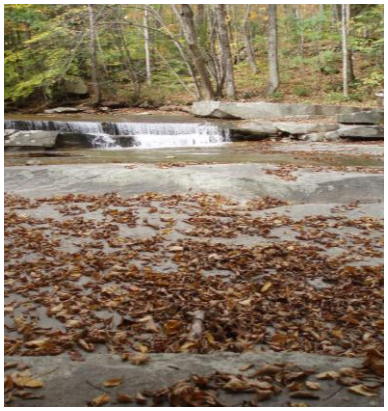
Protecting and Restoring Watershed Resources through Educating and Engaging Communities

Southeastern Vermont Watershed Alliance

Water Quality Monitoring Program
2010, 2011 & 2012 Summary Report






Report Prepared by
Laurie Callahan
2010 - 2012 Water Quality Monitoring Program Coordinator

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Southeastern Vermont Watershed Alliance
(previously known as West River Watershed Alliance)
P.O. Box 402, Brattleboro, VT 05302
Email: sevwa.mail@gmail.com
Website: https://sites.google.com/site/vtsevwa/

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Additionally, the SeVWA/WRWA WQMP appreciated the services of Soren Paris (2010 intern), Daniel Bougie (2011 intern) and Rebecca Salem, 2011 coordinating assistant. Jeremy Schrauf's assistance as sample courier and transporter was invaluable 2010-2012; in 2012 it was an essential element that made the program possible. The SeVWA/WRWA volunteers who faced early mornings and, at times, challenging conditions to collect their samples are also very much appreciated. Their dedicated involvement in the monitoring program is fundamental to the program's existence.

Also, sincere thanks to past WRWA WQMP directors Emily Richards, Clay Houston and Rebecca Salem and former Stream Action Committee and Board of Directors members that – through many contributions of their time, skills and gifts – have helped this program to be viable over the past decade.

The monitoring program would not have been possible in 2010, 2011 and 2012 without the participation of the following volunteers:

Fred Bacon	Rick Holloway	Erik Skarsten
Laura Bacon	Frank Kelley (& student volunteer)	Cory Stark
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Susan Brace	Irwin Kuperberg	Tom and Sally Topitzer
Nelson Bruni	John Lipincott	Cris White (& Thom Chiofalo**)
Laurie Callahan	Michael Marantz*	Nancy Witherill
Phoebe Connolly	David Mink	*Folks that offered to be back-up*
Gloria Cristelli	Cynthia Nau	*samplers, but weren't called-on:*
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Margo Ghia	Dinah Reed	Additional thanks to Tim and Bill
Tom Hildreth	Rebecca Salem	Callahan for assembling sampling
Kevin Hollebeek	Jeremy Schrauf	poles utilized by volunteers in 2012.

** Passed away between the 2010 & 2011 monitoring seasons; is, and will be, missed as a dedicated volunteer on the Ball Mountain Brook in Jamaica.*

*** In 2011 Cris spearheaded the "re-activation" of E. coli testing on the Rock River; Thom Chiofalo of Rock River Preservation supported the effort. In 2012 the site was included in the SeVWA WQMP.*

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ACRONYM LIST:

COND – conductivity
CRWC – Connecticut River Watershed Council
deg C – degrees Centigrade
E. coli - *Escherichia coli*
EPA - Environmental Protection Agency
GEOMEAN – calculated geometric mean
GIS - Geographic Information System
GPS – Global Positioning System
MAX – maximum value measured during season's sampling events
MEAN- arithmetic mean of values for a particular parameter
MPN – most probable number
NO_X – combined Nitrate & Nitrite nitrogen
NTU – nephelometric turbidity unit, unit for measure of turbidity
ORG – Ottauquechee River Group
ppb – parts per billion, equivalent to ug/L (micrograms per liter)
QA – quality assurance
QAPP - Quality Assurance Project Plan
QA/QC - Quality Control/Quality Assurance
SeVWA – Southeastern Vermont Watershed Alliance
TEMP – temperature
mg/L – milligrams per liter
TMDL – Total Maximum Daily Load
SC – Specific Conductance
TP - Total Phosphorous
TURB – Turbidity
uS – micro Siemens
uS/cm – micro Siemens/centimeter, unit of measure for conductivity or specific conductance
U.S. EPA – U.S. Environmental Protection Agency
USFS – U.S. Forest Service
USFWS - United States Fish and Wildlife Service
VT ANR - Vermont Agency of Natural Resources
VT DEC - Vermont Department of Environmental Conservation
WCNRCD - Windham County Natural Resources Conservation District
WQM – water quality monitoring
WQMP - water quality monitoring program
WRWA - West River Watershed Alliance

1.0 INTRODUCTION

1.1 Rationale for the Program

Southeastern Vermont Watershed Alliance (SeVWA), formerly known as West River Watershed Alliance (WRWA), is a non-profit organization that has recognized the importance of water quality monitoring on the West River and other streams and rivers in southeastern Vermont. Data from this monitoring 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- and short-term water quality monitoring in the watershed basin and the data gathered from the volunteer monitoring program is an integral part of the Plan's implementation. Three sites along the Whetstone Brook, in Basin 13, are also included in SeVWA's water quality monitoring program (WQMP). The monitoring program follows data quality assurance protocols and data from the monitoring program is submitted to Vermont Department of Environmental Conservation's (VT DEC's) and the U.S. Environmental Protection Agency's (EPA's) long-term databases.

Vermont Watershed Basins 11 and 13 are both within the Connecticut River watershed. The Connecticut River was designated as an American Heritage River in 1998 and as the county's first national Blueway in 2012. The Connecticut River Watershed Council (CRWC), as the main non-profit conservation stewardship organization for the Connecticut River (in NH, VT, MA and CT), continues to advocate for clean water standards and natural resource conservation and protection along the river's corridor and in its watershed from its northern reaches along the Canadian border to the Long Island Sound.

All rivers and streams in Basins 11 and 13 are important recreational resources in southeastern Vermont and are highly important and valued aspects of local communities.

1.2 Advantages of the Monitoring Program

SeVWA's WQMP 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 SeVWA's WQMP have developed a sense of community and strengthened their connection to, and stewardship of, the rivers that we all enjoy. The monitoring program, through its communication with the public will enable the layperson to better recognize threats to water quality in southeastern Vermont watersheds and, where feasible, spark action to prevent degradation and improve the health of river systems. Ultimately, sustained data collection will allow for an evaluation of long-term trends.

By promoting public communication and involvement with its WQMP, SeVWA has increased citizen awareness of water quality issues. Through this monitoring effort, SeVWA seeks to develop a general public understanding of river ecology and foster a broader sense of stewardship in the region's citizenry for the area's rivers and streams. The program also partners with other non-profits and local and state agencies in the interest of protecting and conserving water quality and watershed resources.

SeVWA's WQMP provides the VT DEC with water quality data that can be compared with other data collected around the state by other 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 identify threats to water quality enables implementation of additional actions to prevent degradation and improve ecological health.

1.3 Program Background

In the fall of 2002, the Stream Action Committee (SAC) of WRWA/SeVWA planned and developed a three-phased stream monitoring program. Phase 1 involved 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 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 involved collecting stream benthic macro-invertebrate samples and conducting stream habitat assessments at sites located throughout the three rivers' watersheds. Phase 3 sampling was not continued after the fall of 2004.

Since 2003 WRWA/SeVWA has run a volunteer based program to perform long term water quality monitoring through monitoring of general water quality monitoring sites and popular swimming holes in the watersheds of the West, Williams and Saxtons Rivers, that form Basin 11. In the time since 2003, monitoring sites on Whetstone Brook, in Basin 13, have also been added to the program.

Due to various uncertainties in 2009 WRWA/SeVWA's monitoring program did not run. In 2010 it was revitalized by the tenacity and determination of a couple of volunteers and the monitoring program, with an enthusiastic and dedicated team of volunteer monitors, was able to carry-out another three seasons of water quality monitoring at about 20-22 sites each season in the West, Williams, Saxtons Rivers' watersheds and along the Whetstone Brook. It is hoped that SeVWA will develop a sustainable program so that it will be able to continue its monitoring program into future years.

In 2010, 2011 and 2012 *E. coli*, total phosphorous (TP), combined nitrate & nitrite nitrogen (NOx), turbidity (TURB), pH, conductivity (COND) and air and water temperatures have been parameters measured and analyzed through SeVWA's WQMP.

In 2010-2012 *E. coli* data results, as they were available from the CRWC lab, were published in local print and online media, were posted at kiosks at the Retreat Meadows and the Dummerston covered bridge and were provided to all volunteers so that they could post them in their communities. In 2012 the *E. coli* results charts were available at the newly created SeVWA website (https://sites.google.com/site/vtsevwa/). Public reporting of *E. coli* results was offered to help recreational users make informed decisions about using certain swimming areas.

In 2012, at the invitation of CRWC, some of SeVWA's *E. coli* monitoring results were made available as public information at a new CRWC and Pioneer Valley Planning Commission (MA) website – www.connecticutriver.us. The website provides information about recreational resources in the Connecticut River watershed and part of that information is about water-based recreation and water quality. Grant funding from Green Mountain Coffee Roasters (GMCR) helped with CRWC's lab costs and www.connecticutriver.us website development costs.

All of WRWA/SeVWA WQMP's data have been entered into database spreadsheets and, as in prior years, have been submitted to VT DEC for inclusion in their database. Data that is determined to meet quality assurance criteria is eventually submitted to U. S. EPA's database – STORET. The compiled data can also be shared with local entities, agencies and others that are interested in the information.

1.4 Program Funding Sources

Major costs to run the WQMP each year are: the laboratory analysis of samples; paying for a coordinator's services during the monitoring season, to perform data review, analysis and end-of-season report writing; mileage costs for sample pick-up from volunteers and delivery to labs; Green Mountain Messenger sample transport fees; purchase of calibration standards, equipment and supplies and maintenance of pH and conductivity meters.

As in past years, 2010-2012 laboratory analysis services were provided by the VT DEC through the VT DEC's LaRosa Lab Services Partnership Program. Through that VT DEC program, LaRosa Lab in Waterbury (2010, 2011) and Burlington (2012), provided sample analysis at no charge to several qualifying volunteer monitoring groups across the state, including SeVWA/WRWA. In using the LaRosa Partnership Program services, monitoring groups must meet specific procedural, sample and data quality assurance requirements to qualify for the services. In years prior to 2010 *E. coli* testing had been provided to SeVWA/WRWA by LaRosa Lab, but in 2010 through 2012 *E. coli* testing was provided by CRWC's laboratory in Greenfield, MA. This was made possible through CRWC grants and services exchange agreement between CRWC and VT DEC's LaRosa Lab Partnership Program.

Laurie Callahan, WQMP coordinator in 2010-2012, was able to obtain an incubator, through SeVWA, from EPA (Region 1) Equipment Loan Program for Volunteer Monitoring in the summer of 2010. The incubator is located at the CRWC lab in Greenfield and ensures that there will be adequate incubator space for the CRWC lab to accommodate SeVWA's and other groups' *E. coli* analyses. According to the grant agreement, in five years the equipment, essentially, becomes the property of the grantee.

In 2010 and 2011 Callahan applied to CRWC CERP small grants program to obtain "up-front" costs for the *E. coli* testing to be performed at the CRWC lab. Funds were awarded from that source for those two years. In 2012 CRWC was awarded GMCR funding to support their collaborative effort to monitor *E. coli* in the Connecticut River watershed and to develop an interactive website to share water quality and other information about Connecticut River watershed resources with the general public. The GMCR funding also helped to support the ability of CRWC to continue *E. coli* analysis for SeVWA. Through the services exchange agreement with VT DEC LaRosa Lab, CRWC has built-up a credit for "equivalent value" lab analysis to be performed for CRWC at a future date.

Additional support or funding in 2010-2012 for SeVWA's WQMP was provided by membership dues and donations and also through contributions by some of the towns in Basin 11 and 13 watersheds. Selectboards, managers, residents or representatives of those towns chose or voted to contribute town funding for the volunteer monitoring efforts in their townships. Many volunteer hours provided to the program by individuals has been an important factor in the existence of the program during its years' of existence.

