West River Watershed Alliance

Water Quality Monitoring Program 2008 Annual Report

compiled and written by
Rebecca Salem

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Table of Contents

List of Tables & Graphs

I. Introduction

A. The Organization

The West River Watershed Alliance (WRWA) is a grass roots organization that engages its members in citizen science by raising the awareness about the watershed and the conservation issues it is faced with today. WRWA was established in 1998 and achieved its incorporation as a non-profit organization in February of 2003 with the mission to protect and restore the West, Williams and Saxtons rivers, and educate the communities within the watersheds about water quality and watershed protection.

Since that time WRWA has grown to become an organization with over 100 members. WRWA and its volunteers have accomplished a number of projects to help increase safe river access and use. Most recently WRWA was one of the leading organizations in the creation of the Basin 11 Management Plan and officially acts as the Watershed Council for the basin. (Basin 11 is the management term used by natural resource agencies in Vermont for the three river basin.) This document outlines all of the major conservation issues within the basin and specifies necessary activities for amelioration or complete reversal of each one. It is an essential resource for concerned citizens, non-profit conservation groups and natural resource professionals as it provides a map of how these different sectors can work together in tackling these issues over the next five years.

In 2007, the WRWA facilitated its first-ever educational program, HELP Rivers (Homeowner Education and Landscaping Projects for Rivers). This program hosted a series of 7 total workshops throughout southeastern Vermont from February through May. The goal of these workshops was to provide ordinary residents of this region with an opportunity to learn ecologically sustainable strategies for maintaining their homes and landscapes. We reached over forty people through this program and partnered with seven towns to host the workshops.

The WRWA maintains an active Board of Directors who successfully guide its programs with the help of a dedicated team of local volunteers. The organization has one part-time employee, Rebecca Salem, Director of the Water Quality Monitoring Program. This was the second full year that WRWA has been operating independently of the Windham County Natural Resource Conservation District and we are continuing the build our resource base of members, volunteers, and funds with the hopes of hiring an Executive Director in the future.

B. The Water Quality Monitoring Program (WQMP)

One principal focus of WRWA has been its Water Quality Monitoring Program. This year, WRWA recruited and trained twenty-three volunteers to collect and transport water samples from the three major rivers in the West River basin. The West River basin includes the West, Williams, and Saxtons Rivers along with their tributaries.

Over the past five years, WRWA and its volunteers have collected samples from 38 sites along these three rivers and their tributaries. Many natural resource professionals, WRWA and other citizen groups use the data collected for a variety of purposes. These include: comparing regions of the state, measuring progress toward project goals, documenting water quality conditions, identifying sites for cleanup and restoration, developing public policy, determining where to direct limited resources and analyzing how and why a water body changes over time. All of these activities are central to keeping our rivers healthy.

Rivers are not only a beautiful part of the landscape but they are essential habitat for many plant and animal species and provide citizens with water for consumption and recreation, as well as being used for irrigation of food and other crops. These are just the very basic services rivers provide directly to us. They are also an integral part of the greater ecological systems that sustain life on this planet and, as our globe continues to suffer from an innumerable amount of activities that threaten this life support system, the WRWA and its volunteers are making a very real, important and local step in protecting, preserving and restoring these systems.

C. Questions and Concerns

The Water Quality Monitoring Program (WQMP) has two main objectives. First, is to inform the public as to the levels of *E.coli* bacteria that is present upstream of their local swimming holes. For this reason, most of the sampling sites are popular swimming spots. WRWA distributes these results to town health officers and publishes them in local newspapers. When a swimming hole is found to have elevated levels of bacteria for a sustained period of time WRWA will notify the town health officer of this fact and recommend that the swimming hole be posted with a sign warning swimmers as to the potential risks of swimming in waters that have high levels of E.coli. If the problem persists, WRWA will make further efforts to work with the town to determine the source of the bacterial pollution and remediate it.

This year, WRWA was able to attain additional support from the Town of Londonderry for the purpose of surveying the river to try and determine the source of the longstanding levels of E.coli bacteria in this stretch of the West River. Results of this study will be available in separate paper by the end of 2008. Other efforts to begin identifying pollutions sources in the rivers included the addition of monitoring sites downstream of the wastewater treatment facilities in Chester and Saxtons Rivers as well as adding sites between Townshend Dam and Newfane.

Other concerns within the West River Watershed are nutrient loading and an increase in water temperature. The WQMP has been monitoring the levels of total phosphorus and nitrates/nitrites throughout the entire five-year sampling period as well as taking measurements of the water temperature. This consistent and sustained collection of information has allowed us to characterize the three rivers in the drainage basin and establish a baseline as to what is "normal." We have also been able to determine where there are problems with some nutrient loading in the system and make some educated guesses as to where there may be an increase in water temperature.

D. Monitoring Parameters

Escherichia coli is a bacteria that lives in the guts of all healthy mammals, including humans. Pathogens are micro-organisms that cause disease. Most species of E.coli bacteria are harmless, but there are some which are pathogenic, such as E.coli 0157:HC57. Infections from E.coli are primarily contracted through the ingestion of undercooked ground beef, but some have been waterborne. The EPA cites two incidents when swimmers were infected in Washington County, NY and Clark County, WA.

