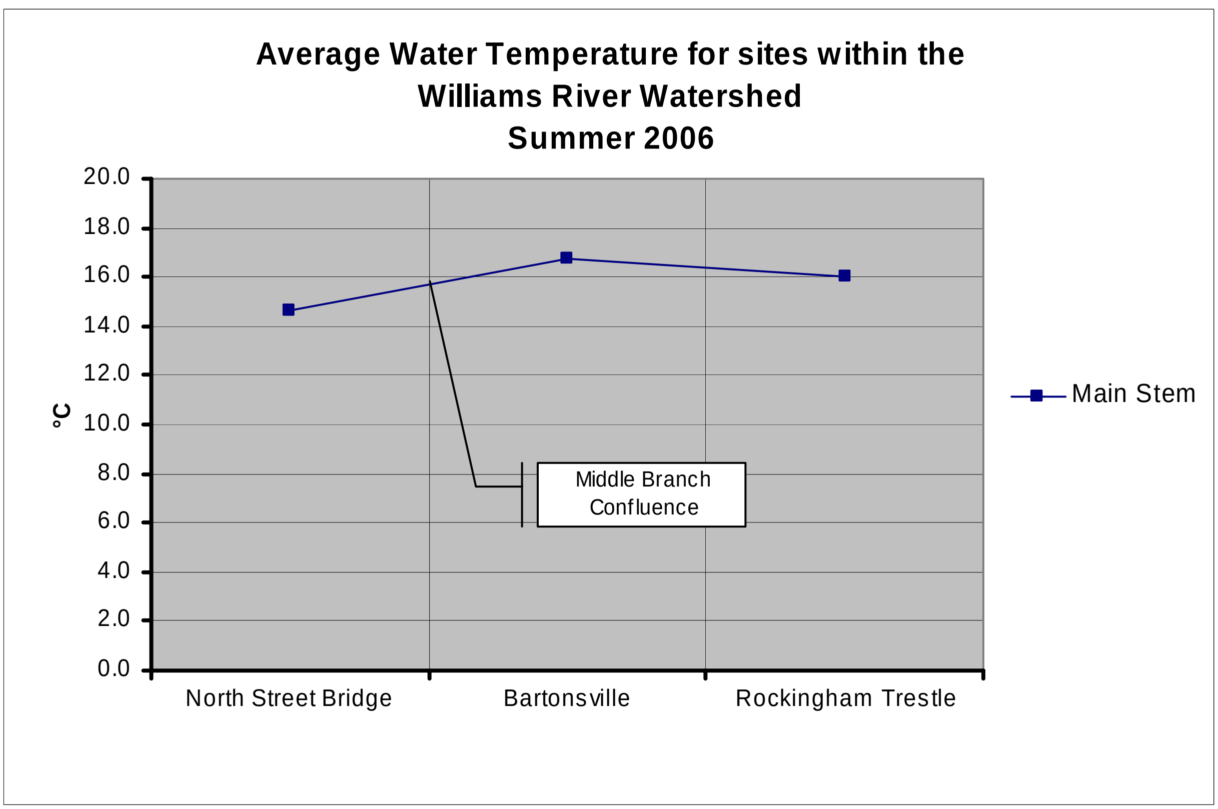
Thermal pollution is an increase in water temperature caused by adding relatively warm water to a body of water. Thermal pollution can come from stormwater running off warmed urban surfaces (streets, sidewalks, parking lots) and industries that discharge warm water from their facilities that was used to cool machinery.

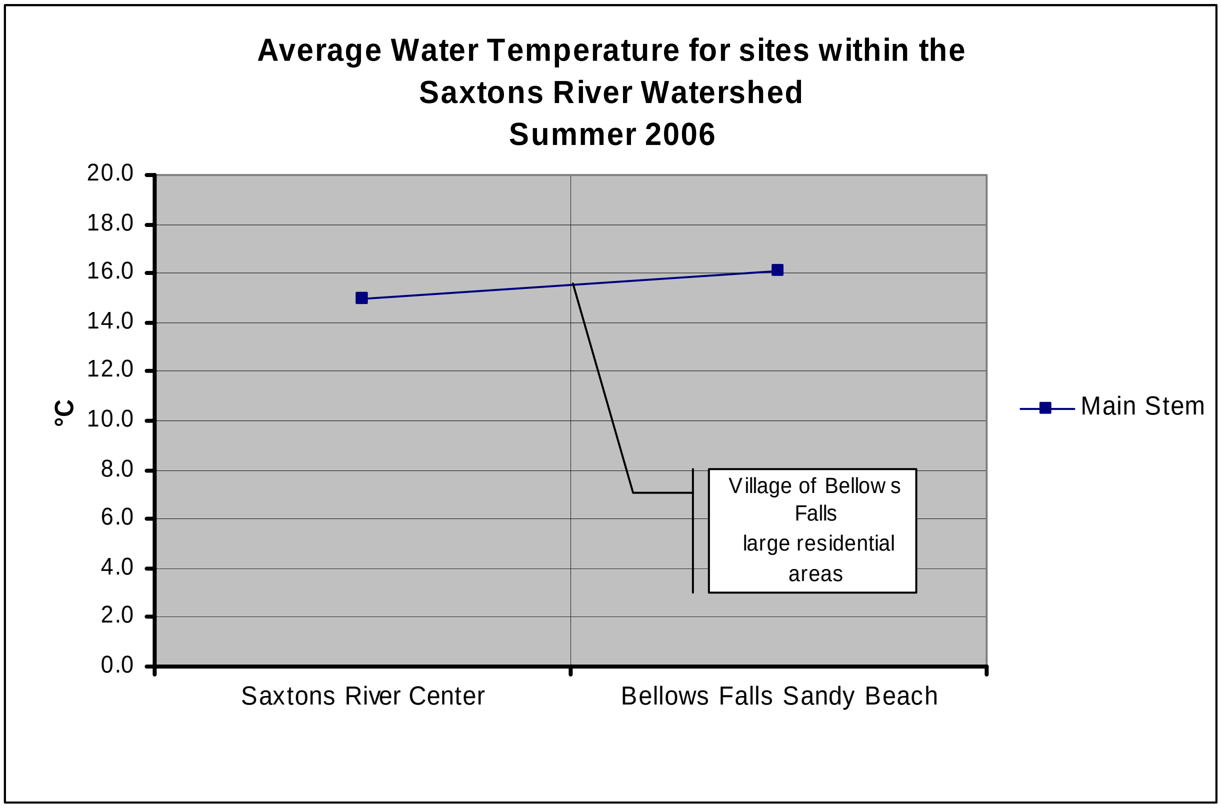
Vermont State Standards do not set a specific temperature range or value. In general, the standards provide that the change or rate of change in temperature, either upward or downward, shall be controlled to ensure full support of aquatic biota, wildlife and aquatic habitat. As pointed out in the West River Watch Project Report, 2001, prolonged temperatures above 20°C (68°F), for a coldwater fishery like many of the rivers and streams in the West River watershed and its neighboring watersheds, are harmful to coldwater fish habitat.

In-stream temperatures readings were taken by WRWA Volunteers at each site. Measurements were recorded to help assess existing thermal conditions and evaluate the relationship between temperature other parameters monitored by the program. Temperatures decreased from 2005 on the main stem of all three rivers with no sites exhibiting temperatures above 20°C (68°F) regularly throughout the sampling season. Temperatures may have decreased due to the increased amount of precipitation that occurred throughout the summer months, and the subsequent increase in cloud cover reducing the impact of intense sun in exposed stream areas with minimal vegetative cover.

The following graphs indicate the average temperature calculated per sampling site over the course of the 2006 sampling season and displayed moving from the upper to lower stream reaches. Confluences with significant tributaries are indicated and where monitoring sites were present, temperatures for those tributaries are depicted.







3.7 pH

pH is the percentage of hydrogen ions (H+) in a solution. A solution is more acidic when it contains more hydrogen ions. The level of acidity of the water is important to the plant and animal life as most organisms are adapted to living in neutral conditions.

Acid rain, a result of air pollution and matter emitted from tailpipes and smokestacks affect the pH. When these things combine with water in the atmosphere, they form sulfuric and nitric acids, then fall to the earth as acid rain, snow, hail, and fog. This precipitation mixes with water already on the earth, in creeks, rivers, ponds and wetlands. Other pollutants carried by runoff from the land also change the acidity of the water.

A pH value of 7 is considered to be neutral. When the pH value is less than 7, it is acidic; a pH value greater than 7 is basic. A pH value between 7.0 and 8.0 are optimal for supporting a diverse aquatic ecosystem. Vermont Water Quality Standards require that pH values shall be maintained within the range of 6.5 and 8.5, where both the change and the rate of change in pH values shall be controlled to ensure the full support of the aquatic biota, wildlife, and aquatic habitat uses.

The Project Director and Volunteer Field Assistant tested the designated pH samples immediately upon arrival at the drop-off point with a calibrated and tested YSI pH100 meter, recording those results on the Director’s field data summary sheets. The range of pH levels measured from sites across the basin continues to correspond well to pH levels recorded in past years. The main stem of the West River is very well buffered in most areas, and exhibited acceptable pH levels. Tributaries and sites near tributary confluences tended to exhibit slightly more alkaline readings more regularly throughout the sampling season. Despite the increased amount of precipitation through the summer, pH levels remained within acceptable ranges, and did not exhibit a more acidic trend. The pH levels measured by the Program Director and the Volunteer Monitoring Assistant during the 2006 are presented in tabular format in Appendix A.

3.8 Conductivity

Conductivity is the measurement of a solution's ability to conduct an electrical current. Absolutely pure water is actually a poor electrical conductor. It is the substances (or salts) dissolved in the water which determine how conductive the solution will be. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. Samples collected by WRWA volunteers were maintained as close to the initial temperature of the sample when collected as possible.

Conductivity in streams and rivers is affected primarily by the geology of the area through which the water flows. Streams that run through areas with granite bedrock tend to have lower conductivity because granite is composed of more inert materials that do not ionize (dissolve into ionic components) when washed into the water. On the other hand, streams that run through areas with clay soils tend to have higher conductivity because of the presence of materials that ionize when washed into the water. Conductivity is measured in micromhos per centimeter (µmhos/cm) or microsiemens per centimeter (µs/cm).

Environmental conditions such as drought, changing seasons, heavy rainfall, etc. can cause the concentration of dissolved salts in water to vary significantly. The higher the conductivity, the more salts are dissolved in the water. By comparing conductivity readings on a regular basis it is possible to monitor changes that occur. There is no Vermont State Standard for Conductivity levels for Class B waters.

Conductivity measurements for the West River maintained levels below 100µs/cm. Similarly to past data, Pikes Falls recorded high conductivity readings averaging 163µs/cm for the season. The home construction that was of concern in 2004 has been completed, however construction is still occurring farther upstream of the sampling site and may be continuing to affect results. On the Saxtons River, Bellows Falls Sandy Beach (SH 17) continued to exhibit higher Conductivity readings, whereas Saxtons River Center (SH 18) decreased to levels more common throughout the basin. On the Williams River, Rockingham Trestle (SH 19) Conductivity levels increased throughout the sampling season, rising above 100 µs/cm by the end of September.

4.0. Data Management

The WRWA Program Director and Volunteer Field Assistant reviewed and QC'd field data sheets as they were collected at the sample drop off points. Field data and laboratory results were reviewed and entered into the WRWA database at the USDA Service Center office using Microsoft Excel as they were received. Printouts were reviewed by a second person. Graphing was performed in Microsoft Excel to uncover any discrepancies or errors. Questionable data was flagged and sources rechecked, re-entered as necessary. Database formats are compatible to those of the state and local agencies.

4.1 Data Reporting/Program Assessment

The Water Quality Monitoring Program has clear and tangible results in the form of analysis reports and data that can be shared with other organizations and agencies working toward basin planning, and maintaining water quality. Sampling results will provide some insight into impacts on water quality and the community's role in affecting those impacts. Upon this fourth year of sampling enough data has been gathered to regularly approach local town governments with result information. A protocol has been written by WRWA board members with the consultation of the Program Director on means to communicate the presence of potential problem sites based on multiple years' worth of data and how to potentially deal with them. Reports for past years have been distributed to help familiarize the towns with the monitoring program and its goals. The WRWA is currently working towards building on this relationship and providing recommendations for areas of concern and contacts to assist in addressing them. Over the long term, the WRWA will use the sampling results to continue to inform policy makers and local citizens of conditions and trends in river water quality, as well as furthering the implementation of a watershed management plan for Basin 11.

4.2 Advantages of WRWA Monitoring Program

This type of hands-on program is a critical public education tool. It provides a venue for citizen involvement and promotes understanding of river and watershed processes and how they affect daily lives of residents and visitors alike. Over the years the volunteers for the Water Quality Monitoring Program have developed a sense of community and strengthened their sense of connection and stewardship to the rivers that they all enjoy. The Monitoring Program, through its continued communication with the public will enable the layperson to help recognize threats to water quality in the basin and, where feasible, spark action to prevent degradation and improve the health of the river system. Ultimately, sustained data collection will allow for an evaluation of long-term trends indicating how each parameter sampled is affecting water quality in the basin.

By promoting public communication and involvement with the Water Quality Monitoring Program, the WRWA has increased citizen awareness of water quality issues. Through this monitoring effort, the WRWA seeks to develop a general public understanding of river ecology and foster a broader sense of stewardship in the surrounding citizenry toward the area's rivers and streams. The program has also increased the participation of other non-profits and local and state agencies in the interest of maintaining water quality.

The WRWA's program provides the VT DEC with a set of comprehensive water chemistry data that can be compared with other data collected around the state by other volunteer programs as well as with historic and subsequent water quality information. The Basin 11 Management Plan is a prime example of the integrated involvement of multiple levels of groups, agencies, volunteers and organizations in the effort to promote water quality in the area. The collaboration of both professionals and volunteers coming together to isolate threats to water quality enables implementation of additional actions to prevent degradation and improve ecological health.