1.5 General Location of Monitoring Program Activities

SeVWA's 2010, 2011 and 2012 river water quality monitoring sites were located along the main stem of the West River and in its watershed, along the Saxtons and Williams Rivers and along Whetstone Brook. As mentioned previously, the West River, Williams River and Saxtons River comprise state-designated Basin 11. Whetstone Brook is in VT DEC's Basin 13 watershed.

Here is a link to the final Basin 11 Management Plan document - http://www.vtwaterquality.org/planning/docs/pl_basin11%20Plan.6-08.pdf and appendices for that document, http://www.vtwaterquality.org/planning/docs/pl_basin11%20Plan_appendix.6-08.pdf

The 2001 VT DEC's Basin 11 West, Williams & Saxtons Rivers Assessment Report describes the three Basin 11 watersheds as follows below:

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 4 percent. Wetlands and developed land each cover one percent of the watershed area according to the 1991-1993 satellite photograph analysis. The main stem of the West River originates 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 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 River is 25 miles long, and its 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 roads and other transportation uses cover 4 percent of the Williams watershed area. The main tributary to the Williams River is the Middle Branch Williams River. Lyman's Brook, Andover Branch and the South Branch are tributaries to the Middle Branch Williams River.

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.

A publication by Windham County Natural Resource Conservation District (WNRCD), **The Whetstone Brook: Flooding Happens**, http://www.vermontconservation.org/Buffer-Projects/The-Whetstone-Brook-Flooding-

Happens-Booklet.html. This booklet describes some aspects of the Whetstone Brook watershed, which is in VT DEC Basin 13:

The **Whetstone Brook** watershed covers nearly 18,000 acres, or about 28 square miles, in southeastern Vermont. Sixty-nine percent of the watershed is in Brattleboro, twenty-nine percent in Marlboro and about two percent is in the town of Dummerston.

Though dense commercial and residential land uses occupy a significant portion of the lower reaches of the watershed, about 17 percent of the watershed is protected from development. Conservation easements are held by the Vermont Land Trust on privately owned land and forests. Much of the upper watershed is forested and there is also agricultural use. The town of Brattleboro's water supply is obtained from Pleasant Valley Reservoir in the Whetstone Brook watershed and the town manages its lands in the watershed to insure a clean drinking water supply for its residents and businesses.

In the VT DEC *TMDL project online publication*, www.vtwaterquality.org/mapp/docs/mp_17whetstonebrook.pdf, the Whetstone Brook is described as follows: "Whetstone Brook flows west to east from the hills of Marlboro across Brattleboro before emptying into the Connecticut River in downtown Brattleboro. The brook's headwaters originate at over 1,500 feet above sea level at Hidden Lake. The brook cascades down from steep hills and follows Vermont Rte. 9 to the Connecticut River flatlands. The brook empties into the Connecticut River at 250 feet above sea level, dropping over 1,250 feet in just seven miles of stream length. Approximately 69% of the (Whetstone) watershed resides in Brattleboro with 29% of the land in Marlboro and 2% of the land within Dummerston. The watershed contains nearly 20 miles of streams and a mix of rural, residential and urban land."

Information regarding Basin 13 at the VT DEC, Watershed Management Division, can be found at this link – http://www.vtwaterquality.org/planning/htm/pl_deerfield.htm. (This page also contains information about Basin 12 – Deerfield River, Green River and North River watershed region.)
This is an additional link to the VT DEC plan for Basin 13 (2002):
http://www.vtwaterquality.org/mapp/docs/mp_basin13assessmntrpt.pdf.
Another resource available at the VT DEC link is the Whetstone Brook Watershed Corridor Plan.

2.0 PROGRAM REQUIREMENTS, ELEMENTS AND LOGISTICS

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

The VT DEC requires all volunteer groups accepting the LaRosa Partnership Program services to submit a Quality Assurance Project Plan (QAPP) to show that each group's sampling methods and procedures were aligned with the State's protocols. Copies of WRWA/SeVWA's QAPP are available upon request.
Aspects of the 2010, 2011 and 2012 water quality program were coordinated and carried-out according to VT DEC protocols and according to WRWA/SeVWA's approved QAPP.

Quality assurance procedures, described in the WRWA/SeVWA QAPP, were conducted throughout the sampling season, including such activities as collection of field duplicate samples, review of field data sheets by the Program Coordinator or other designated person, field checks on volunteers and equipment calibration checks. Calculation of quality assurance target goals were performed to determine acceptance of program data.

Participation in the VT DEC's LaRosa Partnership Program required the WRWA/SeVWA 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/SeVWA Water Quality Monitoring Program Coordinator, intern and designated volunteers 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/SeVWA volunteers were trained and field checked for QA/QC protocols at various stages of the program.

The CRWC lab in Greenfield, where WRWA/SeVWA had its *E. coli* sample analyses performed in 2010-2012 also has a rigorous QA program in place to ensure the quality and value of its protocols and reported results.

2.2 Volunteer Recruitment and Training
2010-2012 field training sessions were held in May and June before the beginning of the sampling season to prepare volunteers for the monitoring program. Training covered step-by-step procedures for each sampling task. Sampling safety was also discussed. Volunteers received sampling equipment kits; field data sheets; contact info for coordinator, assistant and/or intern; chain of custody forms and procedure manuals. All volunteers were requested to attend training sessions or to arrange for an individually scheduled session if they could not attend a group session. New volunteers did not perform sampling until they received training. "Veteran" samplers were requested to complete at least a refresher session to receive updated materials and instructions.

There were 24 total program volunteers in 2010, 12 of which were new to the monitoring program and 8 of the 24 were "backup" samplers. In 2011, there were 28 volunteers. 10 of the 28 were new volunteers and 8 of the 28 were "backup" samplers. Five of the 2010 volunteers did not participate in 2011. In 2012 there were 29 volunteer monitors, which included 2 new volunteers and 5 "back-up" monitors. New volunteers were recruited from local communities where sites were located that needed monitors. Local conservation commissions and other local volunteers were very instrumental in helping to find additional volunteer river monitors.

2.3 Basic Monitoring Plan for 2010, 2011 & 2012
The WRWA/SeVWA WQMP did not run in 2009, so in 2010 a focused effort was launched to reactivate the program. The program was able to run in 2010, 2011 and 2012. Hopefully it will be able to continue into the future.

In addition to a number of long-term, general water quality monitoring sites, sites with concerns regarding water quality impacts and popular river swimming holes are usually selected for the WRWA/SeVWA monitoring program. Previous years' data are reviewed with Marie Caduto, VT DEC Watershed Coordinator, when selecting swimming holes or other monitoring sites. In order to sustain and generate local interest and support for the monitoring program, WRWA/SeVWA tries to maintain monitoring sites in each of Basin 11 rivers' watersheds, as long as there are sites of valid interest or concern.

In years previous to 2010, WRWA sampling sites were designated as either swimming hole (SH) sites, also known as Phase 1, or general water quality monitoring (GW) sites, also known as Phase 2. SH sites were sampled for a battery of tests, including *E. coli*, every 2 weeks during the monitoring season. The GW sites prior to 2010 were sampled once per month during the monitoring season for several parameters, but did not include *E. coli*.

Beginning in 2008 and continuing in 2010, WRWA/SeVWA discontinued the designation of Phase 1 SH sites and Phase 2 GW sites. Most of the organization's monitoring sites were swimming hole sites that were also long term water quality monitoring sites and *E. coli* was an issue at several swimming hole or non-swimming hole sampling locations. A few of SeVWA's WQMP sites are strictly general water quality monitoring sites and are not used or considered to be swimming holes or recreational sites. Starting in 2010 essentially all of WRWA/SeVWA's sites have been sampled once per month for *E. coli*, turbidity, total phosphorous, combined nitrate and nitrite (NO_X) pH, conductivity and temperature and 2 weeks after the monthly monitoring most of those sites have been sampled for just *E. coli* and temperature. In 2011 there were only five sites that were sampled for all parameters on just the once-per-month schedule and in 2012 there were only 4. All of the other 2011 and 2012 sites were sampled on the "every-two-weeks" schedule. In 2011 one site was monitored for just *E. coli* every 2 weeks.

2.3.1 2010, 2011 & 2012 Monitoring Sites

In 2010 there were 20 water quality monitoring (WQM) sites, in 2011 there were 22 WQM sites and in 2012 there were 22 sites.
The following sites were monitored in 2010, 2011 and 2012. Not all sites were monitored all three years; see designations below in Table 1:

Table 1: 2010, 2011 & 2012 list of SeVWA/WRWA water quality monitoring program sites

RIVERS or WATERSHEDS	MONITORING SITES	SITE DESCRIPTION	2010	2011	2012
WEST RIVER	West_ 39	Londonderry village, below dam & Rte 100 bridge		X	
	West_38.5	L'derry, below Mountain Marketplace on Rte 100		X	X
	West_36.2	So. L'derry, Cobb's swim hole, Winhall Hollow Rd.	X		
	West_36.1	So. L'derry, just below West_36.2, above Rte 100 bridge		X	X
	West_36	So. Londonderry, Rowes Rd.	X	X	X
	West_16	Townsend, Ellen Ware Road	X		X
	West_13	Brookline, Brookline bridge	X	X	X
	West_6.4	Dummerston, just above Dummerston covered bridge	X	X	X
	West_1.42	Brattleboro, Behind B'boro Professional Center, Rte. 30	X	X	X
	West_.5	Brattleboro, just above West_.08, new site in 2011		X	
	West_.08	Brattleboro, Milk House Meadows, just above Marina	X	X	X
	Rock_.38	Newfane, vicinity of Indian Love Call, upstream of Rte. 30			X
	NBranchBrk_4.5	Jamaica, Pikes Falls swim hole	X	X	X
	BallMtBrk_1.7	Jamaica, Broken Glass Lane	X		
	BallMtBrk_.58	Jamaica village swim hole, Water St., below Rte. 30	X		
	FloodBrk_6.7	Peru, below Hapgood Pond & Hapgood Pd. Rd.	X		
WILLIAMS RIVER	MBrWilliams_.02	Chester, Mid. Br. Williams R., just above Rainbow Rock		X	X
	Williams_10.8	Chester, just above confl. of Mid.Br.Williams R. & 10.7		X	X
	Williams_10.7	Chester village, Rainbow Rock swim hole	X	X	X
	Williams_10.3	Chester, below Chester village WWTF	X	X	X
	Williams_8.7	Chester, just above Missing Link Rd. bridge		X	X
	Williams_7.0	Rockingham, just above Bartonsville bridge	X	X	X
SAXTONS RIVER	Saxtons_5.6	Rockingham, Stickney's field, above Saxtons R. village	X	X	X
	Saxtons_5.0	Rockingham, below WWTF in Saxtons River village	X	X	X
	Saxtons_.19	Westminster, "sandy beach", just south of BF town line	X	X	X
WHETSTONE BROOK	Whetstone_.2	Brattleboro, downtown, behind Co-op	X	X	X
	Whetstone_6.4	Brattleboro, Dettman Dr., just above bridge	X	X	X
	Whetstone_9.6	Brattleboro, Stark Rd., off of Rte. 9 & just above bridge	X	X	X

Figure 1: Map of 2010 water quality monitoring sites. *(Produced by Soren Paris.)*