So, even though the presence of *E.coli* is not necessarily a direct health threat it is commonly monitored because its presence is a clear indication of sewage or animal waste having entered the water body. Pathogens in the waste can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems. A list of symptoms and more information about the health risks can be found at the EPA's website as well as the Center for Disease Control.

Phosphorus is most commonly found in nature as part of a phosphate ion. It is an essential form of energy for all plants and animals and is constantly being cycled through aquatic and terrestrial ecosystems. Most phosphates are found in deep ocean sediments or in rocks. Over time, rain leaches the phosphates from the rocks and carries them into soils, streams, lakes and rivers. From here it is available to be used by plants. The phosphorus is absorbed into plant roots to make usable organic compounds, and then passed to animals through the food chain. Phosphorus is necessary to animals for the formation of DNA, RNA, cell membranes, bones, teeth, phospholipids (fat cells), and energy carrying molecules (ATP and NADP). Urine, feces, death, and decay release organic phosphates, which are reduced by bacteria back to mineral (inorganic) phosphates into the soil (or the ocean floor), completing the cycle.

When there is too much phosphorus in a river or stream it can cause eutrophication to take place. This process is characterized by a sharp increase in plant growth that will continue until the plants use all of the available carbon dioxide for photosynthesis at which point they will begin to die. The decomposition process depletes the amount of oxygen available for fish, insect larva, and other aquatic life causing a die off of these animals as well.

The **nitrogen** in soil is derived from the earth's atmosphere. Although the atmosphere is 78% nitrogen, most living things cannot use atmospheric nitrogen to make proteins and other organic substances. Whenever an organism dies, decomposers break down the nitrogen compounds in the corpse into ammonium. The highly specialized capacity for converting atmospheric nitrogen to a form that can be used by cells is limited to a few prokaryotes. This unique process is called nitrogen fixation. On a worldwide basis, the usable nitrogen available in soils is the major limiting nutrient in crop plant growth.

We monitor nitrate/nitrite (NOx) because elevated levels are a good indication of pollution from fertilized lawns, fields, farms and septic systems. The naturally occurring amount of nitrate/nitrite in surface waters is very low, less than 1 mg/L. As the availability of usable nitrogen is another limiting factor for plant growth, a water body is again put at risk of eutrophication when over-loaded.

The measurement of **turbidity** puts a number value on the overall clarity of the water. Turbidity is often correlated with the amount of total suspended solids (TSS). TSS is an indicator of many kinds of pollution including increased amounts of erosion due to stream bank development. An increase in turbidity means that light cannot penetrate the water; less sunlight means less photosynthesis and stunted plant growth, especially phytoplankton. An increase in turbidity can also lead to an increase in water temperature as suspended particles absorb heat from the sunlight.

When the **water temperature** of a stream or river is above 20 degrees Celsius for a sustained period of time the plants and animals are put at risk. Cold water holds a greater quantity of dissolved oxygen, which is essential for a healthy stream habitat. Many fish species need cold waters during their larval development. Warmer waters also nurture the growth of pathogens that can infect plant and animal species.

The **pH** of a water body is in indication of how acid or basic it is. The pH scale ranges from 0 to 14 with a reading of 7 being neutral. When a stream or river has a low reading then it is an indication of acid rain, which has a pH of less than 5. Other types of chemical and industrial pollution could also alter the level of pH. It is important to monitor pH and keep a record of baseline data so that if these types of pollution were ever to occur there would be documentation of the healthy river for comparison.

Conductivity is measured for many of the same reasons as pH. It is necessary to establish a baseline of information in order to note any changes that may occur due to future pollution. Water is typically a poor conductor of electricity so that its level of conductivity is largely influenced by the geology of the surrounding area. 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 (umhos/cm) per centimeter or microsiemens per centimeter (us/cm).

The following table outlines the general guidelines for expected amounts of each parameter in a healthy stream. These guidelines can vary for specific streams and rivers.

Table 1a. Natural Ranges for Water Quality Parameters in Vermont[1]

Indicator	**Units of Measurement**	**Natural Range**	**General Water Quality Ranges for Recreational (Class B) Waters**
Total Phosphorus	ug/L as TP	<5 - 100	In rivers, 90-% of TP results <46 ug/L
Nitrate	mg/L as NO_3	<0.1-2	Class A: 2.0 mg/L NO_3-N Class B: 5.0 mg/L $N0_3$-N
pH	pH units	6.5 – 8.5	6.5 – 8.5
Turbidity	Nephelometric Turbidity Units (NTU)	<1-10	Cold Water Fisheries: not to exceed 10 NTU Warm Water Fisheries: not to exceed 25 NTU
Conductivity	microSiemens/centimeter (uS/cm)	50-1,500	Depends on geology of the watershed
Bacteria	# colony forming units/100 milliliters (cfu/100mL)	variable	Drinking water: 0 Contact Recreation: 77 cfu/100mL

[1] 2005. Picotte, A. and Boudette, L. *Vermont Volunteer Surface Water Monitoring Guide.* VT Department of Environmental Conservation. Waterbury. VT.