5. 0 Conclusions and Recommendations

5.1 Conclusions

With four years' of data, the WRWA continues to approach local policy makers with data and collectively assess areas that appear to be persistent problems. Contact has been made with Health Officers from several towns that have sampling sites within their boundaries. WRWA has also presented the contact protocol drafted for these Heath Officers and the local branches of the State Health Department. The WRWA continues to stress that long-term trends indicated by the parameters measured cannot be reliably ascertained yet, and only limited observations can be made concerning overall water quality in these rivers and streams. Most sites sampled continue to experience high levels of bacteria during storm events, to the point of being unsafe for swimming during, and often for several days after, the event. Runoff from storm events similarly prompted higher concentrations of the other pollutants at sites that were monitored. Generally, bacteria data confirms that the majority of the areas that WRWA volunteers monitored are safe for swimming during dry weather conditions, but certain sites have shown consistently high pollutant levels during dry weather conditions for the last three to four years have been indicated as areas of concern. Sites with consistently high *E.coli* levels for 2006 include South Londonderry (SH 12), Bellows Falls Sandy Beach (SH 17) and the Bartonsville Covered Bridge (SH 15) South Londonderry has had high bacteria levels for several years and has been brought to the attention of the town as an issue in need of addressing. In the spring of 2006 members of the VTDEC, utilizing data gathered by the WRWA, notified the town of Londonderry of their concern and potential move to apply state enforcement in the future to remedy this concern. Other parameters have also been consistently high at other sites. NO_x levels continue to be a recurring problem at the Newfane Swimming Hole (SH 7), Bartonsville Covered Bridge (SH 15), Rockingham Trestle (SH 19) and Bellows Falls Sandy Beach (SH 17)sites. This may be due to runoff from the surrounding residential and agricultural areas. The Scott Covered Bridge (SH 9) and Jamaica State Park (SH 10)sites indicated more potential impacts from the flood control dams immediately above them than shown in previous years. The potential impact on Total Suspended Solids, Turbidity and Total Phosphorous resulting in consistently higher concentrations at these two sites will continue to be monitored. The levels of Total Phosphorous across the watersheds resulted in over one third of the sites sampled being over the recommended limit. This has been a continuing occurrence throughout Basin 11. All of the above sites will continue to be monitored, and have been brought to the attention of the towns concerned. The WRWA will continue to work with towns to address these areas.

5.2 Recommendations

Considering the chronic levels of pollutant contamination that the sampling results suggest at certain sites, continued recommendations are that these conditions be further examined by the health officers of the towns where the impacts are occurring. Local and State agencies, such as the Windham County Natural Resources Conservation District, The Vermont DEC Water Quality Division, the Watershed Coordinator for Basin 11, The Windham Regional Commission, The USDA, and the Farm Service Agency can be enlisted to assist town governments with developing strategies and finding solutions to the identified water quality problems.

This report has served to present the 2006 WRWA Water Quality Monitoring Program as it was implemented, its sampling results, and its continued success. We look forward to continuing the WRWA Water Quality Monitoring Program in 2007.

6.0 Cooperating Organizations

The following organizations and agencies are cooperating to facilitate the WRWA water quality monitoring program:

Windham County Natural Resources Conservation District
WRWA Board of Directors
WRWA Volunteers
Basin 11 Watershed Coordinator
Vermont Fish and Wildlife
Vermont Environmental Board
Windham Regional Commission
USDA Natural Resources Conservation Service
VT DEC, Water Quality Division
LaRosa Analytical Laboratory
U.S. Army Corps of Engineers, Water Quality Monitoring Staff

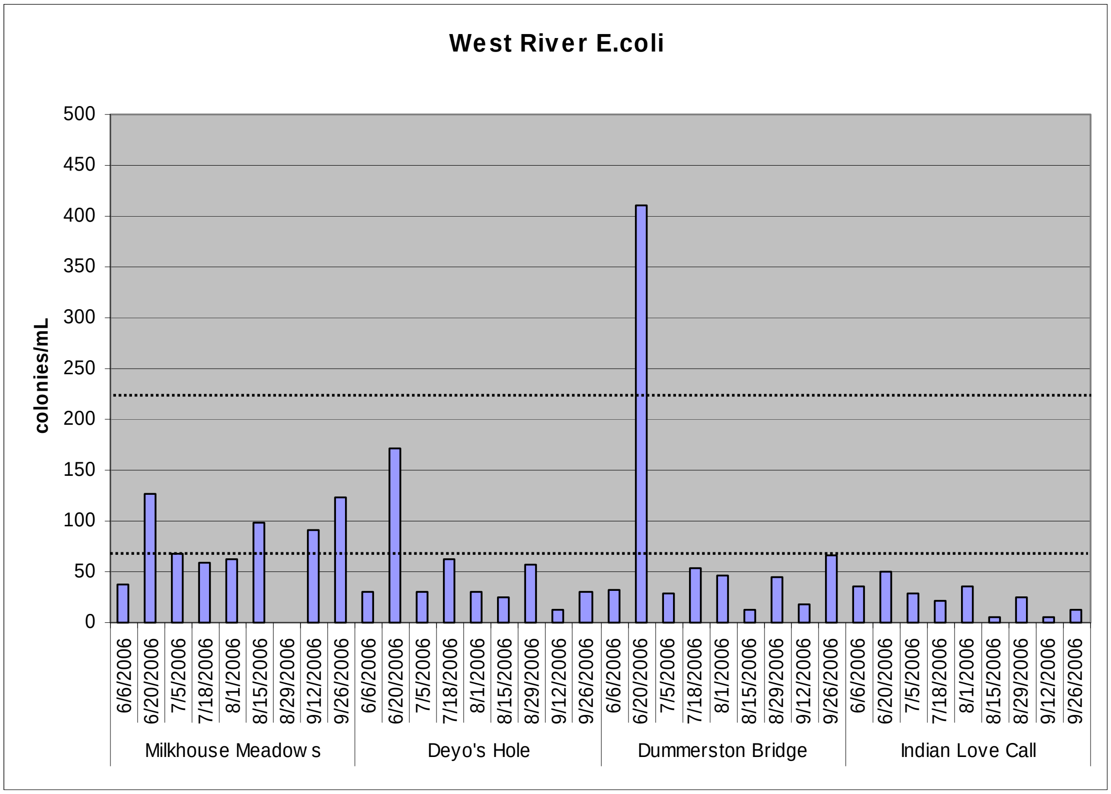
Project Contact:

Jolene Hamilton
Windham County Natural Resource Conservation District
28 Vernon Street, Suite #332
Brattleboro, VT 05301
802-254-5323 x 104

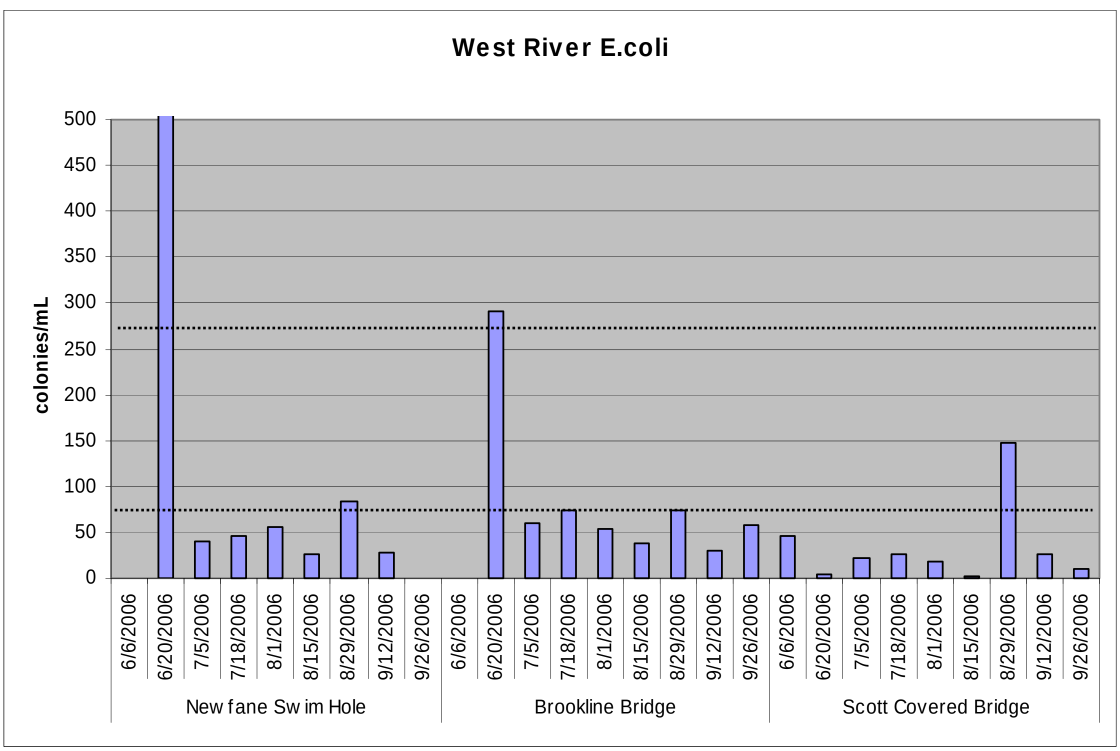
Appendix A

WRWA Phase 1 and Phase 2 Sampling Results Graphs and Tables

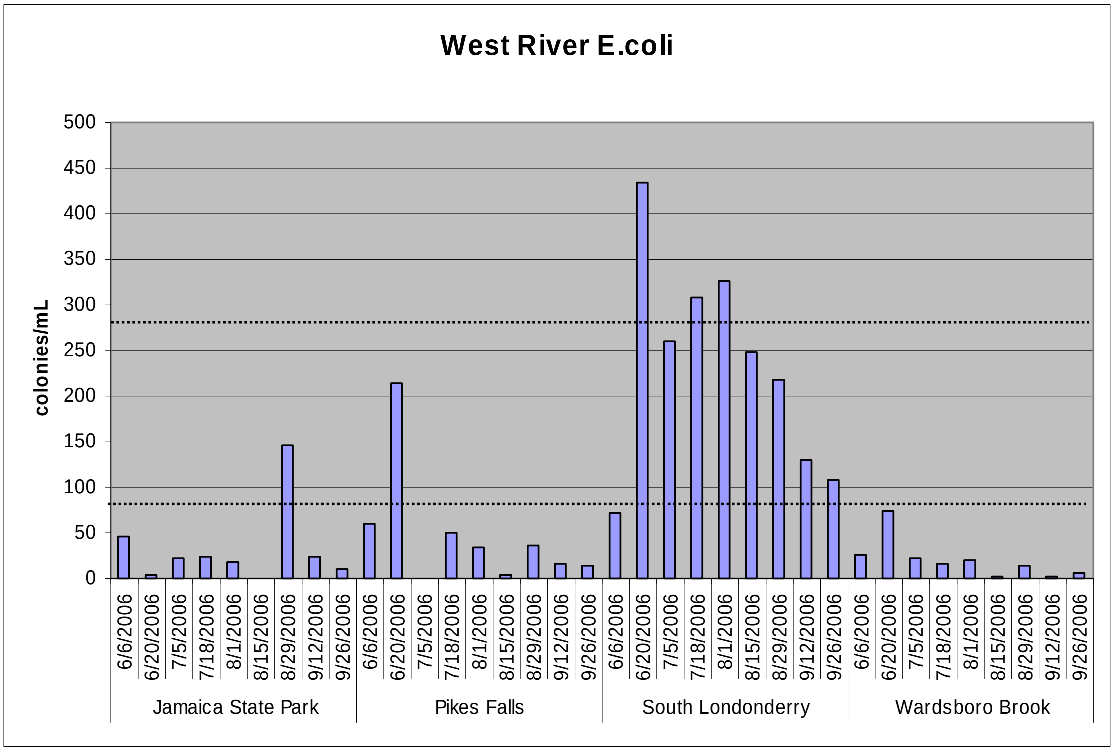
West River Phase 1 Sampling Results – *E.coli*



EPA *E.coli* Standard – 235 colonies/100mL Vermont State *E.coli* Standard is 77 Colonies/100mL

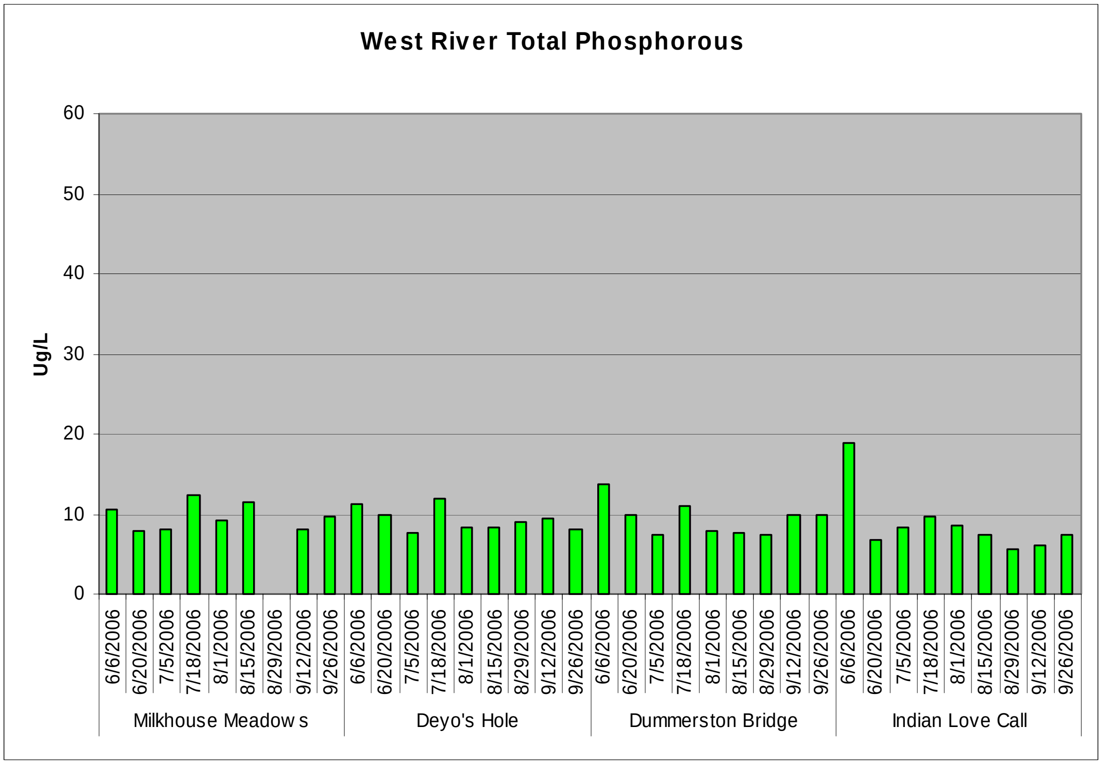


EPA *E.coli* Standard – 235 colonies/100mL Vermont State *E.coli* Standard is 77 Colonies/100mL