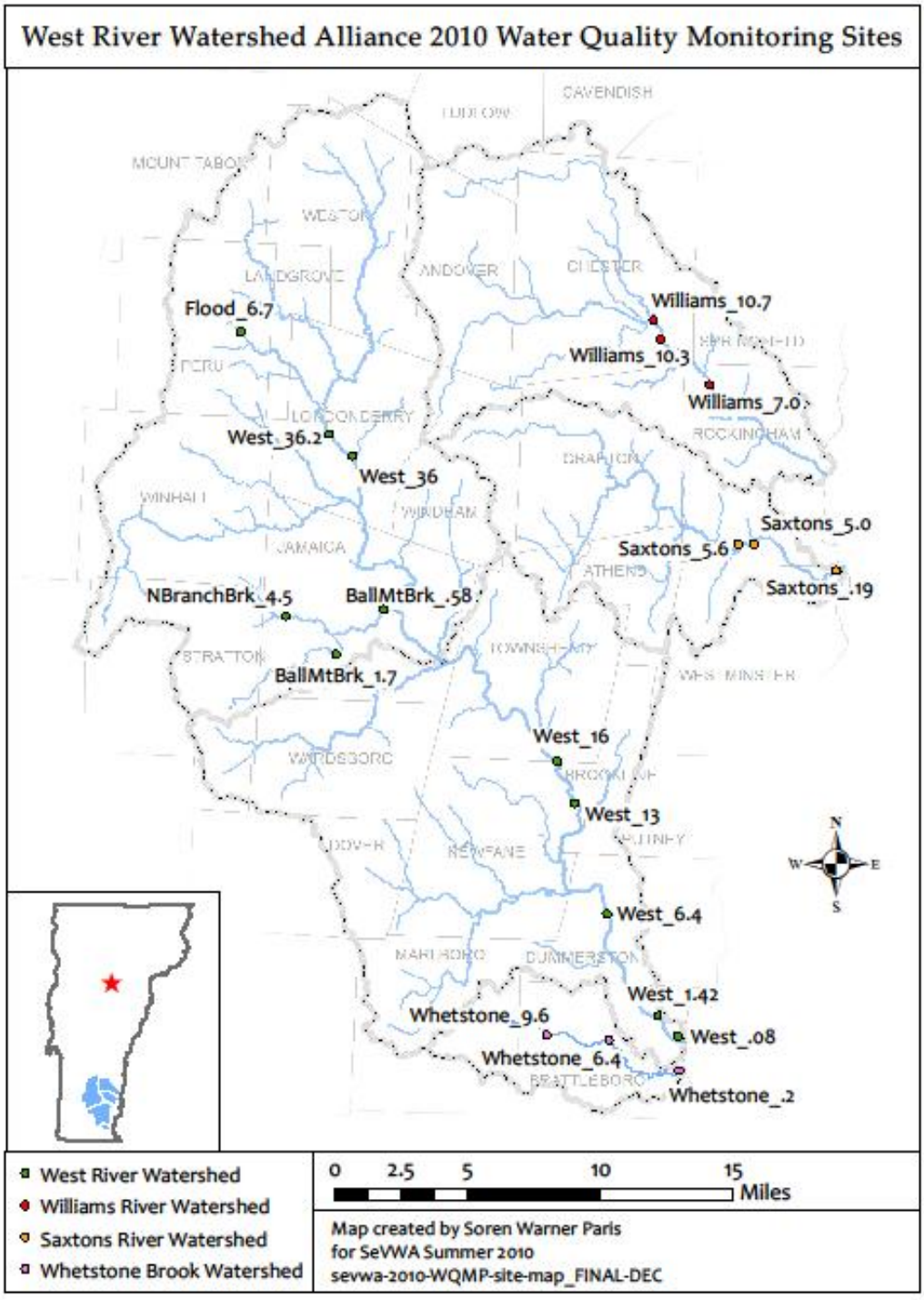


Figure 2: Map of 2011 water quality monitoring sites. *(Produced by Marie Caduto.)*

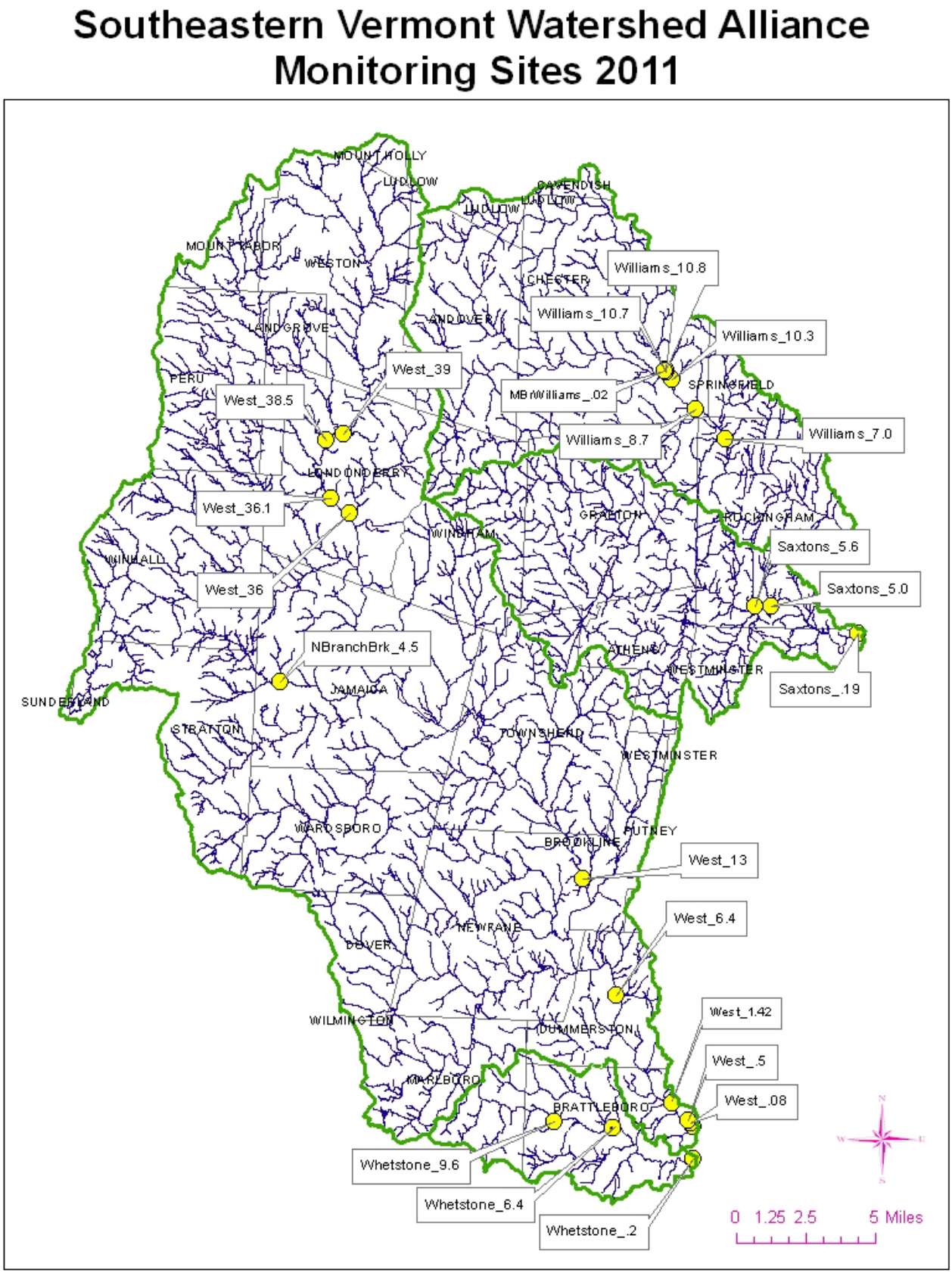
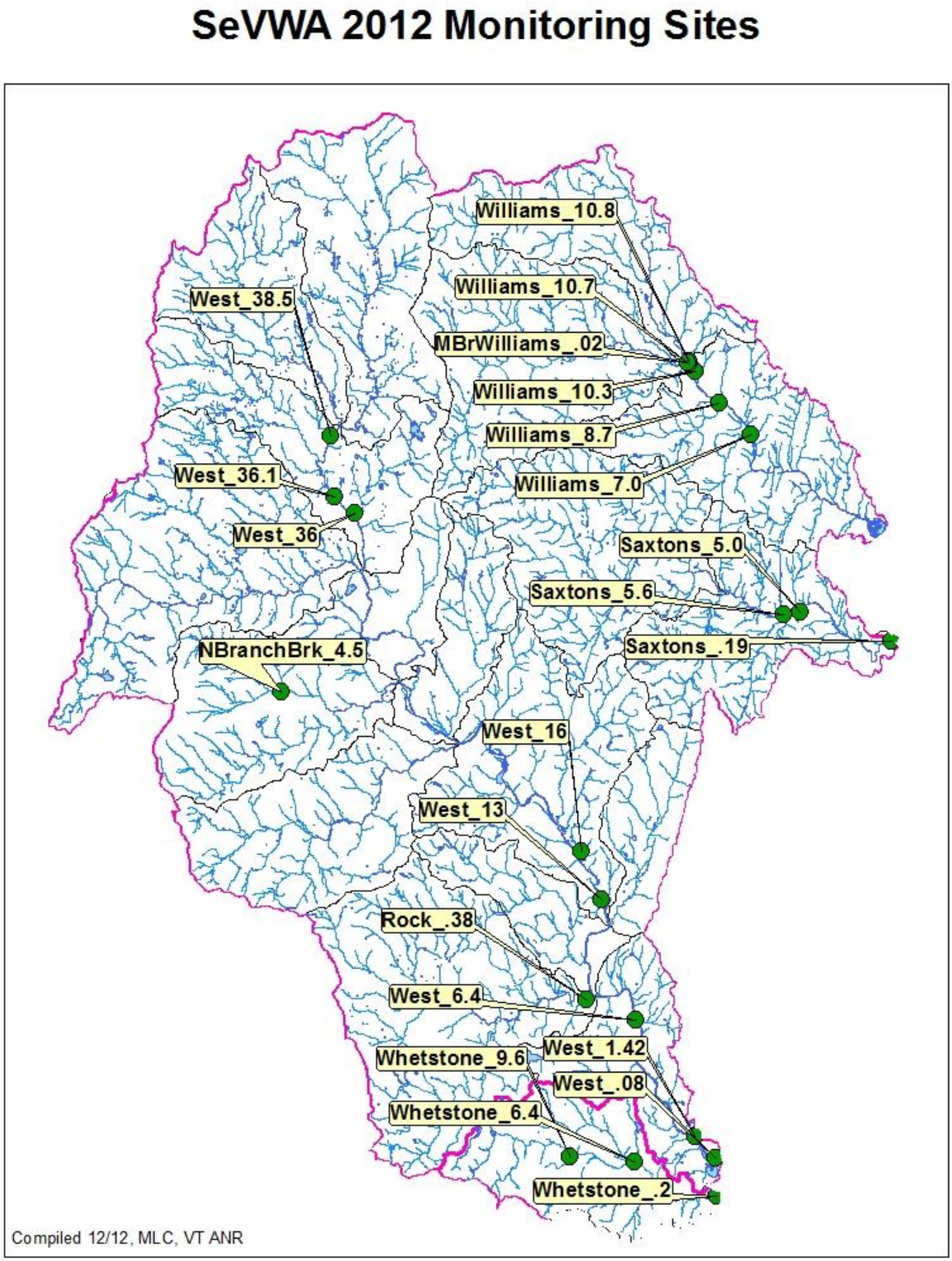


Figure 3: Map of 2012 water quality monitoring sites. *(Produced by Marie Caduto.)*



2.3.2 Monitoring Logistics

In 2010, 2011 and 2012 sampling season began between the middle to end of June and ended around the middle to end of September. In 2012 the 4 once-per-month-only sampling sites had an additional sampling date on October 3rd. Each season's sampling dates were preset, but meteorological conditions were considered. Pre-labeled sample bottles were supplied to volunteers well-ahead of sampling day. Monitoring was done on Wednesday mornings, typically between 6:00-8:30 AM. This timing allowed for the program's *E.coli* samples to be delivered to the CRWC lab in Greenfield within the 6-hour timeframe or for *E.coli* analyses to be conducted within the prescribed 8-hour time frame.

Sample drop-off locations were designated for each river or segment and the program coordinator, assistant or intern picked-up the samples. Examples of drop-off locations: The Pantry in South Londonderry, private residence in Jamaica, Town Office in Newfane, Laurie Callahan's residence in Brattleboro, another private residence in Brattleboro and I-91 Exit 6 Shell station in Rockingham.