E. The Watershed (Description adapted from the Basin 11 Management Plan)
The West River Basin is composed of the West, Williams, and Saxtons Rivers. Natural resource professionals throughout the state commonly refer to this land area as Basin 11. Basin 11 is located in the southeastern corner of Vermont and drains the eastern slope of the Green Mountains. It covers approximately 618 square miles. The rivers and their tributaries flow down from the mountains through the foothills and across the Vermont Piedmont to the Connecticut River Valley where they join the Connecticut River. The Williams River joins the Connecticut River in Rockingham, the Saxtons River joins the Connecticut River in Bellows Falls, and the West River joins it in Brattleboro. Most of Basin 11 lies within Windham County although portions are also within Windsor and Bennington Counties and a very small portion is in Rutland County. The basin is part of the Southern Green Mountain biophysical region of Vermont.

The mainstem of the **West River** originates in the south part of Mount Holly, 2,400 feet above sea level. It flows generally south through the towns of Weston and Londonderry then southeasterly through Jamaica, Townshend, Newfane, Dummerston, and Brattleboro where it meets the Connecticut River. The length of the mainstem is 46 miles and the river drains a watershed that is 423 square miles.

The uppermost section of the West River flows through forested then partially forested and partially open country. It has a stony bottom with extensive gravel bars in some places and is considered good trout and salmon habitat. As it continues its course, the river flows down cascading waterfalls, through rough meadows, alder thickets, dense forests, along roadsides, into reservoirs, and across valleys where it floodplains range from a quarter to a half mile across.

Major tributaries include: Greendale Brook, Utley Brook, Flood Brook, Thompsonburg Brook, Winhall River, Ball Mountain Brook, Wardsboro Brook, and the Rock River. There are two dams that are currently active along the river; these are Townshend Dam and Ball Mountain Dam.

The **Williams River** originates on the eastern edge of the southern Green Mountains and flows easterly then southeasterly through the Southern Vermont Piedmont before joining the Connecticut River at Herricks Cove in Rockingham. The Williams River has a stream length of 25 miles and drains an area of 117 square miles. Much of the upper basin is rugged, hilly land with steep slopes and poor drainage. The Williams River headwater streams come off the slopes of Terrible Mountain and other nearby mountains to form the Williams River mainstem. The river flows easterly through Andover and into the southern portion of Ludlow where Wheaton Brook, Lovejoy Brook, and Bear Brook join in. It continues its easterly flow into Chester and is confined to a relatively narrow valley until it turns south-southeast. At that point it flows in a broad fertile valley down the length of the town of Chester. In the village of Chester, the Middle Branch of the Williams River joins the Williams River mainstem.

The Middle Branch originates in Windham and flows north for several miles before flowing east through Andover and Chester into the Williams River. Lymans Brook, Andover Branch, and South Branch are all tributaries to the Middle Branch. The Middle Branch is 13 miles in length and drains a watershed of 47 square miles.

From Chester village, the Williams River continues its southeasterly flow into the town of Rockingham where it flows through Bartonsville, over the Brockways Mills dam at the top of a dramatic gorge, and through a narrow valley before flowing out into Herricks Cove at the Connecticut River. (VDEC 2001)

The **Saxtons River** rises on the eastern slopes of the southern Green Mountains in the town of Windham and flows southeasterly across the Vermont Piedmont to the Connecticut River. Its length is 20 miles draining an area of 78 square miles with a total drop of approximately 1800 feet. The upper watershed is characterized by narrow steep gorges cut through rugged hilly uplands with outcropping bedrock and poor drainage.

The Saxtons River originates in an extensive wetland complex in the Lawrence Four Corners area in Windham from which it begins its easterly flow. Many headwater tributaries from the hills and mountains of the eastern part of Windham and the western part of Grafton flow northerly and southerly through narrow, forested valleys to join the Saxtons River. The Saxtons continues an easterly flow through Houghtonville where 1.5 miles downstream, the river turns south and flows in a somewhat wider valley to Grafton village.

In Grafton, the South Branch joins the Saxtons River from the south. The South Branch is six miles long and drains a watershed that is 20.3 square miles. From Grafton village and the South Branch confluence, the river flows northeasterly then southeasterly around the base of Kidder Hill then continues southeasterly to the Village of Saxtons River. From the Village of Saxtons River, the river continues its southeasterly journey until North Westminster where it bends back on itself, flows over Twin Falls then continues in a northeast direction for a little more than a mile before emptying into the Connecticut River. (2007, Windham County Natural Resources Conservation District)

F. Monitoring Sites

The Water Quality Monitoring Program Director chose the sites for this year's study. This decision was based on the five-year data summary that was completed at the end of the 2007 Monitoring season, input from the ANR Watershed Coordinator, Marie Caduto and the WQMP Volunteers with approval by the WRWA Board of Directors. There were some sites that we all agreed to discontinue monitoring due to VERY GOOD results according to the past five years of data collection.

The site identification codes were changed from the previous format to a new one. The new format is simply the name of the water body followed by the number of miles the site is located from the mouth of the stream or river. This allows the reader to estimate the location of the water quality site just by looking at its name. The previous system did not have any reference to the site name or location and were thus difficult to use.