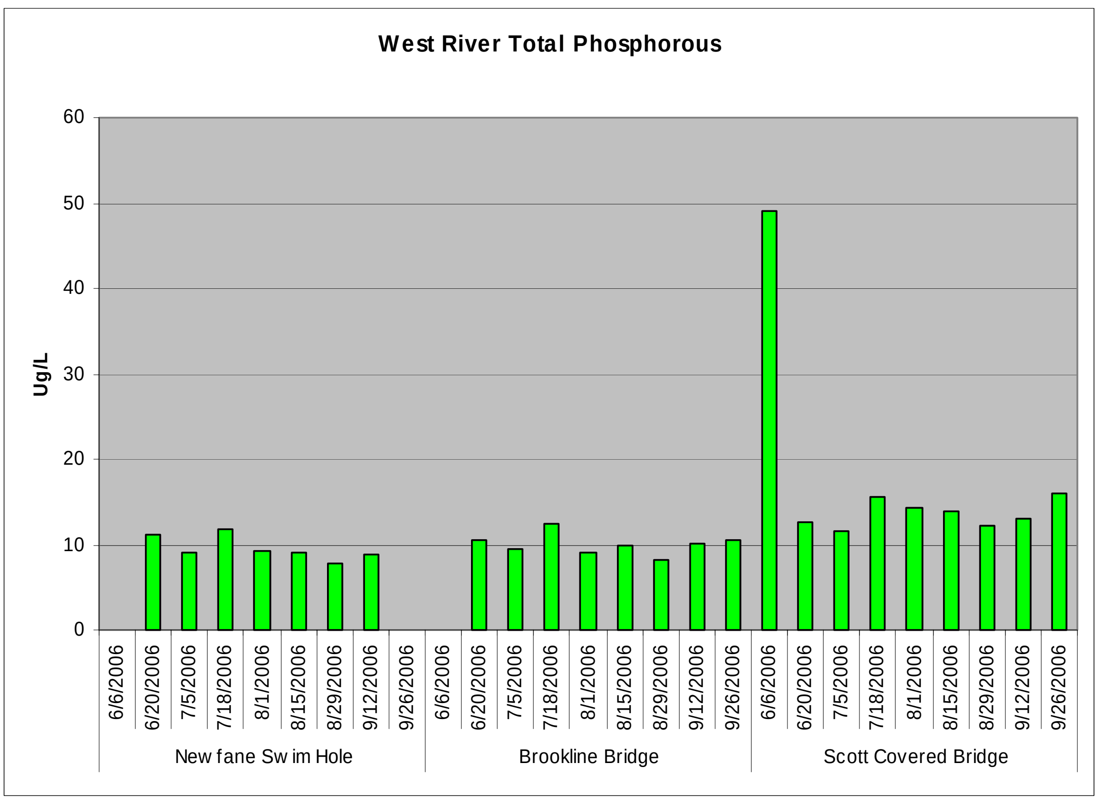


EPA *E.coli* Standard – 235 colonies/100mL Vermont State *E.coli* Standard is 77 Colonies/100mL

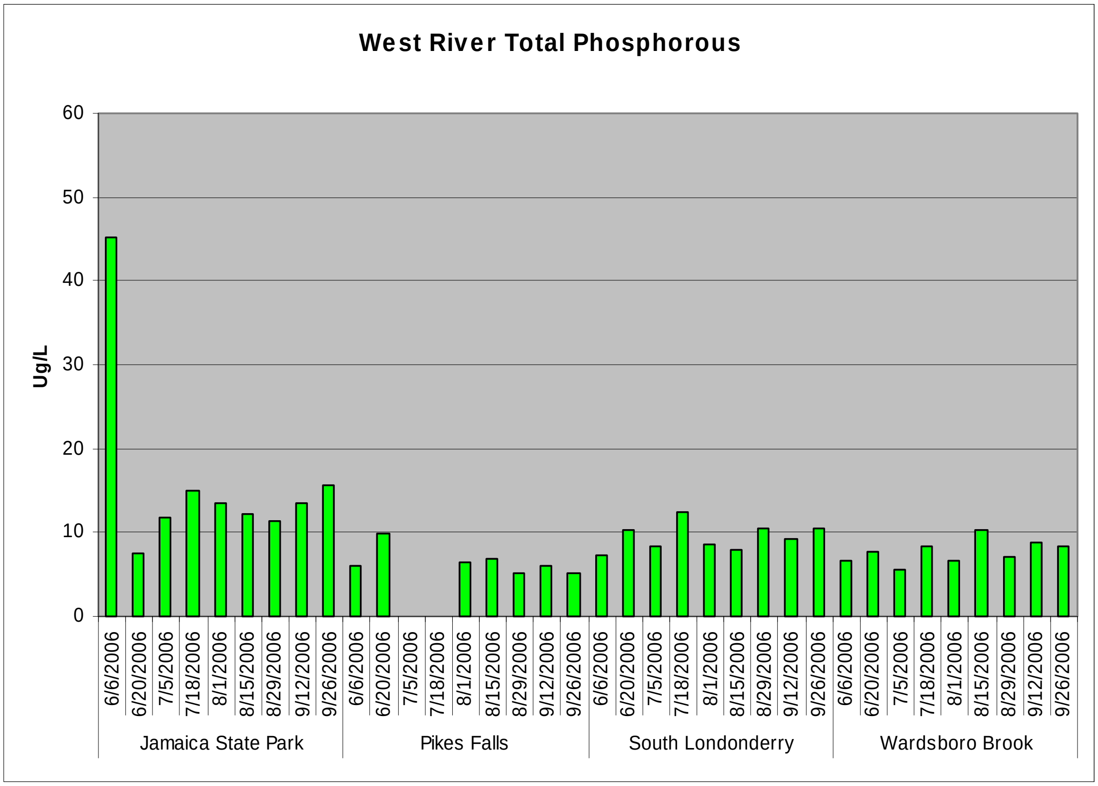
West River Phase 1 Sampling Results – Total Phosphorous



Total phosphorous concentrations of 0.01 mg/L (10µg/L) or less may have measurable impact on nutrient poor upland streams. Larger rivers could respond when concentrations near 0.1 mg/L (100µ /L).

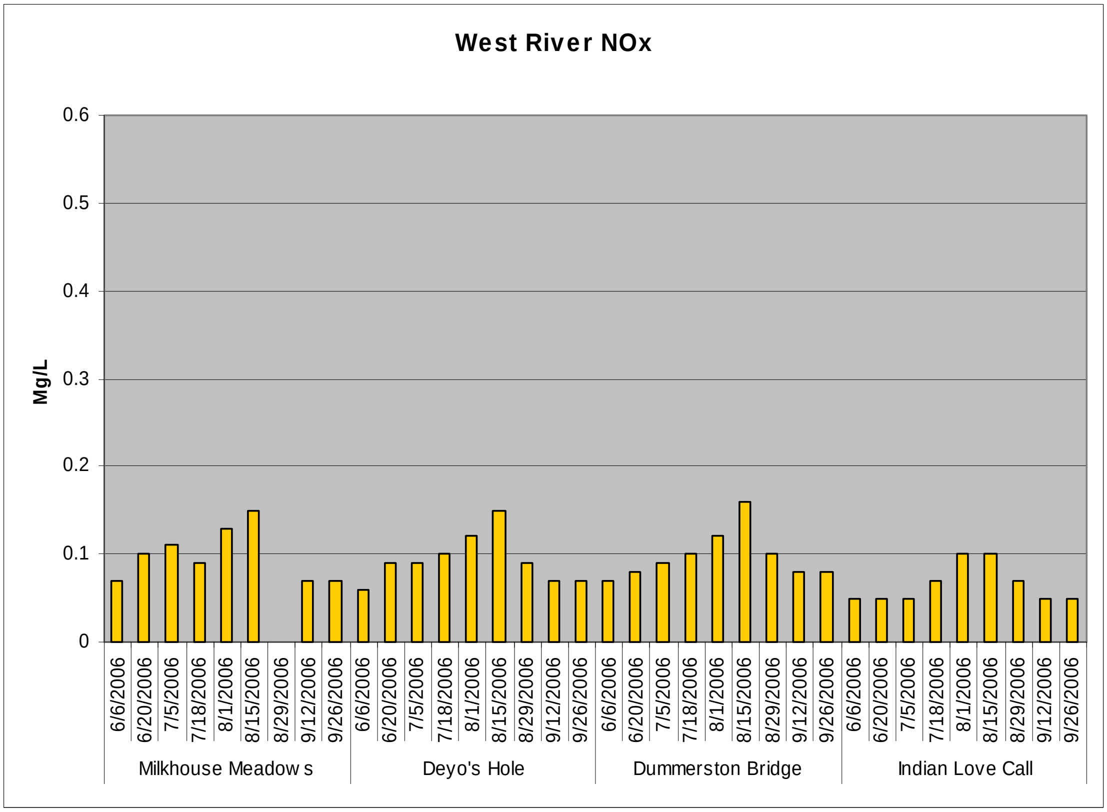


Total phosphorous concentrations of 0.01 mg/L (10µg/L) or less may have measurable impact on nutrient poor upland streams. Larger rivers could respond when concentrations near 0.1 mg/L (100µ /L).

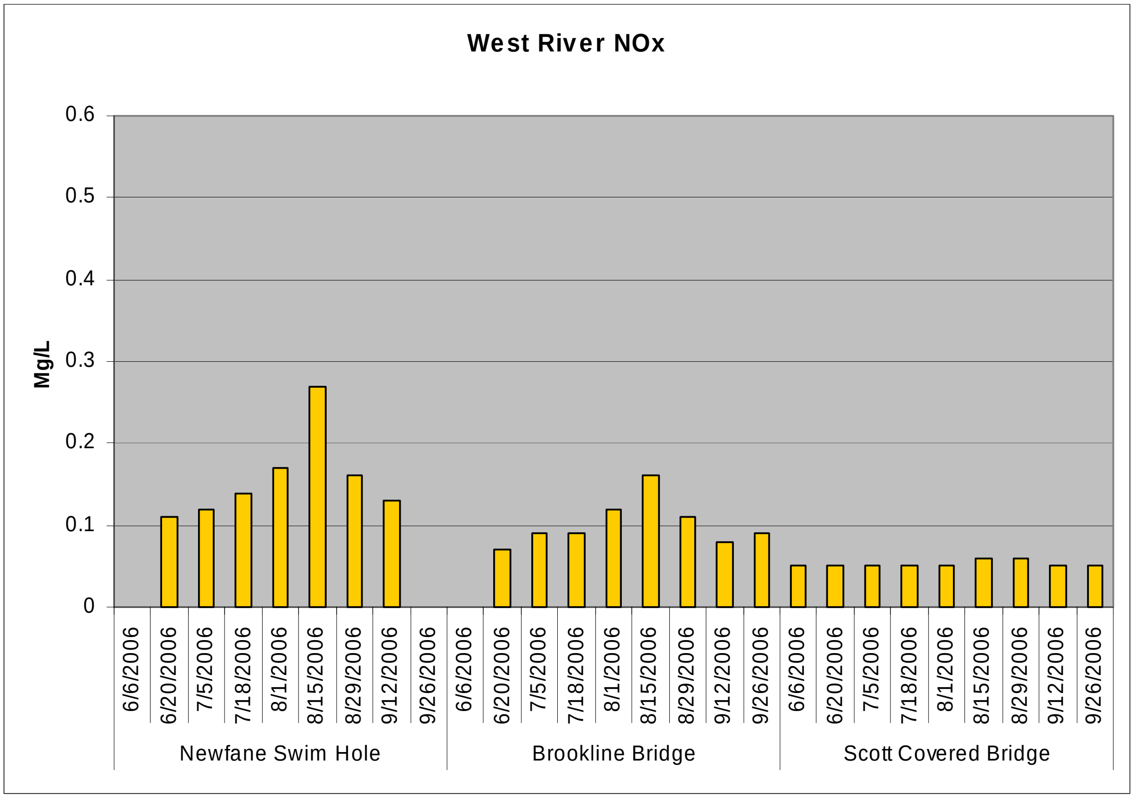


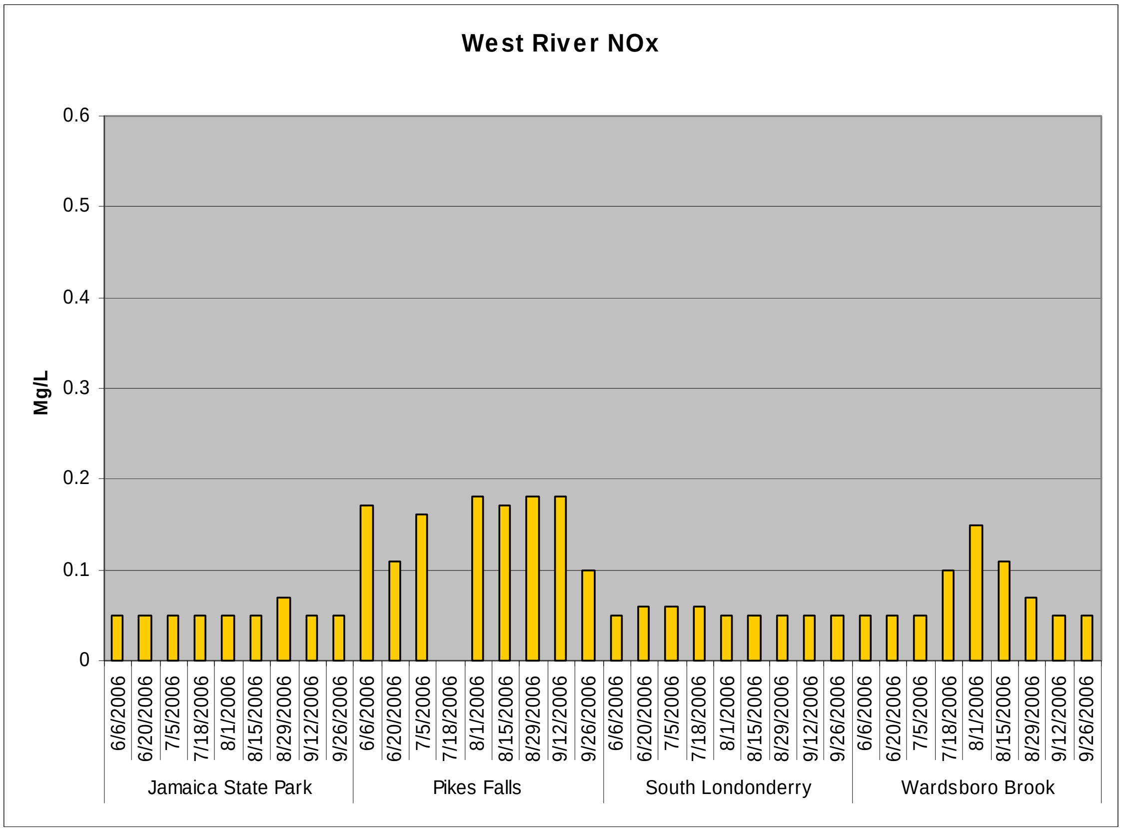
Total phosphorous concentrations of 0.01 mg/L (10µg/L) or less may have measurable impact on nutrient poor upland streams. Larger rivers could respond when concentrations near 0.1 mg/L (100µ /L).