The program coordinator, assistant or intern checked field data sheets and samples, delivered samples to CRWC lab in Greenfield for *E. coli* analyses and performed pH and conductivity analyses. In 2012 turbidity analysis was also performed by SeVWA. In 2010 and 2011 SeVWA shared the services of a part-time VT ANR intern with Ottauquechee River Group (ORG). During those monitoring seasons SeVWA and ORG coordinated their WQMP's monitoring days and transport of samples to LaRosa Lab in Waterbury. SeVWA's WQMP coordinator in 2010-2012, Laurie Callahan, would typically deliver SeVWA's *E. coli* samples to the CRWC lab in Greenfield and would assist with processing the *E. coli* samples at the CRWC lab. In 2012 SeVWA and ORG did not have a VT ANR intern's assistance, ORG did not run their WQMP, SeVWA continued to have CRWC perform their *E. coli* analyses, LaRosa Lab was relocated to Burlington and SeVWA utilized Green Mountain Messenger to transport their TP and NOx samples to LaRosa Lab in Burlington.

2.3.3 Monitoring Parameters:

In 2010 and 2011 laboratory analysis was conducted to determine levels of *E. coli*, total phosphorous (TP), combined nitrate and nitrite nitrogen (NO_X) and turbidity (TURB). Conductivity (COND), as specifc conductance (SC), and pH samples were analyzed with meters by SeVWA's WQMP coordinator or designated individual. Water and air temperature were measured by volunteers with armored glass thermometers in the field. For descriptions of parameters see Appendix B. In 2012 SeVWA performed the TURB analysis, along with pH and conductivity analysis. *E. coli* testing was performed by CRWC lab. LaRosa Lab performed TURB, TP and NO_X tests. In 2012 TURB testing was performed with an EPA approved turbidity meter purchased by Laurie Callahan.

2.3.4 Data Management - Data Reporting & Program Assessment

SeVWA's WQMP has tangible products in the form of charts, analysis reports and data files that can be shared with interested individuals, organizations and agencies. The products are important resources when working toward basin planning and maintaining or restoring water quality. Sampling results provide insight into possible impacts on water quality and the community's role in affecting those impacts. Over the long term, WRWA/SeVWA's sampling results can be used to inform policy makers and local citizens of conditions and trends in river water quality, as well as to support and implement the Basin 11 management plan.

One of the main goals of the WRWA/SeVWA monitoring program is to inform the public of recreational site and swimming hole *E. coli* levels by providing the results in local print and at online sites. The *E. coli* results are also posted at two informational kiosks along the main stem of the West River, reported to town health officers and provided to all volunteers to post, publish or distribute within their own local communities.

In 2010-2012 *E. coli* data results, as they were available from the CRWC lab, were published in local print and online media, were posted at kiosks at the Retreat Meadows and the Dummerston covered bridge and were provided to all volunteers so that they could post them in their communities. Occasionally, in 2011, *E. coli* results were posted at the SeVWA blog site and in 2012 the results charts were available at the newly created SeVWA website (https://sites.google.com/site/vtsevwa/). It is understood by SeVWA that sampling conducted at mid-week does not accurately reflect bacterial levels occurring on the high-use weekend days. Public reporting of *E. coli* results was offered to help recreational users make informed decisions about using certain swimming areas.

In 2012, at the invitation of CRWC, some of SeVWA's *E. coli* monitoring results were made available as public information at a new CRWC and Pioneer Valley Planning Commission (MA) website – www.connecticutriver.us. The website provides information about recreational resources in the Connecticut River watershed and part of that information is about water-based recreation and water quality. To find *E. coli* results, by location, at the website go to http://connecticutriver.us/site/content/sites-list and scroll to a swimming hole of interest. In 2012 SeVWA listed two of the most popular swimming hole sites in the southeastern Vermont region that have public access. More of SeVWA's WQMP sites may become part of the publicly accessible list in future monitoring seasons.

The CRWC Lab in Greenfield typically makes *E. coli* analyses results available in just over 24 hours after the tests are set-up. WRWA/SeVWA WQMP coordinator has generally submitted the results and pertinent comments to volunteers and publications within 24 hours of receiving results from CRWC. Results from tests submitted to LaRosa Lab (turbidity, TP and NO_X) are typically available in about 4-6 weeks from submission to the lab. The LaRosa data, CRWC data and the WRWA/SeVWA generated data (pH, conductivity, temperatures, observations) are usually compiled and shared at the end of the year in the program's summary report. A separate report to the LaRosa program that provides basic program information, data and program quality objectives and site location with coordinate information is also produced each year. All of the monitoring season's data is provided to VT DEC in a spreadsheet format required by that department for participation in the LaRosa Lab Services Partnership Program.

The WRWA/SeVWA Program Coordinator and assistant or intern review field data sheets as they are collected at the sample drop off points. Field data and laboratory results are reviewed and entered into the database using Microsoft Excel. Data is reviewed for correctness – typically by a second person. Producing graphs or charts has typically been performed in Microsoft Excel. Relative Percent difference calculations are also performed. Questionable data is flagged and sources rechecked, re-entered as necessary.

3.0 SUMMARY OF RESULTS

3.1 2010, 2011 & 2012 Results Overview

This section of SeVWA/WRWA's 2010, 2011 and 2012 combined report provides summaries, descriptions, tables and graphs of information and results from those three years of water quality monitoring. Stream flow data acquired from USGS are also included in this results section, as is National Weather Service (NWS) precipitation data for 2012.

In Appendix A WRWA/SeVWA's 2010, 2011 and 2012 monitoring programs' Final Report for the LaRosa Partnership Program can be found. These three separate reports contain QA/QC information along with basic project information and findings that are required by VT DEC from groups that participate in the LaRosa Lab Services Partnership Program. Descriptions of monitoring parameters can be found in Appendix B. Charts of compiled *E. coli* results from 2010, 2011 and 2012 that were used for public reporting can be found in Appendix C. Tables of all 2010, 2011 and 2012 field data and field observations appear in Appendix D.

The next few paragraphs present an overview of basic issues that were recognized during the 2010, 2011 and 2012 monitoring seasons. Additional relevant data descriptions and analysis (with graphs and tables), river flows/discharge information and 2012 precipitation data appears in each watershed or river section on the following pages. As mentioned above, for tables of the complete set of 2010, 2011 and 2012 data for all of the monitoring sites, please see Appendix D.

Please note from the **Mean Daily Discharge** graphs (for stream flow information) that the 2010 sampling season generally appeared to be uncharacteristically dry. It is necessary to use caution when using flow rate or discharge information from gauges at dams where flows can be manipulated – such as the dam on the West River in Jamaica. The gauge data on the Saxtons and Williams River are more indicative of flow rates due to precipitation as there are no dams with manipulated discharges on those rivers in the areas where SeVWA's monitoring occurs. Also note, when considering precipitation, flow rates and *E. coli* levels that elevated *E. coli* results can be due to run-off that results from significant rains during the previous hours or days preceding sampling.

In 2010, 2011 and 2012, there were elevated ***E. coli* bacteria** results at a number of WRWA/SeVWA's monitoring sites. The current Vermont *E. coli* standard for Class B waters is 77 per 100 milliliters (mL) of water

for a single sample or for a geometric mean. The US EPA standard for *E. coli* is 235 per 100 milliliters (mL) of water for a single sample and 126 per 100 mL for a geometric mean. In 2012 VT Department of Health (DOH) revised its *E. coli* standard for suitability for swimming from 77 per 100 mL to 235 per 100 mL.

Currently, there is a Total Maximum Daily Load (TMDL) project underway in Vermont to address waters impaired by bacterial pollution. A stretch of the Whetstone Brook in Brattleboro and a segment of the West River in South Londonderry are both included in that project. In the past there have been some *E. coli* issues on the Williams River in Chester and Rockingham. Additional sites were monitored along those sections in 2011 and 2012. There have also been some elevated *E. coli* results along the 3 Saxtons River sites.

See more information regarding *E. coli* data for those specific rivers' sites, along with other parameter results, in the individual river sections that follow.

In 2010 & 2011 **total phosphorous (TP)** levels were unusually high at only one location on the Saxtons River (Saxtons_5.0) and the values ranged from a low of 16.1 ppb to a high of 75.9 ppb. In 2012 there were only 2 samples collected at that site over the monitoring season for TP and both values were greater than 100 ppb. In all three years TP at sites above and below this site of concern were significantly lower. There were also several other sites in 2012 that had TP results in the 30-50 ppb range. It is possible for TP levels greater than 10 ppb to have an impact on the ecosystems of freshwater streams. In 2010, 2011 and 2012 many of the program's monitoring sites had TP values between 10 ppb and 30 ppb.

In 2012 there were some **nitrate-nitrite nitrogen (NOx)** results that were higher than what has been seen in the previous 2 years. Previous NOx results have typically been in the less than 0.05 to 0.4 milligrams per liter (mg.L) range. Sites of possible concern – where values were 0.53-1.7 mg/L were on the Saxtons and Williams Rivers.

During 2010-2012 monitoring there were also elevated **water temperature** readings (approaching, reaching or exceeding 20 degrees Centigrade) at a few sites on the rivers sampled. It must be kept in mind that these measurements were typically made between 6-8:30 AM on sampling days. Site water temperatures on other days or other times later in the day on sampling days probably reached 20 degrees Centigrade or greater. The rivers of Basin 11 are considered waters that will support cold water fish species and active Atlantic salmon restoration stocking has occurred at a number of watershed Basin 11 sites. When water temperatures approach and reach 20 degrees Centigrade, it can be stressful or harmful to the success of cold water fish species.

There were no seriously significant issues with other monitoring parameters from the samples that were collected, such as **turbidity**, **conductivity** and **pH** though there were a couple of sites where conductivity levels were consistently higher and different than other sites in the same river watershed.

For descriptions of the various parameters and for Vermont water quality standards values see Appendix B. The data appearing in the following sections represents some of the most significant results. The complete data for the 2010, 2011 and 2012 WRWA/SeVWA monitoring programs can be found in Appendix D.

The following sections (3.2 – 3.6) present basic data presentation with basic descriptions and analysis (with graphs and tables), river flows/discharge information and 2012 precipitation data for each watershed or river section in SeVWA's WQMP on the last 3 monitoring seasons. The data presentation and discussion is rudimentary and is presented in this report as a starting point for discussion, further analysis and follow-up monitoring or action.

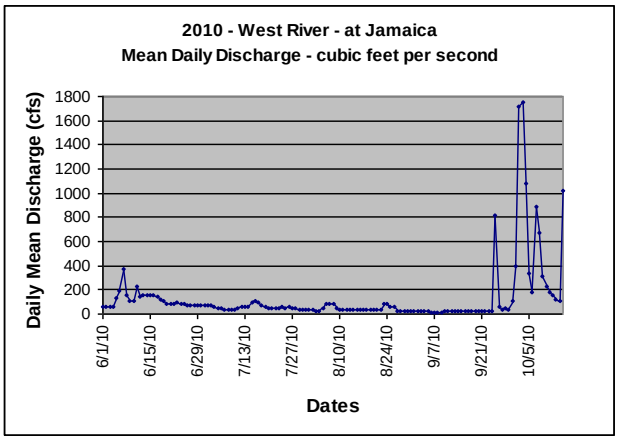
The information provided in this report is a cursory summary of the 2010-2012 SeVWA WQMP data. A more thorough review and analysis of the data should occur when additional time and funds are available. It will be useful to perform a review and analysis of all the years of data – 2003 to 2008 and 2010 to 2012.