The Swimming Hole sites were sampled twice per month as in season past. The General Water Quality sites were changed to Baseline Sites to better reflects the purpose of collecting this data. These sites were sampled once a month, as in the past. The following table can be used to cross-reference the old names with the new names as well as find the status of each site.

Table 1b. Old and New Names for Monitoring Sites

WRWA - WQMP 2008 Sampling Sites

Swimming Hole Sites (sampled 2x/month)

AKA	Site ID	Swim Hole Name	Impacted?
SH-1	West_.08	Milkhouse Meadows	N
SH-4	West_6.4	Dummerston Bridge	N
SH-7	West_9.5	Newfane Swim Hole	Y
SH-8	West_13	Brookline Bridge	Y
SH-9	West_19	Scott Covered Bridge	N
SH-10	West_26.5	Jamaica State Park	N
SH-12	West_36	South Londonderry	Y
GW-19	West_36.2	Cobb's Swim Hole	Y
SH-11	NBranchBrk_4.5	Pikes Falls	N
***	BallMtBrk_.58	Jamaica Town Center	***
SH-19	Williams_2.3	Rockingham Trestle	N
SH-15	Williams_7.0	Bartonsville Bridge	Y
****	Williams_10.7	Rainbow Rock	*
SH-17	Saxtons_.19	BF Sandy Beach	Y
***	Saxons_5.6	SR Town Center	***

Baseline Sites (sampled 1x/month)

AKA	Site ID	Location	Impacted?
GW-1	Whetstone_.2	Brattleboro Co-Op	Y
***	Whetstone_6.4	Dettman Drive	***
GW-16	Whetstone_9.6	Stark Road	N
GW-17	BallMtBrk_1.7	Broken Glass Lane	N
GW-18	Flood_6.7	Hapgood Pond	N
****	Williams_10.3	Chester WWTF	****
****	Saxtons_5.0	Saxtons WWTF	****
****	West_16	Wiswall Hill Road	****

II. Methods

A. Volunteer Training

The WRWA hosted a volunteer training session on May 31st at Townshend Recreation Area. Volunteers met at the park where they were instructed how to properly fill out their field data sheets, measure stream flow, water temperature and fill each of the sample bottles. All of the volunteers received coolers with ice packs, aquatic thermometers, sampling bottles with labels from the La Rosa Lab and a volunteer field manual. The volunteers were all given an opportunity to practice filling the different bottles so they would be ready for the actual events during the summer.

B. Sampling Protocols

Volunteers were trained to collect samples in accordance with the VT state protocols as described in the Quality Assurance Program Plan (QAPP) this is required by the EPA for all recipients of the La Rosa Lab grant. Specifically, these protocols included the following:

1. All volunteers collected samples between 8:00 and 10:00 in the morning. This is a logistical necessity, but it also provides a “snapshot” of the river at this time and allows for data results to be more consistent than if they were collected during different times of day.

2. Samples were taken upstream of the swimming hole sites whenever possible.

3. Volunteers are instructed to wait for one to two minutes before filling their bottles to allow sediment kicked up to flow past the sampling area.

4. Sample bottles were filled upstream of the sampler’s body.

5. Once filled, the samples were deposited into coolers with ice packs as soon as possible.

6. All samples were kept cool for the duration of their transport to the lab.

Many of the volunteers expressed their uncertainty about measuring stream velocity at the beginning of the season. We reviewed the procedures during our volunteer training, but decided that only volunteers who were sampling on tributaries of the main rivers would be required to take this measurement. Stream flow and water level data from the USGS gauges was used to replace this information. The following gauges were used for the following sampling sites.

Table 2a. USGS Stations Used for Stream Flow Estimates

USGS Station	**West River, Jamaica**	**West River, Townshend Dam**	**Saxtons River, Saxtons River**	**Williams River, Rockingham**
Sampling Sites	West_36 West_36.2 West_26.5	West_19 West_13 West_9.5 West_6.4 West_.08	Saxtons_5.6 Saxtons_5.0 Saxtons_.19	Williams_2.3 Williams_7.0 Williams_10.7

The sampling season began on June 10 and ended on September 2nd. Volunteers collected samples between 8:00 am and 10:00 am every other week. The volunteers dropped their samples off at the Dummerston Covered Bridge or the Shell gas station in Rockingham. The Program Director and Intern sorted all of the samples and transferred them into two coolers for transport to the lab in Waterbury, VT.

The pH and field conductivity were measured with YSI meters at the sample drop-off sites. Results were recorded onto the volunteers' field data sheet and then transcribed to the master Excel spread sheet. The pH meter was calibrated each morning.

C. Data Input & Analysis

The Program Director transcribed data from the volunteer field data sheets onto an Excel data sheet. All of the data from the lab analysis was copy and pasted from the website onto into the master Excel data sheet. All numbers were reviewed and checked by the Program Director and the Intern.

Data analysis consisted of a few very basic processes. Initially, all data was sorted by site and then arranged by river system. The Excel Program was used to calculate the appropriate summary number (geometric mean, mean or median) for each parameter per site. This information is then displayed in tables and graphs. The goal is to provide the reader and WRWA with a "snapshot" of the river that we can use for comparison to past and future years. This year's funding only allowed for graphing of data from sites along the West River.