West River Phase 1 Sampling Results - NO_x



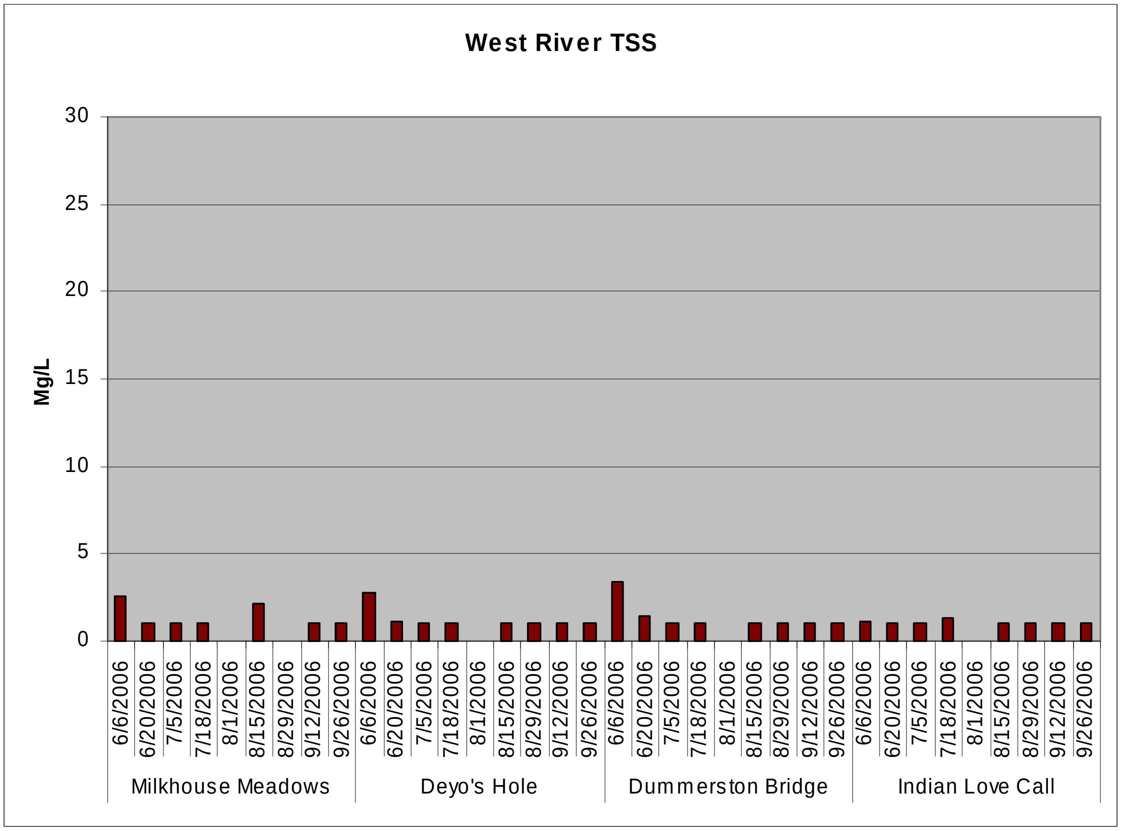
The Vermont Water Quality Standard for Class B waters states that $N0_3$-N concentrations shall not exceed 5.0 mg/L during certain flow conditions.

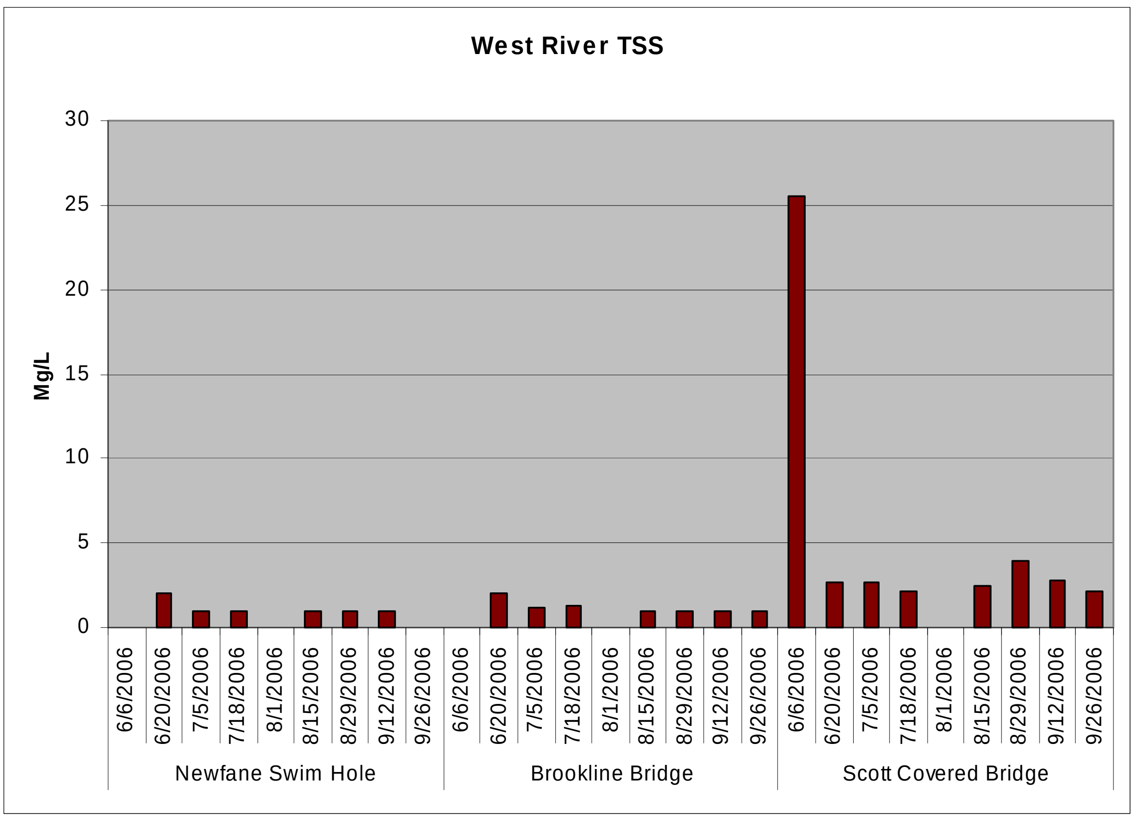


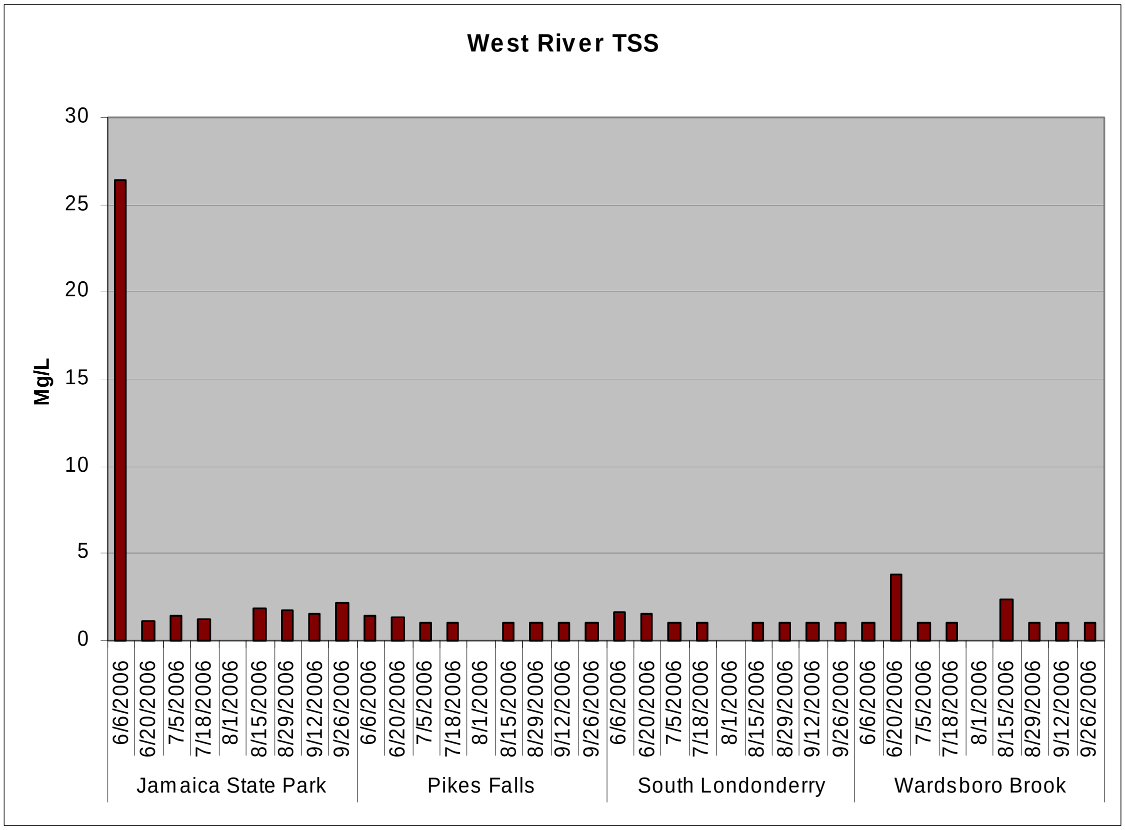


The Vermont Water Quality Standard for Class B waters states that $N0_3$-N concentrations shall not exceed 5.0 mg/L during certain flow conditions.