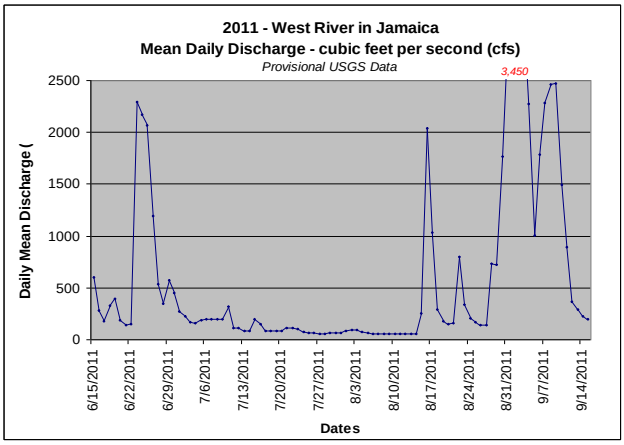
3.2 West River Watershed Summary

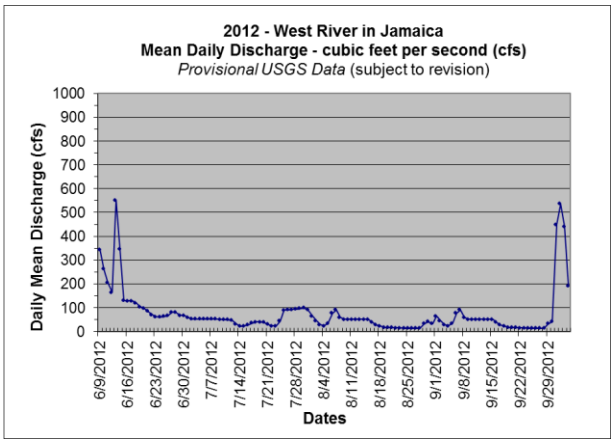
(*Please note that scales on each graph can be very different from other graphs.*)

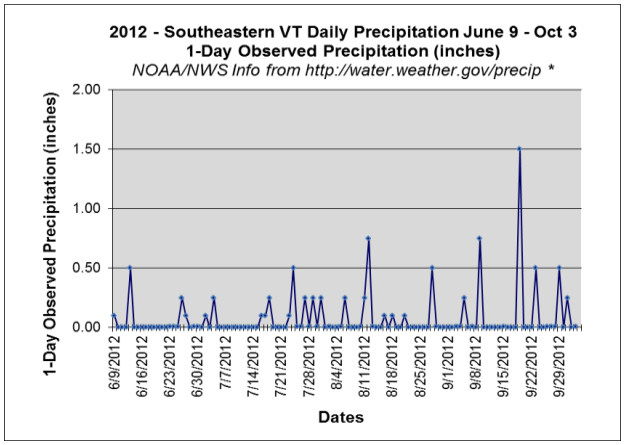
This section is organized as upper West River sites (in Londonderry and South Londonderry), lower West River sites (that are in Townsend, Brookline, Dummerston and Brattleboro); Ball Mountain Brook and North Branch Brook sites; and then the Flood Brook and Rock River (Indian Love Call) monitoring sites.

The mean daily discharge graphs that appear below can be used for the entire West River watershed. They are intended to provide a sense of the volume of water moving through the streams and rivers of the watershed through the 2010, 2011 and 2012 sampling seasons. The lower, right graph shows regional rain data for 2012.









**Mean Daily Discharge or flow rate data available from the USGS National Water Information System at: http://waterdata.usgs.gov/usa/nwis/ or http://waterdata.usgs.gov/vt/nwis/dv/?referred_module=sw

Please note from the Mean Daily Discharge graphs (for stream flow information) that the 2010 sampling season, in particular, appeared to be uncharacteristically dry.

3.2.1 West River - Upper Sites (South Londonderry 2010-2012 and Londonderry 2011-2012)

(*Please note that scales on each graph can be very different from other graphs.*)

MONITORING SITES	SITE DESCRIPTION	2010	2011	2012
West_ 39	Londonderry village, below dam & Rte 100 bridge		**X**	
West_38.5	L'derry, below Mountain Marketplace on Rte 100		**X**	**X**
West_36.2	So. L'derry, Cobb's swim hole, Winhall Hollow Rd.	**X**		
West_36.1	So. L'derry, just below West_36.2, above Rte 100 bridge		**X**	**X**
West_36	So. L'derry, Rowes Rd. (just above small tributary)	**X**	**X**	**X**

Currently, there is a statewide TMDL project underway in Vermont to address waters impaired by bacterial pollution. A segment of the West River in South Londonderry is included in that project. WRWA's WQMP was instrumental in providing data for recognizing the impairment and will continue to collect data for the project's use in order to help remedy the impact.

Due to elevated bacteria measurements during the past few years, the West River from approximately half a mile above to about one mile below South Londonderry's village center did not meet Vermont's water quality standards. The segment was identified as impaired and placed on the 303(d), impaired waters list. The Clean Water Act requires that all 303(d) listed waters undergo a TMDL (Total Maximum Daily Load) assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with state water quality standards. For more information and recommendations to address the possible impacts see the VT DEC online publications, **VT DEC Water Quality Division, Vermont Statewide Total Maximum Daily Load (TMDL) *for Bacteria-Impaired Waters*** and **Vermont Statewide Total Maximum Daily Load (TMDL) *for Bacteria* – Appendix 15, West River**.

Sampling did not occur on scheduled sampling date 8/31/11 due to effects of tropical storm Irene.

***E. coli* results:**

GEOMEAN = geometric mean, MAX = maximum value of season's samples collected, N = total number of samples collected during the sampling season (VT Class B *E. coli* standard: single sample or GEOMEAN = 77 *E. coli* per 100 mL; VT DOH "suitable for swimming" standard (single sample) = 235 per 100 mL; US EPA standard: single sample = 235 per 100 mL, GEOMEAN = 126 per 100 mL)

2010 *E. coli* results [MPN (most probable number of) *E. coli* per 100 milliliters of water]

SITE	6/30/10	7/14/10	7/28/10	8/11/10	8/25/10	9/8/10	9/22/10	GEO-MEAN	MAX	N
West_36.2	101.7	1986.3	116.9	166.4	152.9	98.7	63.1	167.8	1986.3	7
West_36	50.4	866.4	161.6	133.4	95.8	122.3	135.4	147.1	866.4	7

2011 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/22/11	7/6/11	7/20/11	8/3/11	8/17/11	8/31/11	9/14/11	GEO-MEAN	MAX	N
West_39	160.7	77.1	150.0	62.4	228.2	NT	66.3	109.8	228.2	6
West_38.5	65	52.8	101.7	41.4	139.6	NT	41.0	66.0	53	6
West_36.1	60.9	47.3	73.8	39.9	161.6	NT	26.2	57.4	161.6	6
West_36	67.0	79.4	98.7	387.3	325.5	NT	23.3	107.5	387.3	6

2012 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/13/12	6/27/12	7/11/12	7/25/12	8/8/12	8/22/12	9/5/12	GEO-MEAN	MAX	N
West_38.5	727.0	272.3	86.0	547.5	52.1	27.2	52.0	131.7	727.0	7
West_36.1	920.8	298.7	108.6	770.1	156.5	162.4	143.9	261.7	920.8	7
West_36	920.8	344.1	93.3	686.7	88.4	90.9	117.8	212.0	920.8	7

Based on recommendations from the VT DEC TMDL project, in 2011 the West_36.2 site in So. Londonderry was moved slightly downstream to West_36.1, as the site at 36.2 had relatively little stream flow and significant sediment that was easily disturbed. There were also 2 monitoring sites added upstream in Londonderry -

West_38.5 and West_39. Some of the higher *E. coli* values at West_39 could possibly be due to the location of the site, which is below Rte. 100/11, a dam that is essentially where the road crosses the river and a large, shallow impounded area behind the dam. West_39 was not included in the monitoring program in 2012. In 2011, very high *E. coli* values that were seen in previous years were not seen. The explanation for this is not currently known. The 2011 results seemed to indicate that there was possibly an impact source between West_36.1 and West_36. In 2012 some results at all sites exceeded VT Class B, EPA and "swimming suitability" standards. Rain and resulting run-off from surrounding landscape had an influence on some of the days results in 2012, but dry weather days' results in 2012 did not reflect the patterns of 2011.

Please note from the Mean Daily Discharge graphs (for stream flow information) that the 2010 sampling season in general was uncharacteristically dry.

Here is a table of 2010, 2011& 2012 Londonderry and So. Londonderry sites' *E. coli* GEOMEANS:
(N = number of samples from each site during the monitoring season; NT = this site not tested during this season)

SITE	SITE DESCRIPTION	2010 GEOMEAN N = 7	2011 GEOMEAN N = 6	2012 GEOMEAN N = 7
West_39	Londonderry village, below dam & Rte 100 bridge	NT	109.8	NT
West_38.5	L'derry, below Mountain Marketplace on Rte 100	NT	66.0	131.7
West_36.2	So. L'derry, Cobb's swim hole, Winhall Hollow Rd.	167.8	NT	NT
West_36.1	So. L'derry, just below West_36.2, above Rte 100 bridge	NT	57.4	261.7
West_36	So. L'derry, Rowes Rd. (just above small tributary)	147.1	107.5	212.0

Total Phosphorous (TP) results:
It is possible for TP levels greater than 10 ppb to have an impact on freshwater stream ecosystems.
Upper West River sites:
2010 – At upper West River sites TP values ranged from 8.5 – 14.7 ppb
2011 – At upper West River sites TP values ranged from 10.1 – 16.1 ppb
2012 – At upper West River sites TP values ranged from 7.82 – 23.8 ppb

Water Temperature:
At some point over the course of the 2010 monitoring season from late June until early September, water temperatures at monitoring sites along the Saxtons, Williams and West Rivers measured in ranges at or above 20 degrees Centigrade (C). These temperatures can have a negative impact on cold water fish species.
It must be kept in mind that these measurements were typically made between 7-8 AM on sampling days. Site water temperatures on other days or other times later in the day on sampling days probably reached 20 deg C or greater. It may be helpful to further define actual temperature occurrences at some of these sites – especially those expected to support cold water fisheries restoration – with longer term data collection utilizing HOBO temperature monitoring devices.
West River - upper sites:
2010 - At West_36 and West_36.2 in South Londonderry the maximum water temperature measured during sampling was 21 degrees Centigrade.
2011 - At West_36 and West_36.1 in South Londonderry and West_38.5 and West_39 in Londonderry the maximum water temperature measured during sampling was 20 degrees Centigrade.
2011 - At West_36 and West_36.1 in South Londonderry the maximum water temperature measured during sampling was 20 degrees Centigrade.

3.2.2 West River - Lower Sites (2010, 2011 & 2012 Townsend, Brookline, Dummerston, Brattleboro)

(*Please note that scales on each graph can be very different from other graphs.*)

MONITORING SITES	SITE DESCRIPTION	2010	2011	2012
West_16	Townsend, Ellen Ware Road	**X**		**X**
West_13	Brookline, Brookline bridge	**X**	**X**	**X**
West_6.4	Dummerston, Dummerston covered bridge	**X**	**X**	**X**
West_1.42	Brattleboro, Behind B'boro Professional Center, Rte. 30	**X**	**X**	**X**
West_.5	Brattleboro, just above West_.08, new site in 2011		**X**	
West_.08	Brattleboro, Milk House Meadows, just above Marina	**X**	**X**	**X**

Sampling did not occur on scheduled sampling dates 8/31/11 and 9/14/11 due to effects of tropical storm Irene. During the 2012 sampling season major construction at the Dummerston covered bridge site prevented sampling on just one day, on 7/25/12.

Please note from the Mean Daily Discharge graphs (for stream flow information) that the 2010 sampling season in general appeared uncharacteristically dry.