D. Quality Assurance

WRWA made an effort to follow all quality assurance procedures as stated in the Quality Assurance Project Plan. This process began at the volunteer training session where emphasis was put on the importance of keeping the bottles, sampling area and all equipment as clean and free of contaminants as possible. Once the sampling season started, field duplicate samples were taken every tenth site sampled. This procedure ensures that protocols are being followed and that the samples are truly representative of the water body being sampled. The following chart shows that the mean relative percent difference calculated for each of the parameters sampled is within the target range noted in the QAPP.

Table 2b. Mean Relative Percent Difference (RPD) as calculated for all field duplicates.

Site	E.coli	N	TP	Turb
West .08	7.1	0	0.7	45.4
West 6.4	0	0	0	0
West 9.5	23.1	0	8.5	3.5
West 6.4	39.8	0	10.9	12.1
West 13	10.9	8.7	4.9	1.3
West 19	12.8	0	2.6	5.3
West 26.5	100	0	0	17.1
West 36	11.7	0	0	21.3
West 36.2	14.7	0	0	9.4
Saxtons .19	33.6	0	5	20.8
Saxtons 5.6	30	0	9.1	0.58
NBranchBrk 4.5	42	0	18.9	11.8
BallMtBrk .58	31.3	0	8.4	202
Williams 2.3	11.5	3.5	3.3	0
Williams 10.7	20.2	10.5	0.5	11.3
AVERAGE RPD	25.9	1.5	4.85	24.13
GOAL	50 - 125	<10	<15	<15

Field blanks were periodically taken throughout the season to ensure that bottles were not being contaminated in the coolers. A field blank is a bottle that is filled with distilled water and then placed in the cooler along with all of the other sample bottles. All of the blank samples yielded results of less than one of the units measured for each parameter.

Finally, all of the swimming hole sites were sampled 7 times. The Baseline Sites were almost all sampled four times each. The following table lists all of the sampling sites and how many samples were taken per site.

Table 2c. Number of samples per Sampling Site

West_.08	6
West_6.4	6
West_9.5	7
West_13	6
West_19	5
West_26.5	7
West_36	4
West_36.2	5
NBranchBrk_4.5	6
BallMtBrk_.58	7
Williams_2.3	7
Flood_6.7	2
Williams_10.3	3
Williams_7.0	4
Williams_10.7	5
Saxtons_.19	7
Saxons_5.6	5
Whetstone_.2	3
Whetstone_6.4	1
Whetstone_9.6	2
Saxtons_5.0	5
West_16	3

III. 2008 Results

A. The West River & Its Tributaries

Table 3a. West River Summary

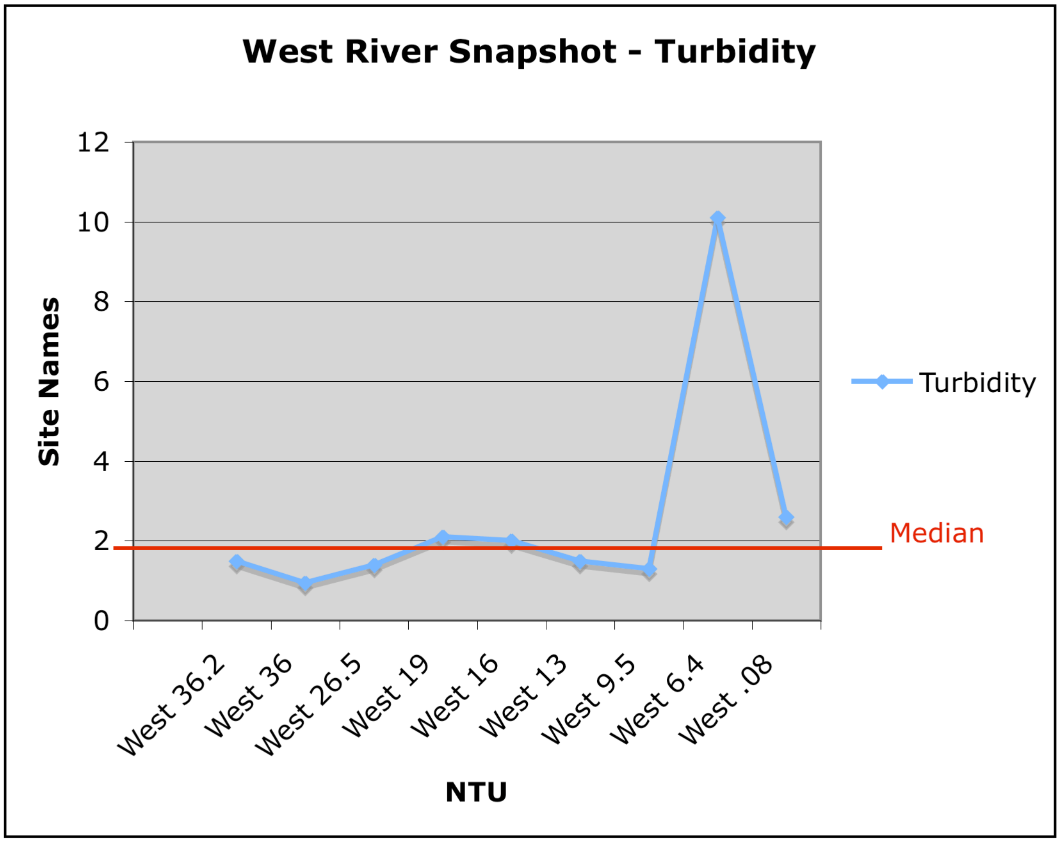
The following table shows the result averages from all samples taken during the sampling season. Sampling sites are listed in order from the headwaters of the river to the mouth. The highlighted numbers are results that exceed a natural or safe range and indicate places where there could be pollution entering the river system.