West River Phase 1 Sampling Results – Total Suspended Solids

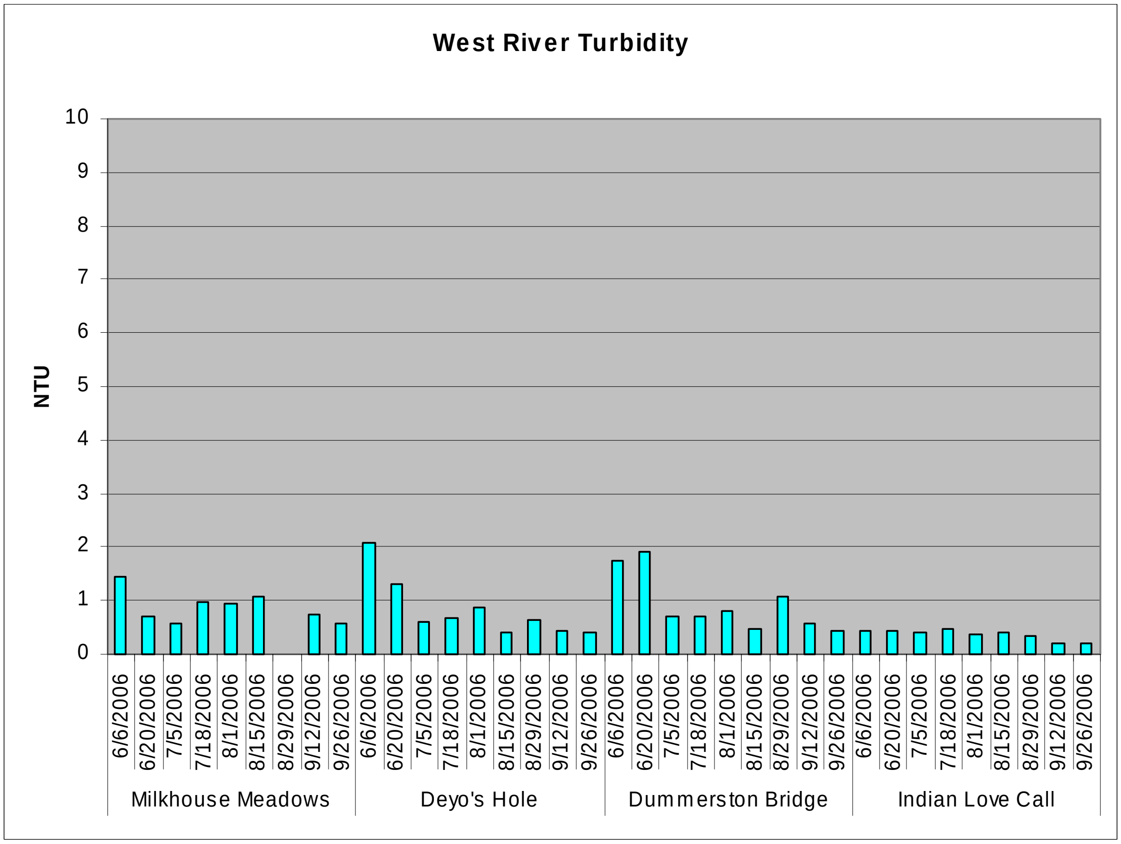


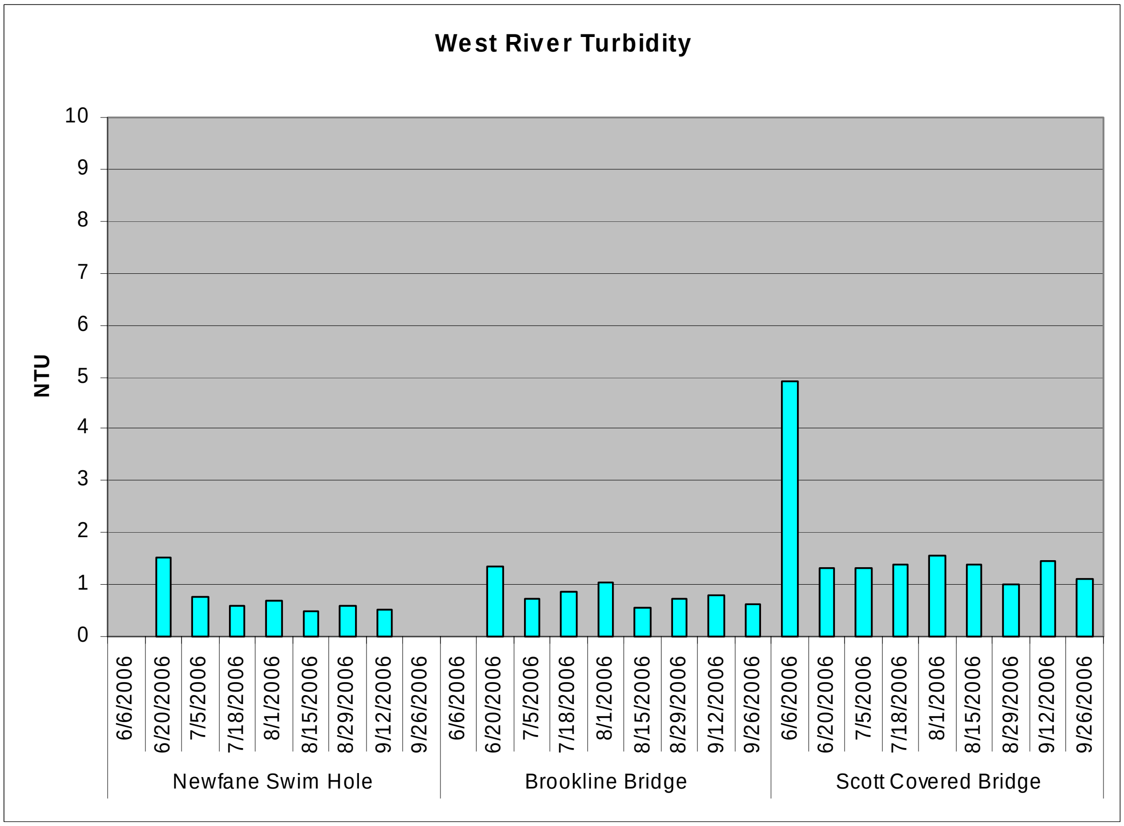


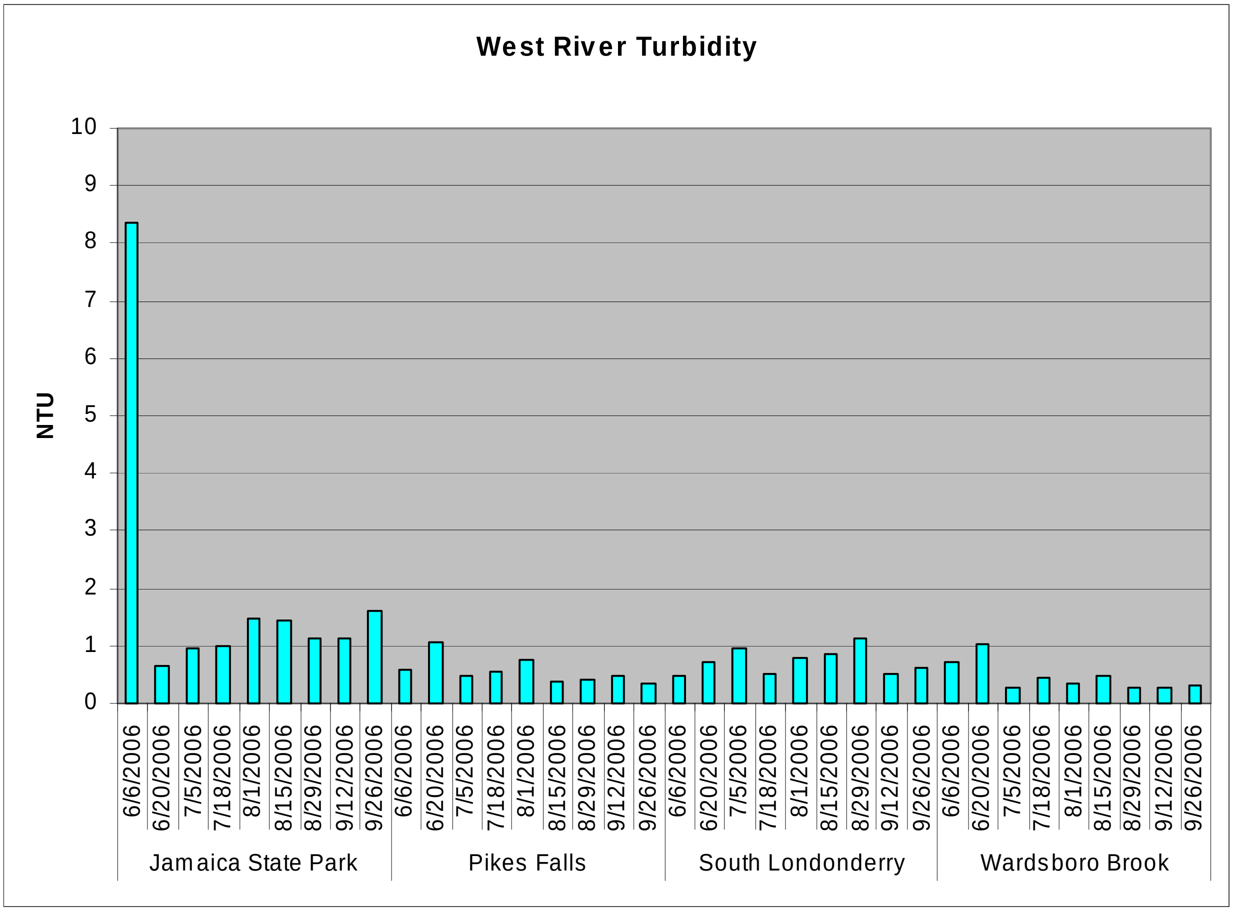


West River TSS
Mg/L
30
25
20
15
10
5
0
6/6/2006
6/20/2006
7/5/2006
7/18/2006
8/1/2006
8/15/2006
8/29/2006
9/12/2006
9/26/2006
Jamaica State Park
Pikes Falls
South Londonderry
Wardsboro Brook

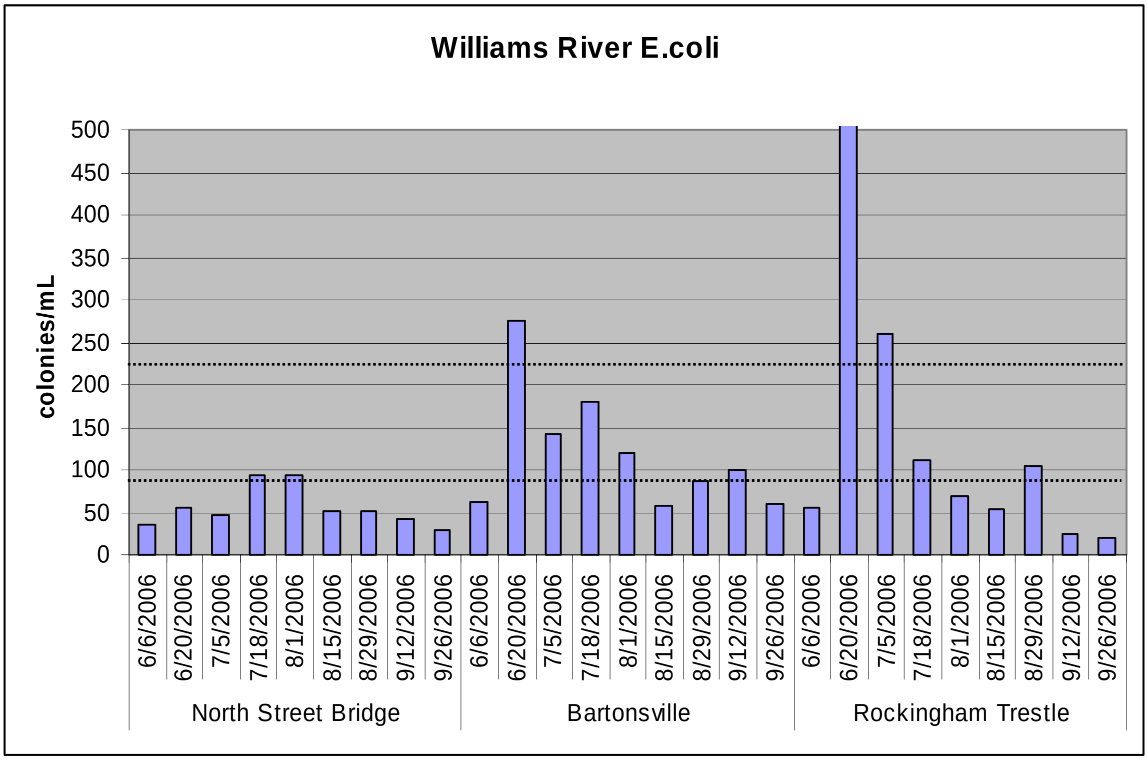
West River Phase 1 Sampling Results – Turbidity





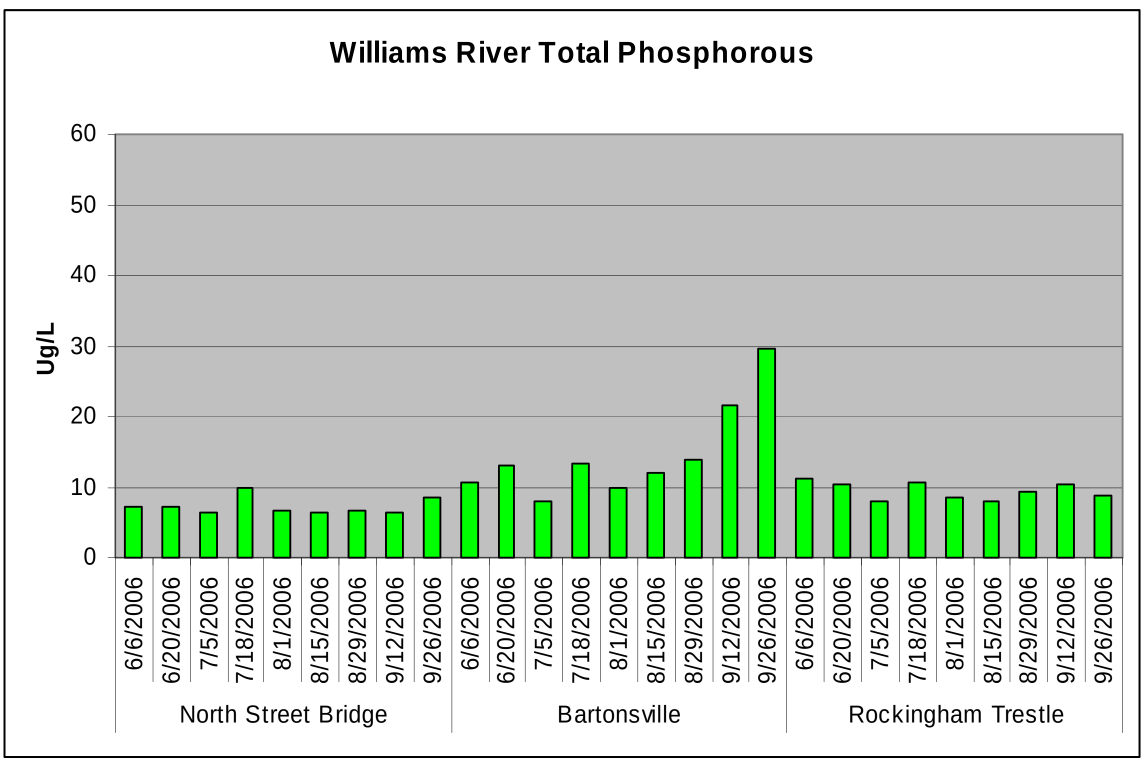

West River Turbidity
NTU
10
9
8
7
6
5
4
3
2
1
0
6/6/2006
6/20/2006
7/5/2006
7/18/2006
8/1/2006
8/15/2006
8/29/2006
9/12/2006
9/26/2006
Jamaica State Park
Pikes Falls
South Londonderry
Wardsboro Brook