***E. coli* results:**

GEOMEAN = geometric mean, MAX = maximum value of season's samples collected,
N = total number of samples collected during the sampling season
(VT Class B *E. coli* standard: single sample or GEOMEAN = 77 *E. coli* per 100 mL;
VT DOH "suitable for swimming" standard (single sample) = 235 per 100 mL;
US EPA standard: single sample = 235 per 100 mL, GEOMEAN = 126 per 100 mL)

2010 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/30/10	7/14/10	7/28/10	8/11/10	8/25/10	9/8/10	9/22/10	GEOMEAN	MAX	N
West_16	42.2	NT	52.9	NT	69.1	NT	33.1	47.5	69.1	4
West_13	52.0	25.6	52.0	66.3	95.9	272.3	21.8	59.4	272.3	7
West_6.4	18.7	12.0	30.9	58.3	93.4	51.2	34.1	35.1	93.4	7
West_1.42	22.8	51.2	49.6	71.7	143.9	39.1	17.5	45.6	143.9	7
West_.08	39.3	88.4	127.4	648.8	21.3	866.4	579.4	163.1	866.4	7

2011 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/22/11	7/6/11	7/20/11	8/3/11	8/17/11	8/31/11	9/14/11	GEOMEAN	MAX	N
West_16	NT	NT	NT	NT	NT	NT	NT	NA	NA	0
West_13	32.7	40.4	52.8	45.0	517.2	NT	NT	69.5	517.2	5
West_6.4	39.3	34.5	25.9	35.5	NT	NT	NT	33.4	39.3	4
West_1.42	96.0	25.6	NT	24.1	579.4	NT	NT	76.5	579.4	4
West_.5	30.5	38.9	44.8	69.1	387.3	NT	NT	67.7	387.3	5
West_.08	42.0	52.8	42.8	78.5	307.6	NT	NT	74.5	307.7	5

2012 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/13/12	6/27/12	7/11/12	7/25/12	8/8/12	8/22/12	9/5/12	GEOMEAN	MAX	N
West_16	79.4	68.3	40.4	166.4	93.3	50.4	67.6	73.5	166.4	7
West_13	133.3	56.3	33.2	189.1	85.7	79.8	76.3	81.8	189.1	7
West_6.4	115.3	54.8	17.1	NA	62.4	34.1	129.6	55.7	129.6	6
West_1.42	150.0	95.9	24.7	1,046.2	69.7	30.9	38.4	84.5	1,046.2	7
West_.5	NT	NT	NT	NT	NT	NT	NT	NA	NA	0
West_.08	156.5	59.1	9.7	68.3	59.8	63.1	178.5	63.4	178.5	7

N = number of samples collected from each site during the monitoring season;
NA = results from this site not available for this date this site not tested on this date;
NT = sample from this site either not collected or not tested for this date
MAX = maximum value for this site for this monitoring season
See 2010, 2011 and 2012 lower West River sites' E. coli GEOMEANS charts on the next page.

Here is a table of 2010, 2011& 2012 lower West River sites' *E. coli* GEOMEANS:
(NT = this site not tested during this season)

SITE	SITE DESCRIPTION	2010 GEOMEAN	2011 GEOMEAN	2012 GEOMEAN
West_16	Townsend, Ellen Ware Road	47.5	NT	73.5
West_13	Brookline, Brookline bridge	59.4	69.5	81.8
West_6.4	Dummerston, Dummerston covered bridge	35.1	33.4	55.7
West_1.42	Brattleboro, Behind B'boro Professional Center, Rte. 30	45.6	76.5	84.5
West_.5	Brattleboro, just above West_.08, new site in 2011	NT	67.7	NT
West_.08	Brattleboro, Milk House Meadows, just above Marina	163.1	74.5	63.4

In 2010 *E. coli* values were elevated at West_.08, the Milkhouse Meadows site just above the convergence with the Connecticut River and The Marina Restaurant in Brattleboro. In 2011 a site was added just above West_.08, at West_.5, to help determine the possible direction of the *E. coli* source. In 2010 there appeared to be more geese in this area of the West River, just upstream of West_.08, than in previous seasons. In 2011 the number of geese did not appear to be as high as in 2010. There could have been other possible contributing factors. There is also a beaver colony in a river setback area and a house with a private septic system just north of the West_.5 and West_.08 sites. Also at times, because of influences of the Connecticut River, the flow can move upstream at the West_.08 site on the West River. There is also a town of Brattleboro public wastewater pumping station just below the West_.08 site beside a road that parallels the river. In 2011 West_.08 and the newly selected site West_.5 *E. coli* GEOMEANS were less than the VT standard of 77. The West_.5 site was not monitored in 2012.

In general, for the lower West River sites in 2010-2012, the *E. coli* GEOMEAN values were less than or just barely above the VT Class B standard of 77. In 2012, about 1/3 of individual sample values were above the VT Class B standard of 77, but those results did not exceed the VT "suitable for swimming" standard or EPA single sample standard of 235.

West_1.42 was included in the monitoring program in 2010 as there is a riverside town park being developed in the vicinity and a public hand-carry boat access will be located in close proximity to the monitoring site. The sampling site is also in close proximity to a popular swimming hole that has been monitored in past years. There was an unusually high *E. coli* result on 7/25/12 at the West_1.42 site. This date was considered a "wet" sampling date, but precipitation had not been heavy preceding the AM sampling on 7/25. The West_.08 site, about 1 mile downstream, had a remarkably lower *E. coli* result of 68.3 on that sampling date. There are not any significant tributaries that enter the West River between West_1.42 and West_.08 to dilute the flow between the two sites. A possible cause for the remarkably unusual result is elusive. The source of the elevated *E. coli* may have been a very brief, locally isolated event.

Other elevated *E. coli* results on particular days appear to be related to "wet" sampling events. There had probably been a significant amount of rain in the previous 2-3 days, so conditions were above base flow, and there appears to be bacteria laden run-off making it to the river. Other possible explanations for increased *E. coli* levels along this lower stretch of the West River were addressed in the first paragraph above.

Total Phosphorous (TP) results:
It is possible for TP levels greater than 10 ppb to have an impact on freshwater stream ecosystems.
West River – lower sites:
2010 – At lower West River sites (West_16 down to West_.08) TP values ranged from 8.2 – 14.2 ppb
2011 – At lower West River sites (West_13 down to West_.08) TP values ranged from 10.5 – 22.5 ppb (The highest values were at the most downstream sites.)
2012 – At lower West River sites (West_16 down to West_.08) TP values ranged from 8.98 – 32.3 ppb

Water Temperature:
At some point over the course of all 3 monitoring seasons, water temperatures at monitoring sites along the lower stretch of the West River (West_16 to West_.08) measured in ranges approaching, at or above 20 degrees Centigrade (C). These temperatures can have a negative impact on cold water fish species. It must be kept in mind that these measurements were typically made between 7-8 AM on sampling days. Site water temperatures on other days or other times later in the day on sampling days probably reached 20 deg C or greater.

The tree canopy along the lower stretch of the West River is very open, or is not present, and the river is much wider than most of the other rivers and streams in Basin 11 and 13. There are also many shallow, rocky, bouldery areas which heat-up in the summer sun and warm the water.

In all 3 years – 2010, 2011 and 2012 – the highest water temperatures recorded on sampling mornings were from West_.08. In 2010 it was 26 degrees C, in both 2011 and 2012 it was 24.5 degrees C.

3.2.3 North Branch Brook site (Pikes Falls) and Ball Mountain Brook sites, Jamaica (2010-2012 North Branch Brook_4.5, 2010 only for 2 Ball Mountain Brook sites)

(*Please note that scales on each graph can be very different from other graphs.*)

MONITORING SITES	SITE DESCRIPTION	2010	2011	2012
NBranchBrk_4.5	Jamaica, Pikes Falls swimming hole	**X**	**X**	**X**
BallMtBrk_1.7	Jamaica, Broken Glass Lane	**X**		
BallMtBrk_.58	Jamaica village swimming hole, Water St., below Rte 30	**X**		

The NBranchBrk_4.5 site was only scheduled to be sampled on a monthly basis during 2010, 2011 and 2012. No *E. coli* samples were collected in 2010, but they were collected once per month along with other parameters in 2011 and 2012. The BallMtBrk_1.7 site was also only scheduled to be sampled on a monthly basis during 2010 and no *E. coli* samples were collected there either in 2010. BallMtBrk_.58 was sampled every 2 weeks in 2010 and since it is a popular swimming hole *E. coli* samples were collected each sampling day.

The NBranchBrk_4.5 site, Pikes Falls, is a popular swimming hole in Jamaica, is a site selected by VT DEC for long term water quality monitoring and is also a long term monitoring site for WRWA/SeVWA. The two Ball Mountain Brook sites that were part of the monitoring program in 2010 were not sampled in 2011 or 2012.

Sampling did not occur on scheduled sampling dates 8/31/11 and 9/14/11 due to effects of tropical storm Irene. Please note from the Mean Daily Discharge graphs (for stream flow information) that the 2010 sampling season in general appeared uncharacteristically dry.

***E. coli* results:**

GEOMEAN = geometric mean, MAX = maximum value of season's samples collected, N = total number of samples collected during the sampling season (VT Class B *E. coli* standard: single sample or GEOMEAN = 77 *E. coli* per 100 mL; VT DOH "suitable for swimming" standard (single sample) = 235 per 100 mL; US EPA standard: single sample = 235 per 100 mL, GEOMEAN = 126 per 100 mL)

2010 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/30/10	7/14/10	7/28/10	8/11/10	8/25/10	9/8/10	9/22/10	GEOMEAN	MAX	N
BallMtnBrk_.58	5.1	59.1	57.3	79.4	47.1	52.8	16.1	34.2	79.4	7
BallMtnBrk_1.7	NT	NT	NT	NT	NT	NT	NT	NA	NA	0
NBranchBrk_4.5	NT	NT	NT	NT	NT	NT	NT	NA	NA	0

2011 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/22/11	7/6/11	7/20/11	8/3/11	8/17/11	8/31/11	9/14/11	GEOMEAN	MAX	N
BallMtnBrk_.58	NT	NT	NT	NT	NT	NT	NT	NA	NA	0
BallMtnBrk_1.7	NT	NT	NT	NT	NT	NT	NT	NA	NA	0
NBranchBrk_4.5	13.4	NT	10.9	NT	95.9	NT	NT	24.1	95.9	3

2012 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/13/12	7/11/12	7/25/12	8/8/12	8/22/12	9/5/12	10/3/12	GEOMEAN	MAX	N
BallMtnBrk_.58	NT	NT	NT	NT	NT	NT	NT	NA	NA	0
BallMtnBrk_1.7	NT	NT	NT	NT	NT	NT	NT	NA	NA	0
NBranchBrk_4.5	NT	2.0	NT	42.2	NT	344.1	9.7	24.1	344.1	4

N=number of samples from site during the monitoring season; NA=results from this site, this date not available;
NT = sample from this site not collected or not tested for this date;
MAX = maximum value for this site for this monitoring season

Table of 2010-2012 NBranchBrk_4.5 sites' *E. coli* GEOMEANS:
(N = number of samples from the site during the monitoring season; NT = this site not tested during this season)

SITE	SITE DESCRIPTION	2010 GEOMEAN	2011 GEOMEAN N = 3	2012 GEOMEAN N = 4
NBranchBrk_4.5	Jamaica, Pikes Falls swimming hole	NT	24.1	23.0

E. coli levels at the Ball Mountain Brook and North Branch Brook sites 2010-2012 have typically tested below the VT Class B standard of 77, sometimes they have run approximately at or slightly above the VT standard. *E. coli* GEOMEAN values at these sites have typically been below the VT standard. Of the 4 once-per-month samples collected at the NBranchBrk_4.5 site in 2012, the 9/5/12 sample had an unusually high *E. coli* result. 9/5/12 was considered a "wet" sampling day.

There was some brief discussion about some construction and streamside disturbance above Pikes Falls in Jamaica. The matter was mentioned to Marie Caduto and a suggestion was made to the Jamaica resident to contact a person in Environmental Compliance at the state if there were concerns.

There were not any significant water quality issues detected at these sites in 2010 and 2011 based on the dates sampled and the parameters analyzed. One remark here regarding conductivity readings for the NBranchBrk_4.5 site: Conductivity readings typically run higher – around 200 uS/cm – at the NBranchBrk_4.5 site than at most of the other program sites. This may be due to upstream influences or character of local soils or geology. The maximum water temperature recorded for the 4 sampling mornings in 2012 was 15 deg C.

3.2.4 Flood Brook, just below Hapgood Pond & Hapgood Pond Rd., Peru (2010 only, not monitored in 2011, 2012)

MONITORING SITES	SITE DESCRIPTION	2010	2011	2012
FloodBrk_6.7	Peru, below Hapgood Pond and Hapgood Pd. Rd.	**X**		

This site was monitored in 2010 at the request of Marie Caduto VT DEC, Basin 11 Watershed Coordinator. It was only scheduled to be sampled on a monthly basis during the 2010 monitoring season. WRWA/SeVWA did not collect samples for *E. coli* testing at this site in 2010. U.S. Forest Service (USFS) runs the recreational area with a beach at Hapgood Pond and they do *E. coli* testing through the summer months. Those results are probably available to the public from the USFS, but are not available in this report.