	E. Coli.	**NO2-NO3**	**TP**	**Turbidity**	**pH**	**Conductivity**	**h20T**
	mpn/100 ml	*Mg/L*	*Ug/L*	*NTU*	*pH units*	*Us/cm*	*°C*
West 36.2	134	0.06	17.5	1.5	7.22	62.6	18
West 36	137	0.07	12.28	0.94	7.1	59.9	18
West 26.5	24	0.06	15.3	1.39	7.2	57.6	
West 19	74	0.06	16	2.05	8.6	52.8	
West 16	150	0.09	18.75	2	6.9	71.6	
West 13	82	0.11	14.25	1.5	7.2	71.16	
West 9.5	83	0.17	74.7	1.32	7.2	64.4	19.7
West 6.4	56	0.68	74.9	10.1	7.3	66.3	
West .08	84	0.11	65.2	2.584	7.032	79.52	22.1

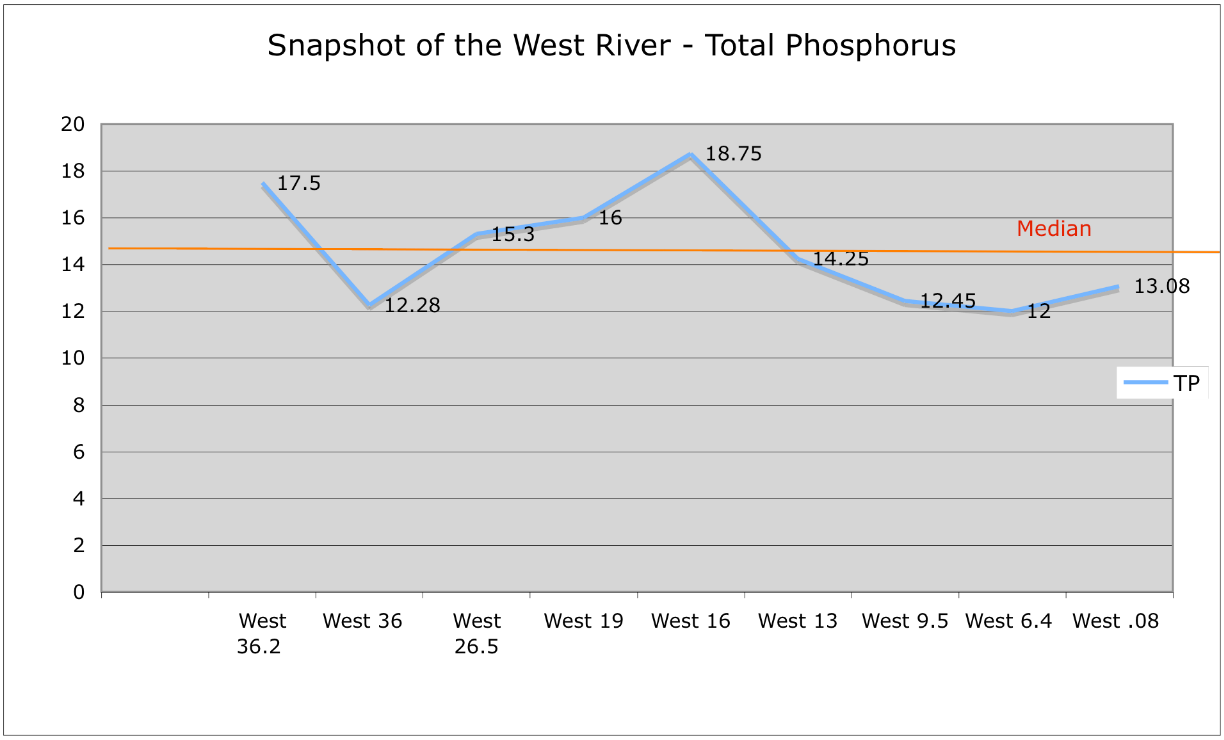
Gray areas mark results that are high in comparison to what is expected for a healthy river.

West River Snapshot - Graphs 3.1 – 3.5
The following graphs present the results outlined in Table 3.a. for each parameter sampled. They provide a kind of "picture" of the river. The sampling sites are in the same order as in the table: upstream to downstream, left to right. The median for all of the sites sampled along the river is depicted as a blue line; this can be interpreted as a kind of baseline number for comparisons over time.