Williams River Phase 1 Sampling Results – *E.coli*



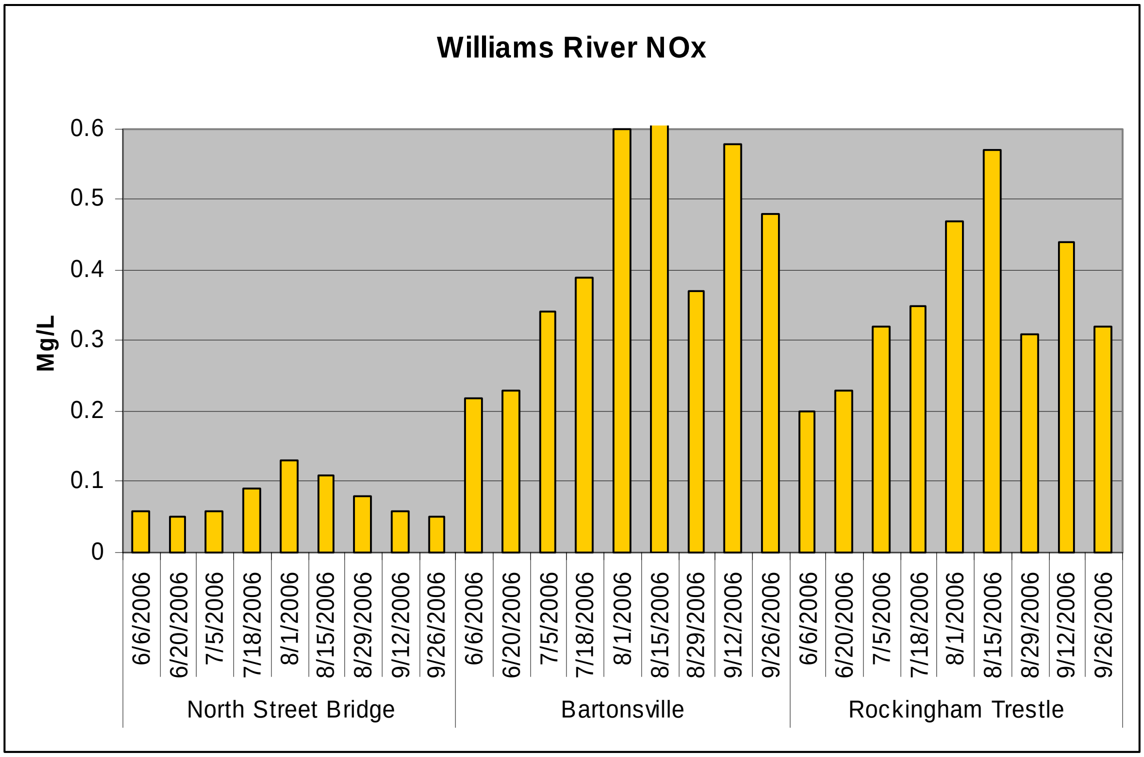
EPA *E.coli* Standard – 235 colonies/100mL Vermont State *E.coli* Standard is 77 Colonies/100mL

Williams River Phase 1 Sampling Results – Total Phosphorous



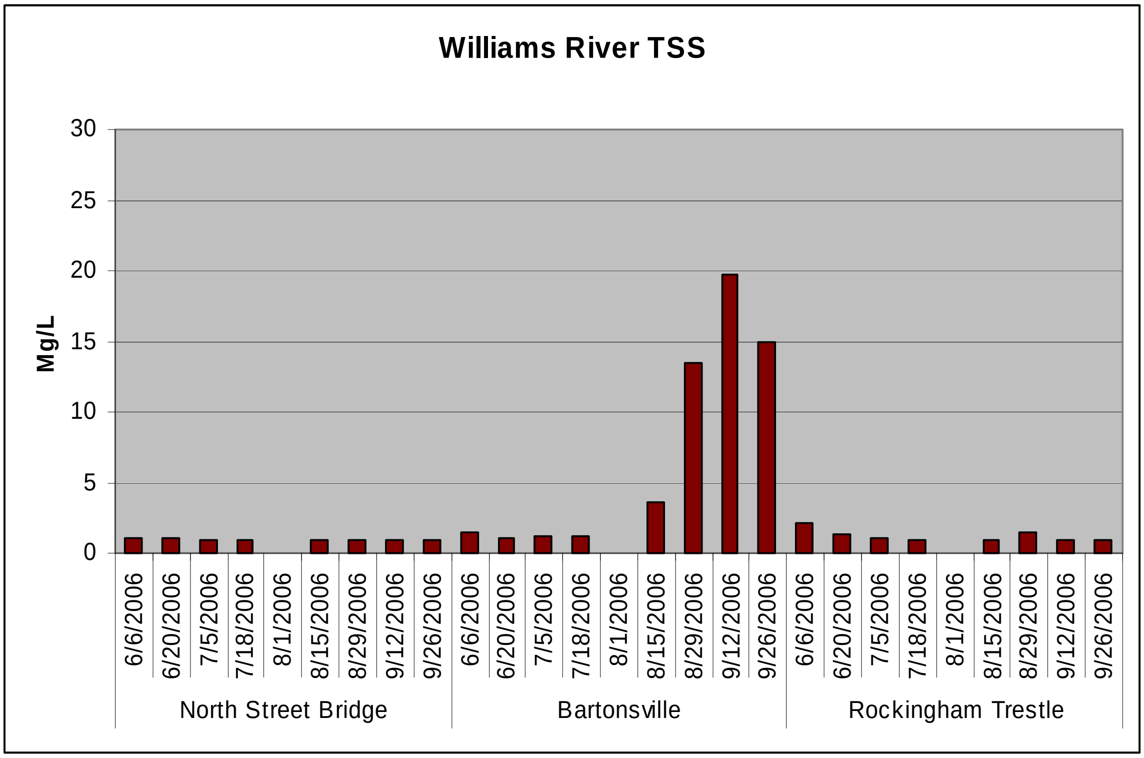
Total phosphorous concentrations of 0.01 mg/L (10µg/L) or less may have measurable impact on nutrient poor upland streams. Larger rivers could respond when concentrations near 0.1 mg/L (100µ /L).

Williams River Phase 1 Sampling Results - NO_x

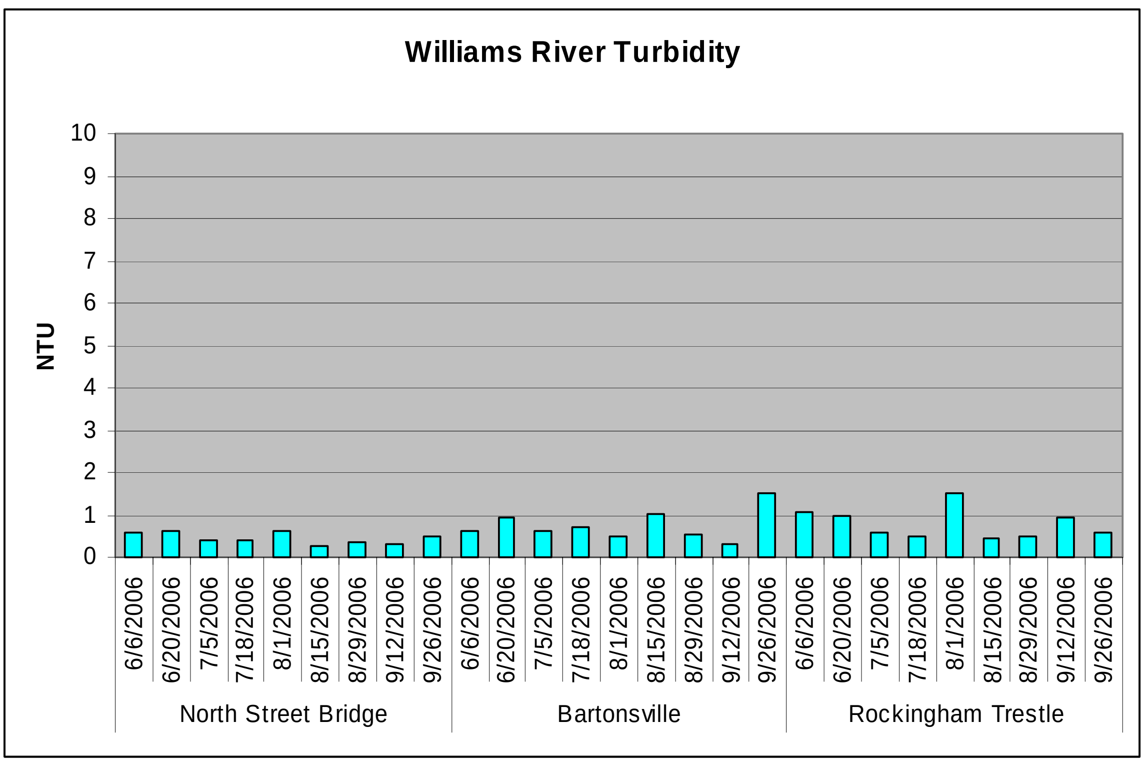


The Vermont Water Quality Standard for Class B waters states that $N0_3$-N concentrations shall not exceed 5.0 mg/L during certain flow conditions.

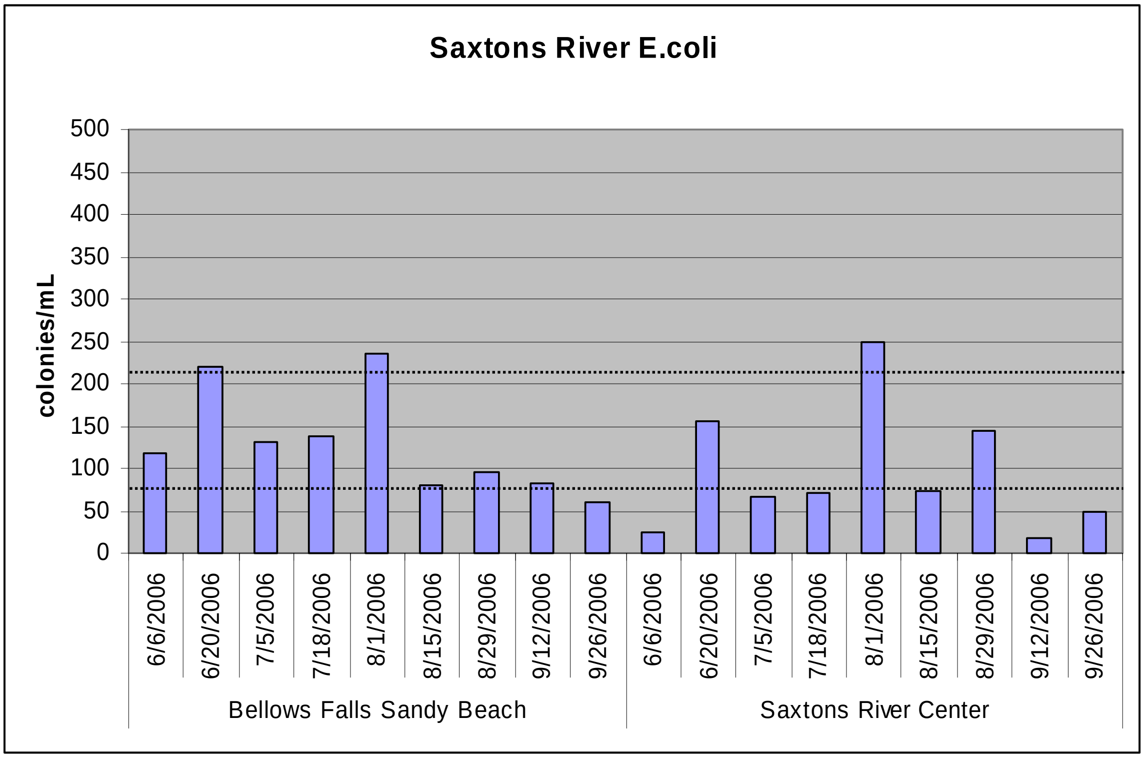
Williams River Phase 1 Sampling Results – Total Suspended Solids