The only parameter analyzed in 2010 (and in previous years) that was somewhat indicative of a possible water quality issue was total phosphorous (TP). TP samples in 2010 ranged from 13.4 ppb to 18.8 ppb. These values could be, in part, due to the fact that there is usually beaver activity upstream of the site and due to the very shallow, probably wind-mixed, small pond at the Hapgood Pond recreational area, also just upstream of the sampling site.

The FloodBrk_6.7 site was not monitored in 2011 and there are no plans to include it in the SeVWA monitoring program in 2012.

3.2.5 Rock River, in vicinity of Indian Love Call, just above Rte 30, Newfane

[E. coli monitoring in 2011, independent of WRWA/SeVWA program (though SeVWA provided assistance); monitoring part of SeVWA program in 2012]

A note regarding Indian Love Call swimming hole on the Rock River in Newfane, VT:

In 2011 Cris White, a Newfane property owner in the vicinity of Indian Love Call on the Rock River in Newfane, spearheaded an independent effort to re-activate *E. coli* monitoring at the Indian Love Call swimming hole site. WRWA had monitored in the vicinity for a few years, but more recently the site has not been part of the WRWA/SeVWA WQMP. Cris received volunteer water sampling training from WRWA/SeWVA, she collected samples the same mornings that the SeVWA volunteers collected samples and then her samples were transported with SeVWA samples to the CRWC lab in Greenfield. Since the Rock River site was not a part of the SeVWA 2011 WQMP Cris and Rock River Preservation, via Thom Chiofalo, paid for the CRWC *E. coli* analysis. SeVWA was glad to be able to facilitate Cris' effort to re-activate the monitoring at Indian Love Call.

The site was included in the 2012 SeVWA WQMP and Cris participated as the volunteer monitor for the site.

(*The Rock River is a significant tributary of the West River, meeting the West River between the West_13 and West_6.4 WQMP monitoring sites.*)

2011 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

* This site was not officially part of SeVWA's WQMP in 2011. Data from CRWC lab provided by Cris White. (See text box above for more info.)

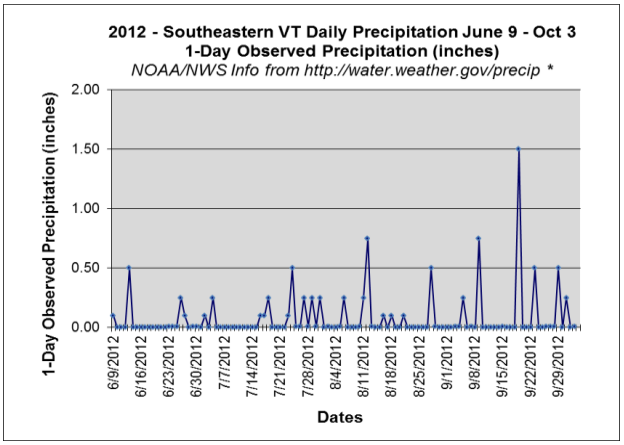
SITE	6/22/11	7/6/11	7/20/11	8/3/11	8/17/11	8/31/11	9/14/11	GEO-MEAN	MAX	N
Indian Love Call*	NA	24.1	13.4	10.9	118.7	NT	NT	25.4	118.7	4

2012 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/13/12	6/27/12	7/11/12	7/25/12	8/8/12	8/22/12	9/5/12	GEO-MEAN	MAX	N
Rock_.38	307.6	81.6	28.2	58.3	22.3	88.2	206.4	77.5	307.6	7

N=number of samples from site during the monitoring season; NA = results from this site, this date not available;
NT = sample from this site not collected or not tested for this date;
MAX = maximum value for this site for this monitoring season

The highest *E. coli* values from both years were from "wet" sampling days. On 8/17/11, 6/13/12 and 9/5/12 all of the *E. coli* values exceeded the VT Class B waters standard of 77, though only the 6/13/12 results exceeded the VT "suitable for swimming" and EPA standards of 235. The GEOMEANS basically met the VT Class B waters standard.



At this site and upstream of it are a series of popular swimming holes along the Rock River. There are concerns that there are inadequate sanitary facilities at this heavily used stream location. On hot summer weekends this location is visited by hundreds of people. There are no public restrooms or sanitary facilities available.

On 9/5/12 the water temperature at 7:30 AM was 19.5 deg C.

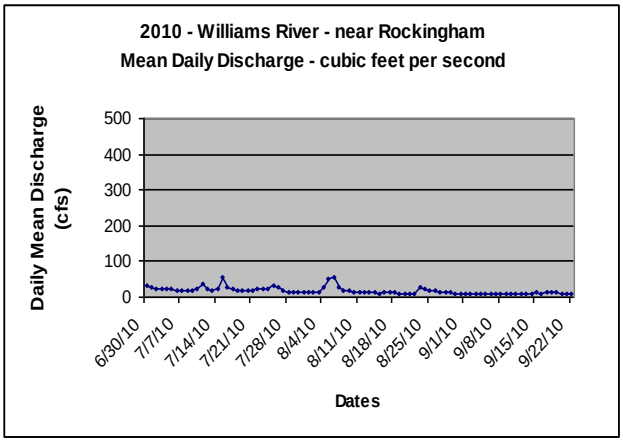
Generally there were no concerns with other parameters analyzed through SeVWA's program at this site. To reiterate, those parameters are TP, NOx, pH, COND and TURB.

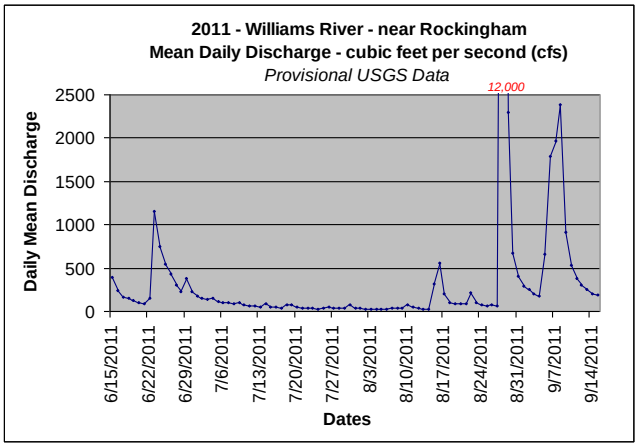
3.3 Williams River Summary - This section presents upper Williams River sites in the village of Chester and lower Williams River sites in Chester and Rockingham. Data shown is for 2010-2012 monitoring seasons**.** (Please note that scales on each graph can be very different from other graphs.)

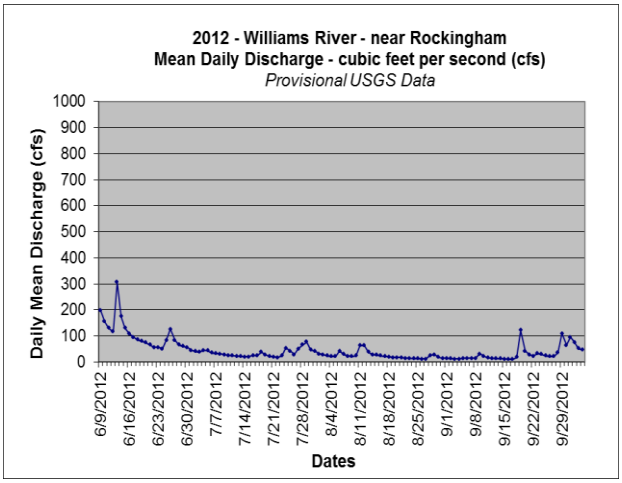
MONITORING SITES	SITE DESCRIPTION	2010	2011	2012
MBrWilliams_.02	Chester, Middle Branch Williams R., just above Rainbow Rock		X	X
Williams_10.8	Chester, just above confluence of Middle Br. Williams R. & 10.7		X	X
Williams_10.7	Chester village, Rainbow Rock swimming hole	X	X	X
Williams_10.3	Chester, below Chester village WWTF	X	X	X
Williams_8.7	Chester, just above Missing Link Rd. bridge		X	X
Williams_7.0	Rockingham, just above Bartonsville bridge	X	X	X

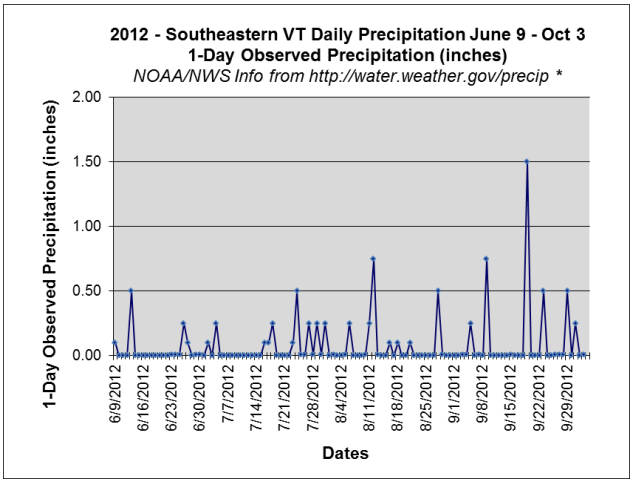
Construction at the Bartonsville bridge site, Williams_7.0 required moving the monitoring location upstream slightly.

The mean daily discharge graphs that appear below can be used for all Williams River sites. They are intended to provide a sense of the volume of water moving through the streams and rivers of the watershed through the 2010, 2011 and 2012 sampling seasons. The lower, right graph shows regional rain data for 2012.









**Flow Rate Data available from the USGS National Water Information System at:
http://waterdata.usgs.gov/usa/nwis/ or http://waterdata.usgs.gov/vt/nwis/dv/?referred_module=sw

Please note from the Mean Daily Discharge graphs (for stream flow information) that the 2010 sampling season, in particular, appeared to be uncharacteristically dry.

***E. coli* results:**

In 2010 *E. coli* results at the 3 Williams River sites seemed to regularly exceed the VT Class B waters standard of 77 *E. coli* per 100 mL of water. Because of that 2 additional sites were added in Chester above Rainbow Rock (Williams_10.7) and an additional site was added above the Bartonsville bridge site (Williams_7.0). In 2011 there was not a very dramatic difference in the *E. coli* values compared to 2010, but in 2012 the individual sites' results and the GEOMEANS for each site appear to have had significant increases. These 2010-2012 *E. coli* results need closer scrutiny, with methodical follow-up examination of possible sources of the *E. coli* in the stream corridor and watershed.