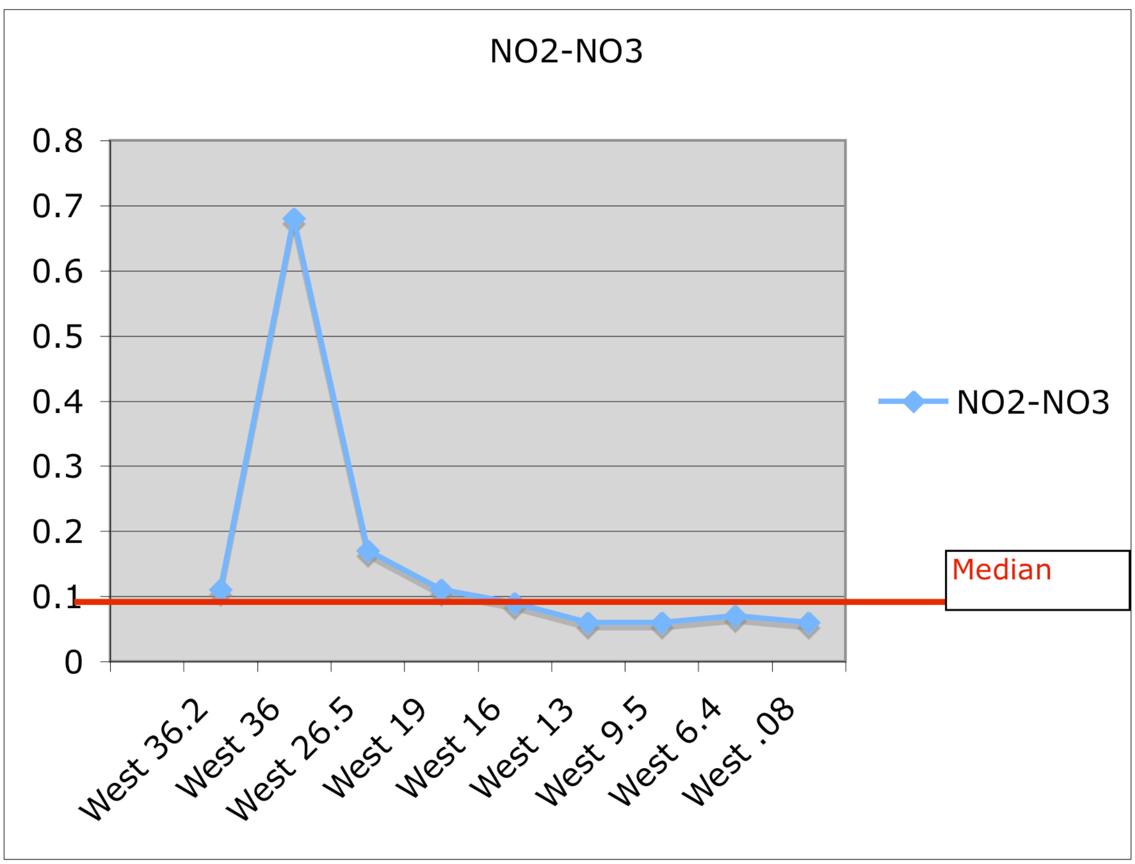
Graph 3.1



Graph 3.2



Graph 3.3



Graph 3.4

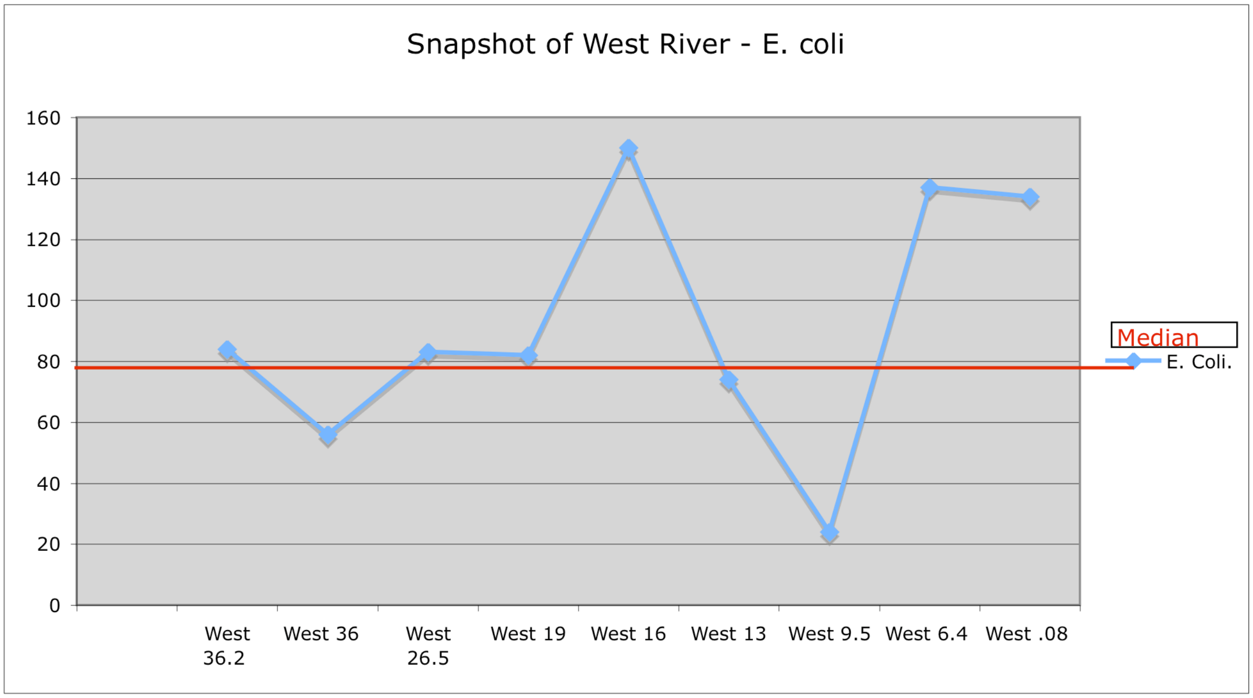


Table 3.b West River Tributaries

Site Names	E. coli	mg - N/l	ug-P/L	Turbidity	pH	Fied Conductivity
BallMtBrk_.58	53.5	.07	40.6	.51	7.1	166.8
NBrnchBrk_4.5	60	.13	47	1.1	7.4	184.76

Table 3c. Summary for Whetstone Brook

	E. Coli.	NO2-NO3	TP	Turbidity	pH	Conductivity	h20T	AirT
Whetstone 9.6	34	.21	16	2	7	80	16	19
Whetstone 6.4	98	.19	11	1	7	71	18	22
Whetstone .2	690	.32	17	2	7	127	17	20

B. The Williams River

The levels of E.coli bacteria found in the Williams Rivers are higher this year than last year. The site located near the wastewater treatment facility did register results that are nearly twice as high as the EPA standard for safe recreation. The levels of TP are also above the expected range for rivers in Vermont with 90% of these falling below 46 ug/L. Turbidity levels are within the expected range.

Table 3c. Williams River Summary

Location	**E. Coli.**	**NO2-NO3**	**TP**	**Turbidity**	**pH**	**Conductivity**
	mpn/100 ml	mg/L	ug/L	NTU		us/cm
Williams 10.7	277	.14	85	4	7	90
Williams 10.3	548	.11	48	4	7	97
Willams 7.0	164	.39	54	1		108
Williams 2.3	100	.35	14	1	7	121

C. The Saxtons River

The following table shows the mean levels of each parameter for all sampling sites on the Saxtons River as well as the median for each both sites.

Table 3.d Saxtons River Summary

Location	**E. Coli.**	**NO2-NO3**	**TP**	**Turbidity**	**pH**	**Conductivity**
Saxtons 5.6	89.95	0.08	10.7	1.03	7.3	69.46
Saxtons 5.0	104.11	0.46	10.03	0.87	7	109
Saxtons .19	164.3	0.16	16.1	2.04	9.5	89.7

V. Conclusions for 2008

The data collected through the Water Quality Monitoring Program provides a chemical picture of the three major rivers and some of their tributaries in the West River Basin. The rivers' chemistry is only one aspect of the entire system and provides information as to where there are concerns about water quality and what kinds of pollution is entering the river. In order to find out how the river is being impacted, where the source of pollution is often requires more research.