Williams River Phase 1 Sampling Results – Turbidity

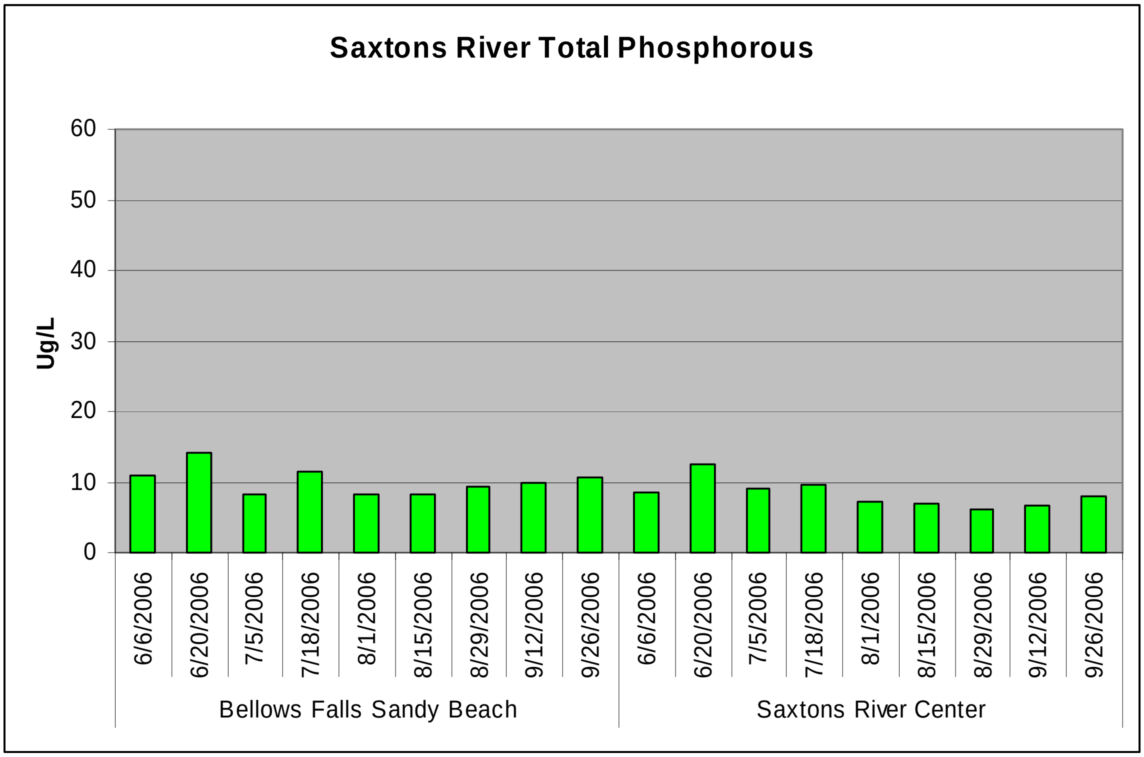


Saxtons River Phase 1 Sampling Results – *E.coli*



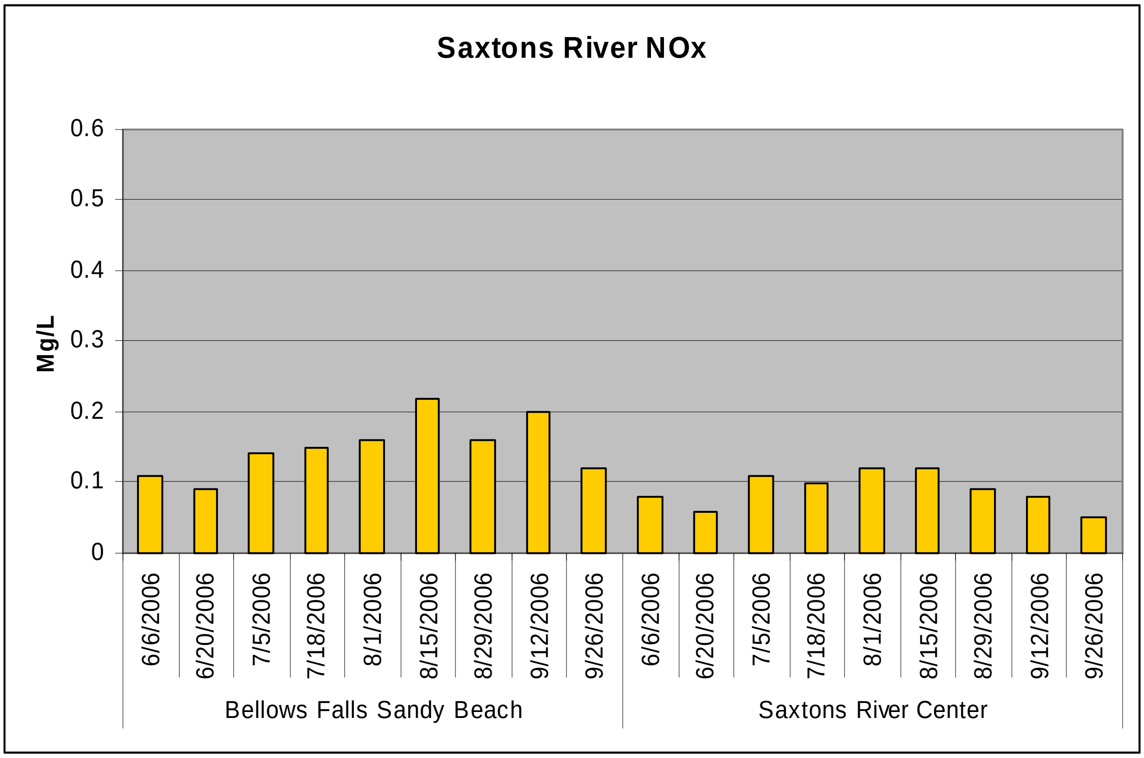
EPA *E.coli* Standard – 235 colonies/100mL Vermont State *E.coli* Standard is 77 Colonies/100mL

Saxtons River Phase 1 Total Phosphorous



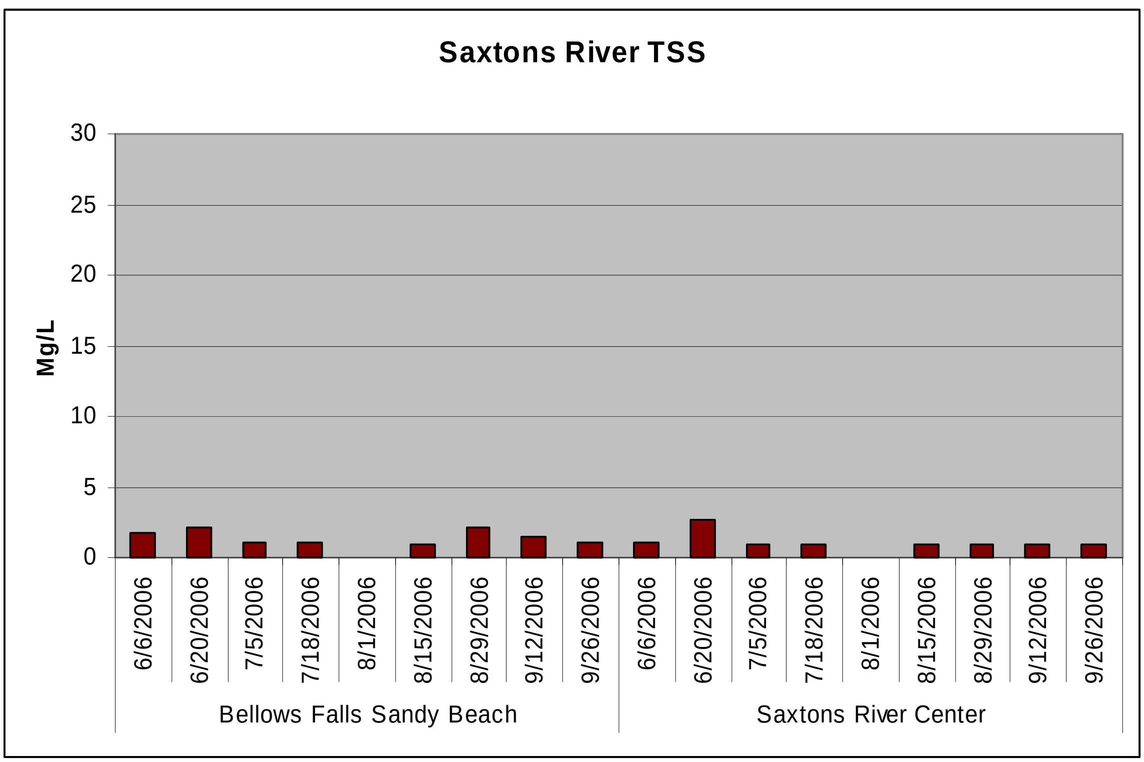
Total phosphorous concentrations of 0.01 mg/L (10µg/L) or less may have measurable impact on nutrient poor upland streams. Larger rivers could respond when concentrations near 0.1 mg/L (100µ /L).

Saxtons River Phase 1 Sampling Results - NO_x

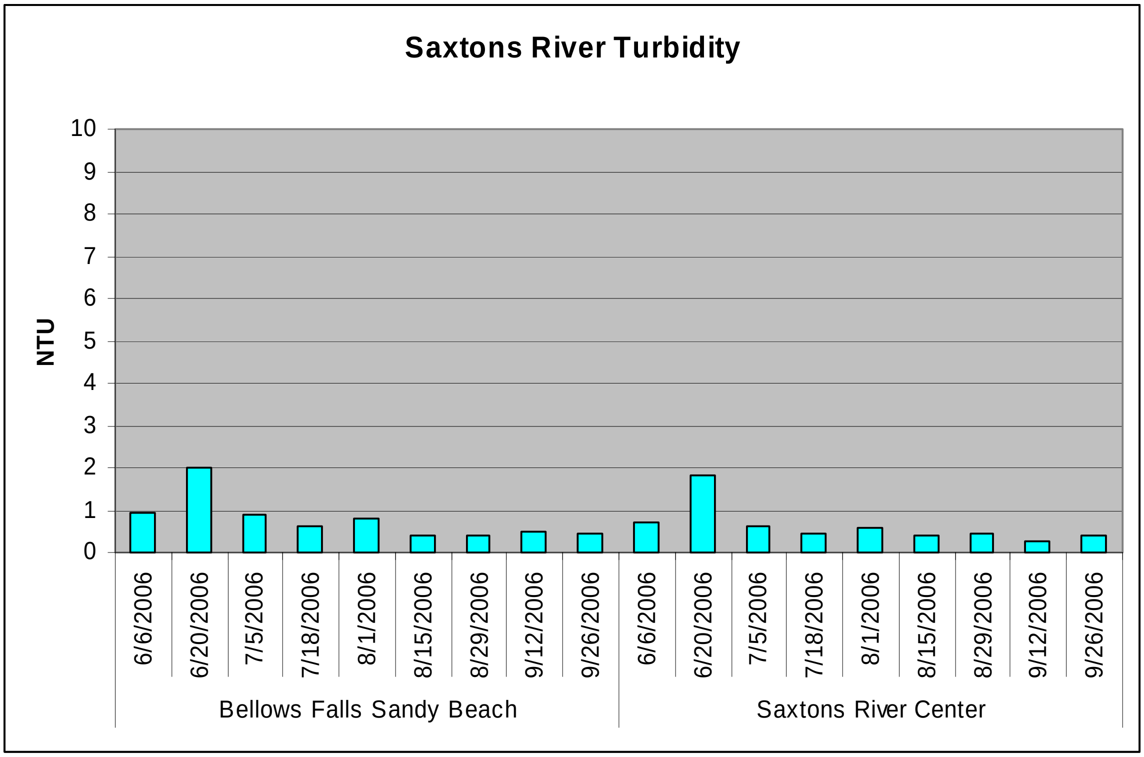


The Vermont Water Quality Standard for Class B waters states that $N0_3$-N concentrations shall not exceed 5.0 mg/L during certain flow conditions.

Saxtons River Phase 1 Sampling Results – Total Suspended Solids



Saxtons River Phase 1 Sampling Results – Turbidity



West River Phase 1 Sampling Results 2006

Site Number	Data Year	Date Collected	Water Temp	Air Temp	pH	Cond. (us/cm)	*E. Coli* (Bacteria/ 100ml)	TP (ug/l)	NOX (mg-N/l)	TSS (mg/l)	Turbidity (NTU)
SH 1 Milkhouse Meadows	2006	6/6/2006	9	21	6.73	44	38	10.6	0.07	2.6	1.44
	2006	6/20/2006	17.5	19	7.1	67.3	127	7.86	0.1	1	0.7
	2006	7/5/2006	17.5	23.5	6.95	6.28*	68	8.06	0.11	1	0.56
	2006	7/18/2006	21	24	6.91	69.4	59	12.3	0.09	1	0.98
	2006	8/1/2006	23	25	7.33	81.1	63	9.23	0.13	?	0.94
	2006	8/15/2006	19	13	7.2	83	98	11.4	0.15	2.2	1.09
	2006	8/29/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	9/12/2006	14.5	9	6.22	68.2	91	8.12	0.07	1	0.74
	2006	9/26/2006	15	14	7.34	71.9	124	9.7	0.07	1	0.57
SH 2 Deyo's Hole	2006	6/6/2006	8	22	6.57	42.8	30	11.2	0.06	2.76	2.07
	2006	6/20/2006	17.5	20.5	7.36	63.6	172	9.84	0.09	1.1	1.31
	2006	7/5/2006	17.5	20.5	7.09	58.4	30	7.58	0.09	1.04	0.59
	2006	7/18/2006	20	24	7.16	65.3	62	11.8	0.1	1	0.68
	2006	8/1/2006	22	24	7.45	76.3	30	8.41	0.12	?	0.88
	2006	8/15/2006	17	14	73.4	74.3	25	8.32	0.15	1	0.4
	2006	8/29/2006	17	17	7.26	71.1	57	9.05	0.09	1	0.63
	2006	9/12/2006	13	9	6.76	64.2	13	9.34	0.07	1	0.45
	2006	9/26/2006	14	17	7.39	67.5	31	8.18	0.07	1	0.41
SH 3 Quarry Road	2006	6/6/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	6/20/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	7/5/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	7/18/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	8/1/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	8/15/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	8/29/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	9/12/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	9/26/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
SH 4 Dummerston Covered Bridge	2006	6/6/2006	ND	ND	6.85	48.9	33	13.7	0.07	3.43	1.76
	2006	6/20/2006	16	19	6.92	58.3	411	9.96	0.08	1.44	1.91
	2006	7/5/2006	18	22	7.08	56.5	29	7.4	0.09	1	0.69
	2006	7/18/2006	21	25	7.27	63.6	53	11.1	0.1	1	0.71

Site Number	Data Year	Date Collected	Water Temp	Air Temp	pH	Cond. (us/cm)	*E. Coli* (Bacteria/ 100ml)	TP (ug/l)	NOX (mg-N/l)	TSS (mg/l)	Turbidity (NTU)
SH 4 Dummerston Covered Bridge	2006	8/1/2006	21	22	7.45	72.4	47	7.92	0.12	?	0.81
	2006	8/15/2006	17	15.5	7.24	72.5	12	7.57	0.16	1	0.48
	2006	8/29/2006	17	17	7.45	73.2	45	7.31	0.1	1	1.06
	2006	9/12/2006	13	9	6.49	63.8	18	9.83	0.08	1	0.56
	2006	9/26/2006	14	15.5	7.51	66.2	66	9.78	0.08	1	0.42
SH 5 Williamsville Station	2006	6/6/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
West/Rock confluence	2006	6/20/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	7/5/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	7/18/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	8/1/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	8/15/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	8/29/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	9/12/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	9/26/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
SH 6 Indian Love Call	2006	6/6/2006	11.5	14.5	6.67	62.3	36	18.8	0.05	1.12	0.45
	2006	6/20/2006	15	17	7.35	46	50	6.77	0.05	1	0.42
	2006	7/5/2006	17	21	7.03	47.5	29	8.3	0.05	1	0.41
	2006	7/18/2006	19.5	25	7.34	55.1	22	9.57	0.07	1.3	0.48
	2006	8/1/2006	18.5	21	7.43	55.5	35	8.64	0.1	?	0.37
	2006	8/15/2006	15	18	7.35	60.1	5	7.46	0.1	1	0.4
	2006	8/29/2006	15	16	7.93	61.6	25	5.59	0.07	1	0.34
	2006	9/12/2006	9	4.5	8.04	50.6	6	6.1	0.05	1	0.2
	2006	9/26/2006	10	7	7.73	56.5	12	7.39	0.05	1	0.2
SH 7 Newfane Swimming Hole	2006	6/6/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	6/20/2006	19	19	6.5	59.2	687	11.1	0.11	1.98	1.51
	2006	7/5/2006	18	22	7	58.3	39	9.04	0.12	1	0.75
	2006	7/18/2006	20	21	7.33	63.4	45	11.7	0.14	1	0.59
	2006	8/1/2006	20	22	8.04	73.4	56	9.29	0.17	?	0.68
	2006	8/15/2006	16	12	7.91	88.7	25	9.01	0.27	1	0.48
	2006	8/29/2006	18	18	5.89*	79	83	7.8	0.16	1	0.58
	2006	9/12/2006	12	6	6.79	66.5	27	8.94	0.13	1	0.52
	2006	9/26/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND

Site Number	Data Year	Date Collected	Water Temp	Air Temp	pH	Cond. (us/cm)	*E. Coli* (Bacteria/ 100ml)	TP (ug/l)	NOX (mg-N/l)	TSS (mg/l)	Turbidity (NTU)
SH 8 Brookline Bridge	2006	6/6/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	6/20/2006	18	18	6.56	60.2	291	10.6	0.07	2.04	1.36
	2006	7/5/2006	16	25	6.97	58.9	60	9.39	0.09	1.2	0.72
	2006	7/18/2006	21	23.5	7.03	61.8	74	12.5	0.09	1.3	0.86
	2006	8/1/2006	20.5	21	7.29	74	53	9.11	0.12	?	1.03
	2006	8/15/2006	17	13.5	7.73	80.2	37	9.89	0.16	1	0.57
	2006	8/29/2006	16	17	ND	ND	74	8.26	0.11	1	0.74
	2006	9/12/2006	12	9	6.77	62.8	30	10.2	0.08	1	0.8
	2006	9/26/2006	ND	ND	7.59	67.3	58	10.5	0.09	1	0.64
SH 9 Scott Covered Bridge	2006	6/6/2006	ND	ND	6.95	39.9	54	49.1	0.05	25.5	4.9
	2006	6/20/2006	19	ND	6.67	60.4	ND	12.7	0.05	2.71	1.32
	2006	7/5/2006	16	ND	ND	ND	43	11.6	0.05	2.7	1.32
	2006	7/18/2006	23	ND	7.16	59.5	54	15.5	0.05	2.1	1.38
	2006	8/1/2006	23	23	7.46	74.5	36	14.3	0.05	?	1.55
	2006	8/15/2006	18	12	ND	ND	28	14	0.06	2.5	1.37
	2006	8/29/2006	18	18	7.21	75.3	86	12.2	0.06	4	1
	2006	9/12/2006	18	14	6.7	ND	21	13	0.05	2.8	1.44
	2006	9/26/2006	10	15	7.62	66.4	38	15.9	0.05	2.14	1.12
SH 10 Jamaica State Park	2006	6/6/2006	12	15	6.42	42.2	46	45.3	0.05	26.4	8.35
	2006	6/20/2006	17	19	6.97	48.5	4	7.58	0.05	1.12	0.64
	2006	7/5/2006	18	19	7.58	44.7	22	11.7	0.05	1.4	0.96
	2006	7/18/2006	20	22	7.39	49.4	25	15	0.05	1.22	0.99
	2006	8/1/2006	ND	23	7.33	58.4	18	13.6	0.05	?	1.46
	2006	8/15/2006	ND	13	7.3	60.6	1	12.2	0.05	1.89	1.45
	2006	8/29/2006	16	19	7.45	61.4	147	11.4	0.07	1.75	1.14
	2006	9/12/2006	13	8	6.71	51.2	25	13.6	0.05	1.53	1.12
	2006	9/26/2006	13	14	7.27	56.1	10	15.7	0.05	2.2	1.61
SH 11 Pikes Falls	2006	6/6/2006	ND	ND	6.62	108.9	60	6.06	0.17	1.43	0.57
	2006	6/20/2006	15.5	18	7.17	186.9	214	9.91	0.11	1.35	1.06
	2006	7/5/2006	15.5	18	7.42	157.4	44*	5.82*	0.16	1	0.49
	2006	7/18/2006	ND	21	7.37	170.7	50	ND	ND	1	0.55
	2006	8/1/2006	ND	20	7.39	191.3	34	6.33	0.18	?	0.75

Site Number	Data Year	Date Collected	Water Temp	Air Temp	pH	Cond. (us/cm)	*E. Coli* (Bacteria/ 100ml)	TP (ug/l)	NOX (mg-N/l)	TSS (mg/l)	Turbidity (NTU)
SH 11 Pikes Falls	2006	8/15/2006	ND	13	7.25	179.1	4	6.87	0.17	1	0.37
	2006	8/29/2006	14	15	7.26	174.5	37	5.07	0.18	1	0.4
	2006	9/12/2006	8.5	5.5	7.06	143.3	16	6	0.18	1	0.47
	2006	9/26/2006	10	11.5	7.21	153.3	15	5.07	0.1	1	0.35
SH 12 South Londonderry	2006	6/6/2006	12.5	15	6.61	40.8	72	7.25	0.05	1.6	0.49
	2006	6/20/2006	14	14	7.27	54.6	435	10.3	0.06	1.52	0.72
	2006	7/5/2006	12.5	10	7.41	61.3	261	8.35	0.06	1	0.97
	2006	7/18/2006	15.5	20	7.26	57	308	12.5	0.06	1	0.52
	2006	8/1/2006	22	26	7.28	72.6	326	8.56	0.05	?	0.79
	2006	8/15/2006	9	8.5	7.29	73.3	248	8.02	0.05	1	0.85
	2006	8/29/2006	10.5	12	7.26	59.5	219	10.4	0.05	1	1.13
	2006	9/12/2006	4.5	3	6.87	61.7	131	9.15	0.05	1	0.51
	2006	9/26/2006	6	5.5	7.37	59.1	108	10.4	0.05	1	0.61
SH 16 Wardsboro Brook	2006	6/6/2006	11	15	6.48	38.2	26	6.66	0.05	1	0.71
	2006	6/20/2006	14	17	7.35	60	74	7.73	0.05	3.78	1.03
	2006	7/5/2006	14.5	20	7.03	55	22	5.52	0.05	1	0.26
	2006	7/18/2006	17.5	20	7.11	72.3	16	8.4	0.1	1	0.44
	2006	8/1/2006	18	20	7.4	81	20	6.57	0.15	?	0.35
	2006	8/15/2006	11	12.5	7.59	89.3	3	10.2	0.11	2.4	0.48
	2006	8/29/2006	13	15	7.67	73.4	14	6.97	0.07	1	0.27
	2006	9/12/2006	8	5.5	6.83	58.9	2	8.76	0.05	1	0.26
	2006	9/26/2006	9.5	12	ND	ND	7	8.41	0.05	1	0.32

Williams River Phase 1 Sampling Results 2006

Site Number	Data Year	Date Collected	Water Temp	Air Temp	pH	Cond. (us/cm)	*E. Coli* (Bacteria/ 100ml)	TP (ug/l)	NOX (mg-N/l)	TSS (mg/l)	Turbidity (NTU)
SH 13 Gassetts Talc Mine	2006	6/6/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	6/20/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	7/5/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	7/18/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	8/1/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	8/15/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	8/29/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	9/12/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
	2006	9/26/2006	ND	ND	ND	ND	ND	ND	ND	ND	ND
SH 14 North Street Bridge	2006	6/6/2006	11.5	17	6.9	44.2	35	7.31	0.06	1.12	0.58
	2006	6/20/2006	16	20	6.85	53.4	56	7.09	0.05	1.1	0.63
	2006	7/5/2006	15.5	21	7.03	52.9	46	6.44	0.06	1	0.41
	2006	7/18/2006	18	25	7.34	54.8	93	9.97	0.09	1	0.41
	2006	8/1/2006	18	22	7.32	68.4	93	6.8	0.13	?	0.63
	2006	8/15/2006	13	11	8.78	76.5	51	6.53	0.11	1	0.28
	2006	8/29/2006	15	18	7.11	63.6	51	6.67	0.08	1	0.37
	2006	9/12/2006	8*	4	6.51	61.7	43	6.51	0.06	1	0.32
	2006	9/26/2006	10	10	7.43	65.9	28	8.49	0.05	1	0.48
SH 15 Bartonsville Covered Bridge	2006	6/6/2006	ND	ND	6.72	53.6	62	10.7	0.22	1.52	0.61
	2006	6/20/2006	15	ND	6.94	76.2	276	13.2	0.23	1.06	0.94
	2006	7/5/2006	16	ND	ND	ND	142	8.11	0.34	1.2	0.64
	2006	7/18/2006	19	ND	7.45	83.7	179	13.4	0.39	1.2	0.69
	2006	8/1/2006	19	23	7.31	108.3	120	9.93	0.6	?	0.51
	2006	8/15/2006	20	18	ND	ND	58	11.9	0.78	3.6	1.03
	2006	8/29/2006	18	15	7.14	88.3	86	14	0.37	13.5	0.54
	2006	9/12/2006	16	10	6.91	99.8	99	21.7	0.58	19.7	0.33
	2006	9/26/2006	11	13	7.32	97.3	59	29.5	0.48	15	1.53

Site Number	Data Year	Date Collected	Water Temp	Air Temp	pH	Cond. (us/cm)	*E. Coli* (Bacteria/ 100ml)	TP (ug/l)	NOX (mg-N/l)	TSS (mg/l)	Turbidity (NTU)
SH 19 Rockingham Trestle	2006	6/6/2006	12	17	7.12	61.6	55	11.3	0.2	2.2	1.07
	2006	6/20/2006	17	20	6.81	86.3	649	10.5	0.23	1.29	0.97
	2006	7/5/2006	17	20	7.19	84.3	261	7.96	0.32	1.1	0.59
	2006	7/18/2006	20	23	7.52	94.1	111	10.8	0.35	1	0.5
	2006	8/1/2006	21	26	7.48	116.3	70	8.61	0.47	?	1.53
	2006	8/15/2006	16	15	7.36	127.8	53	7.97	0.57	1	0.45
	2006	8/29/2006	17	17	7.34	97	105	9.28	0.31	1.43	0.48
	2006	9/12/2006	12	7	7.08	99.6	25	10.3	0.44	1	0.92
	2006	9/26/2006	12	8	7.42	102.4	20	8.78	0.32	1	0.56

Saxtons River Phase 1 Sampling Results 2006

Site Number	Data Year	Date Collected	Water Temp	Air Temp	pH	Cond. (us/cm)	*E. Coli* (Bacteria /100ml)	TP (ug/l)	NOX (mg-N/l)	TSS (mg/l)	Turbidity (NTU)
SH 17 Bellows Falls Sandy Beach	2006	6/6/2006	13	16	7.23	65.7	118	11	0.11	1.7	0.93
	2006	6/20/2006	16.5	20.5	6.92	92.5	219	14.1	0.09	2.16	2.01
	2006	7/5/2006	17	20	7.27	82.3	131	8.15	0.14	1.1	0.87
	2006	7/18/2006	22	24	7.44	96.7	137	11.5	0.15	1.1	0.64
	2006	8/1/2006	20	22	7.47	105.4	236	8.4	0.16	?	0.79
	2006	8/15/2006	16	12	7.42	121.1	81	8.4	0.22	1	0.41
	2006	8/29/2006	ND	ND	7.43	112.8	96	9.22	0.16	2.1	0.42
	2006	9/12/2006	12	13	7.11	102.2	82	9.86	0.2	1.49	0.49
	2006	9/26/2006	12	10	7.4	106	61	10.8	0.12	1.08	0.43
SH 18 Saxtons River Center	2006	6/6/2006	13	15	6.94	44.2	24	8.48	0.08	1.13	0.72
	2006	6/20/2006	15	17	6.76	65.6	156	12.5	0.06	2.63	1.82
	2006	7/5/2006	17	19	7.21	65.6	66	9.19	0.11	1	0.62
	2006	7/18/2006	20	23	7.31	80	71	9.65	0.1	1	0.43
	2006	8/1/2006	19.5	21	7.37	92.1	249	7.23	0.12	?	0.6
	2006	8/15/2006	14.5	12	7.53	94.3	74	7.01	0.12	1	0.41
	2006	8/29/2006	ND	ND	7.33	89.7	144	6.13	0.09	1	0.44
	2006	9/12/2006	10	6.5	7.2	79.4	18	6.58	0.08	1	0.27
	2006	9/26/2006	11	10	7.32	84.1	50	7.98	0.05	1	0.38

General Water Quality Phase 2 Sampling Results 2006 – All Watersheds

Site Number	Data Year	Date Collected	Water Temp	Air Temp	pH	Cond. (us/cm)	TP (ug/l)	NOX (mg-N/l)	TSS (mg/l)	Turbidity (NTU)
GW 1 Whetstone Brook	2006	6/4/2006	ND	ND	5.39	71.1	23.3	0.12	6.9	3.56
	2006	7/16/2006	19	26	7.77	142.2	13.3	0.24	1.9	0.87
	2006	8/14/2006	16	18	7.9	199.3	6.98	0.41	1	0.2
	2006	9/10/2006	15	20	7.67	166.1	10.4	0.25	1	0.4
GW 5 Ball Mountain Brook	2006	6/4/2006	ND	ND	6.37	48	22.1	0.07	3.78	1.71
	2006	7/16/2006	21	26	7.51	75.6	7.96	0.05	1	0.31
	2006	8/14/2006	19	17	7.59	88	5	0.11	1	0.2
	2006	9/10/2006	14.5	12	6.76	66.2	9.47	0.05	2.06	0.2
GW 6 Cobb Brook	2006	6/4/2006	9	11	6.09	16.2	7.36	0.05	1.74	1.3
	2006	7/16/2006	17	23	7.45	22	7.35	0.05	1	0.3
	2006	8/14/2006	ND	19	7.6	20.1	5.65	0.08	1	0.2
	2006	9/10/2006	11	15	6.96	21.3	5.23	0.05	1	0.2
GW 11 Flood Brook	2006	6/4/2006	ND	ND	6.2	21.4	12.4	0.05	1.96	1.13
	2006	7/16/2006	14.5	23	7.19	24	12.1	0.05	1	0.39
	2006	8/14/2006	10	13.5	7.41	29.4	8.94	0.07	1	0.2
	2006	9/10/2006	ND	15.5	7.3	27.6	9.18	0.06	1	0.32
GW 15 William's Beach	2006	6/4/2006	ND	ND	6.99	37.9	22	0.1	7.77	2.92
	2006	7/16/2006	18	29	8.05	61.8	11.9	0.22	1.1	0.86
	2006	8/14/2006	16	22	7.29	110.5	7.02	0.64	1	0.37
	2006	9/10/2006	15	17	7.51	80.6	11.4	0.31	1.03	1.03