Most sites sampled along the **West River** fell within the guidelines for clean and healthy rivers. The series of graphs titled "West River Snapshot" provide a demonstration of how the results for each sampling site compares to the median level for all sites sampled on the river. There are three sites that show signs of nutrient loading. Sites with an average level of total phosphorus that is close to or above the guidelines for a healthy river are the Newfane Swimming Hole, Dummerston Bridge, and Milkhouse Meadows. It should also be noted that the last two of these sites have turbidity levels that are above the river median of 1.9 which is one whole unit greater than last year's median of .7 NTU. This could indicate the presence of excessive run-off at these sites.

The mean levels of e.coli bacteria are higher overall than those found in 2007. It was a very wet summer and the high results accounted for a lot of media coverage over the summer. Essentially, we were able to see how the high amounts of rainwater run-off increased the level of pollutants in the river, which is to be expected.

The results for e.coli bacteria found in S. Londonderry were close to the median and much lower than in years past. This is also due to the fact that it was a very wet year and as past data has indicated, these are thought to be point source pollution points – so the increase in rainfall effectively decreased the amount of bacteria found in the river.

Results from the three sampling sites along the **Williams River** also exhibit signs of nutrient loading and bacterial pollution. The pattern is almost identical to that of years past. It is even more apparent that this river is in need of more forested buffers. The results from the sampling site below the waste water treatment plant are almost double than those taken from all other sampling sites on the river.

The levels of E. coli, nitrate/nitrite and total phosphorus remain elevated at the Bellows Falls Sandy Beach in Westminster. (This site was also noted by volunteers as having a lot of litter and smelling like urine. The site is located where the river passes under Route 5 and just downstream of Bellows Falls. The direct relationship between stream flow and pollution levels found at this site indicates that surface run-off from surrounding urban areas could be impacting the river.

WRWA has taken steps to notify the town health officers about elevated bacteria levels that pose a health risk to swimmers. The organization hopes to use this information to continue a dialog with town officials and other members of the community to define and remediate the exact sources of pollution. WRWA will also use this data to inform the future of the WQMP.