GEOMEAN = geometric mean, MAX = maximum value of season's samples collected, N = total number of samples collected during the sampling season (VT Class B *E. coli* standard: single sample or GEOMEAN = 77 *E. coli* per 100 mL; VT DOH "suitable for swimming" standard (single sample) = 235 per 100 mL; US EPA standard: single sample = 235 per 100 mL, GEOMEAN = 126 per 100 mL)

2010 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/30/10	7/14/10	7/28/10	8/11/10	8/25/10	9/8/10	9/22/10	GEO-MEAN	MAX	N
Williams_10.7	111.9	290.9	NT	143.9	206.4	304.4	54.6	158.9	304.4	6
Williams_10.3	NT	NT	93.3	NT	NT	NT	34.5	56.7	93.3	2
Williams_7.0	204.6	137.6	96.0	>2419.6	165.8	133.4	33.1	173.8	>2419.6	7

2011 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/22/11	7/6/11	7/20/11	8/3/11	8/17/11	8/31/11	9/14/11	GEO-MEAN	MAX	N
MBrWilliams_.02	31.8	90.6	86.2	45.7	104.3	NT	NT	65.3	104.3	5
Williams_10.8	410.6	83.3	122.3	101.2	NT	NT	NT	143.4	410.6	4
Williams_10.7	76.7	108.1	88.4	75.4	142.1	NT	NT	95.3	142.1	5
Williams_10.3	90.8	107.6	116.2	66.3	129.6	NT	38.9	85.1	129.6	6
Williams_8.7	83.3	67.7	127.4	46.4	201.4	NT	NT	92.3	201.4	5
Williams_7.0	63.1	79.4	175.2	88.0	222.4	NT	42.6	94.9	222.4	6

2012 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/13/12	6/27/12	7/11/12	7/25/12	8/8/12	8/22/12	9/5/12	GEO-MEAN	MAX	N
MBrWilliams_.02	NT	517.2	325.5	298.7	160.7	228.2	1,413.6	371.0	1413.6	6
Williams_10.8	NT	214.2	209.8	488.4	224.7	461.1	260.3	289.8	488.4	6
Williams_10.7	NT	328.2	129.6	NA	228.2	290.9	1,413.6	331.3	1413.6	6
Williams_10.3	1,553.1	>2,419.6	125.9	224.7	116.2	290.9	260.3	369.2	>2419.6	7
Williams_8.7	1,986.3	248.9	275.5	325.5	116.9	224.7	1,413.6	400.3	1986.3	7
Williams_7.0	1,046.2	>2,419.6	155.3	686.7	206.4	117.8	260.3	402.4	>2419.6	7

N=number of samples from site during the monitoring season; NA=results from this site, this date not available;
NT = sample from this site not collected or not tested for this date;
MAX = maximum value for this site for this monitoring season

Table of 2010-2012 Williams River *E. coli* GEOMEANS (NT = this site not tested during this season):

SITE	SITE DESCRIPTION	2010 GEOMEAN	2011 GEOMEAN	2012 GEOMEAN
MBrWilliams_.02	Chester, Mid. Br. Williams R., just above Rainbow Rock	NT	104.3	371.0
Williams_10.8	Chester, just above confl. of Mid.Br.Williams R. & 10.7	NT	410.6	289.8
Williams_10.7	Chester village, Rainbow Rock swimming hole	158.9	142.1	331.3
Williams_10.3	Chester, below Chester village WWTF	56.7	129.6	369.2
Williams_8.7	Chester, just above Missing Link Rd. bridge	NT	201.4	400.3
Williams_7.0	Rockingham, just above Bartonsville bridge	173.8	222.4	402.4

In 2010 *E. coli* levels were of concern at Williams_10.7 and at Williams_7.0. Williams_10.7 had a maximum season value of 304 *E. coli* per 100 milliliters of water and a GEOMEAN of 158.9. These values exceeded

both the VT and EPA standards for single samples and for GEOMEANS. Williams_7.0 had a maximum season value of >2419.6 *E. coli* per 100 milliliters of water and a GEOMEAN of 173.8. These values also exceeded both the VT and EPA standards for single samples and for GEOMEANS. In 2011 additional monitoring sites were chosen in an attempt to possibly explain the source locations of the elevated *E. coli* at those two sites. For the 2011monitoring season MBrWilliams_.02 and Williams_10.8 were added just above the Williams_10.7 site and Williams_8.7 was added above Williams_7.0.

During the 2011 sampling season the Williams_10.7 site's *E. coli* results exceeded the VT standard on 3 single sample occasions and the GEOMEAN of 95.3 exceeded the VT standard of 77, but none of those single sample values exceeded the EPA single sample standard of 235 and the GEOMEAN value of 95.3 did not exceed the EPA GEOMEAN standard of 126. The new Williams_10.8 site's maximum season value exceeded both the VT and EPA single sample standard and the GEOMEAN for that site also exceeded both the VT and EPA GEOMEAN standards. The other new site, MBrWilliams_.02, upstream of Williams_10.7 exceeded the VT single sample standard on 3 occasions in 2011, but did not exceed the EPA single sample standard and its GEOMEAN value was below the VT and EPA GEOMEAN standard.

In 2011 Williams_7.0 exceeded the VT single sample standard on 3 occasions, but did not exceed the EPA single sample standard of 235 and its GEOMEAN value was 94.9, about 18 above the VT GEOMEAN standard, but below the EPA GEOMEAN standard of 126. Williams_8.7 had a similar pattern in 2011.

In 2012 the same 6 sites were monitored as were in 2011. In general individual sample results and GEOMEANS were higher than in the previous two years. Several of the single sample results from a number of the sites exceeded the VT Class B standard of 77, the VT "suitable for swimming" and EPA standard of 235. All of the 2012 *E. coli* GEOMEAN values exceeded the VT Class B, the VT "suitable for swimming" and EPA standards.

E coli GEOMEAN information should be used carefully. The sample number (N) used in the calculation can have a strong effect. Comparing values calculated from 3 sample results compared to one based on 7 sample results can be misleading. Comparisons are more equally representative if they are based on similar sample numbers.

Other water quality aspects of possible concern at the SeVWA WQMP sites along the Williams River are:

Water Temperature:
Water temperatures that occur above 20 degrees C can have negative effects on cold water fish species.

Degrees C, Maximum Season Value (sampling typically occurs between 7-8 AM)

SITES	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
MBrWilliams_.02									17.0	18.0
Williams_10.8									17.0	19.0
Williams_10.7						NA		21.0	17.0	18.5
Williams_10.3						15.0		16.0	19.0	17.5
Williams_8.7									18.0	19.0
Williams_7.0	21.0	17.0	20.5	20.0	21.0	20.0		21.0	17.0	18.0

It should be kept in mind that these measurements were typically made between 7-8 AM on sampling days. Site water temperatures on other days or other times later in the day on sampling days probably reached 20 deg C or greater. It may be helpful to further define temperature occurrences at some of these sites – especially those considered for cold water fisheries restoration – utilizing season-long, left-in-place monitoring devices.

Total Phosphorous (TP) results:
It is possible for TP levels greater than 10 ppb to have an impact on freshwater stream ecosystems.
TP values appear to have increased in 2012 from below the Chester WWTF to the 2 sites further downstream. There is significant agricultural use of this part of the watershed and also a number of tributaries that feed into the Williams River along this reach from Williams_10.3 to Williams_7.0.

2010 – TP values at Williams_10.7 ranged from 5.9 – 8.8 ppb
– TP values at Williams_10.3 ranged from 6.9 – 12.2 ppb
– TP values at Williams_7.0 ranged from 11.2 – 17.3 ppb
2011 – TP values at MBrWilliams_.02 ranged from 8.6 – 11.2 ppb
– TP values at Williams_10.8 ranged from 9.0 – 9.8 ppb
– TP values at Williams_10.7 ranged from 8.5 – 11.5 ppb
– TP values at Williams_10.3 ranged from 8.1 – 12.2 ppb
– TP values at Williams_8.7 ranged from 11.2 – 14.0 ppb
– TP values at Williams_7.0 ranged from 11.4 – 14.5 ppb
2012 – TP values at MBrWilliams_.02 ranged from 7.35 – 8.55 ppb
– TP values at Williams_10.8 ranged from 7.65 – 10.9 ppb
– TP values at Williams_10.7 ranged from 6.96 – 8.68 ppb
– TP values at Williams_10.3 ranged from 7.87 – 28.9 ppb
– TP values at Williams_8.7 ranged from 10.7 – 53.7 ppb
– TP values at Williams_7.0 ranged from 9.86 – 34.4 ppb

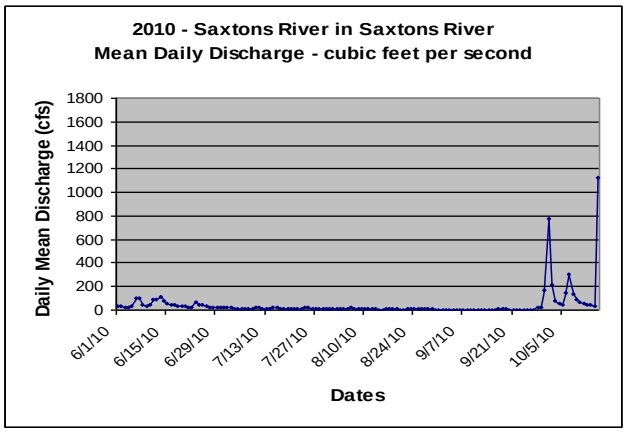
2012 Nitrate-Nitrite Nitrogen (NOx) results:
NOx samples appear to have higher values at the 2 furthest downstream sites – Williams_8.7 & 7.0.

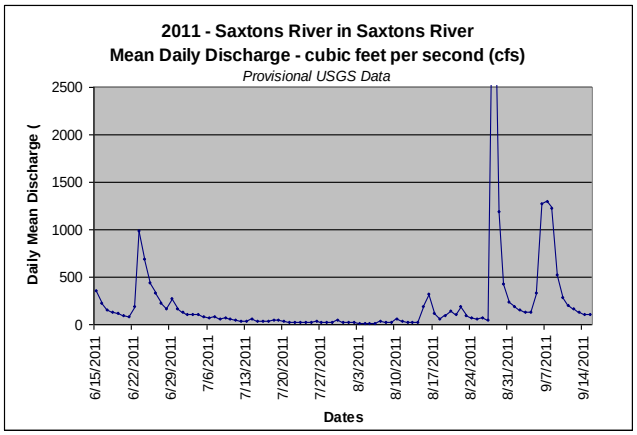
2010 – NOx values at Williams_10.7 ranged from 0.09 – 0.13 mg/l
– NOx values at Williams_10.3 ranged from 0.12 - 0.13 mg/l
– NOx values at Williams_7.0 ranged from 0.41 - 0.69 mg/l
2011 – NOx values at MBrWilliams_.02 ranged from 0.11 - 0.13 mg/l
– NOx values at Williams_10.8 ranged from 0.16 - 0.18 mg/l
– NOx values at Williams_10.7 ranged from 0.06 - 0.15 mg/l
– NOx values at Williams_10.3 ranged from 0.06 - 0.15 mg/l
– NOx values at Williams_8.7 ranged from 0.11 - 0.41 mg/l
– NOx values at Williams_7.0 ranged from .11 - .4 mg/l
2012 – NOx values at MBrWilliams_.02 ranged from 0.09 – 0.19 mg/l
– NOx values at Williams_10.8 ranged from 0.27 – 0.33 mg/l
– NOx values at Williams_10.7 ranged from 0.12 – 0.22 mg/l
– NOx values at Williams_10.3 ranged from 0.05 – 0.24 mg/l
– NOx values at Williams_8.7 ranged from 0.08 – 0.8 mg/l
– NOx values at Williams_7.0 ranged from 0.1 – 0.78 mg/l

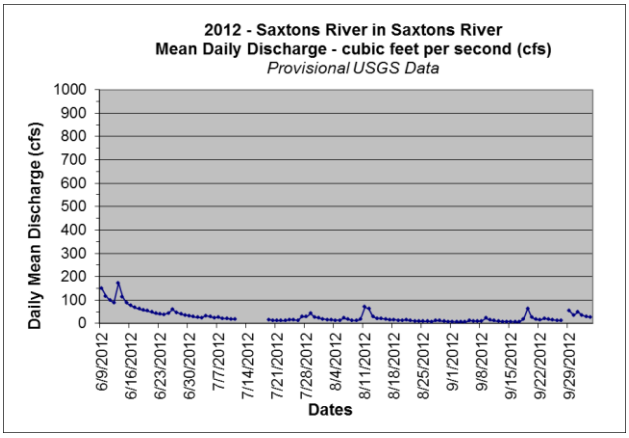
3.4 Saxtons River Summary (*Please note that scales on each graph can be very different from other graphs.*)

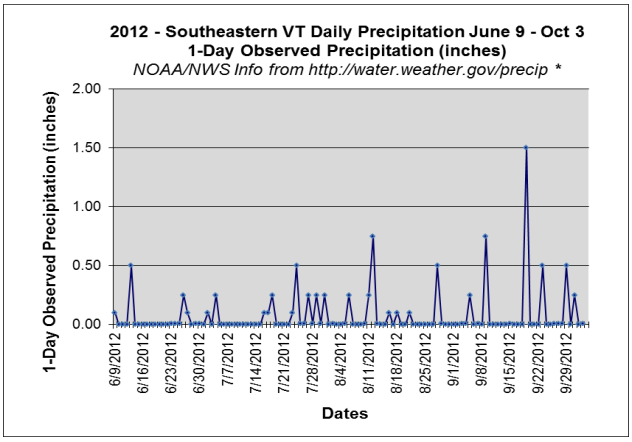
MONITORING SITES	SITE DESCRIPTION	2010	2011	2012
Saxtons_5.6	Rockingham, just above Saxtons River village, Stickney's field	**X**	**X**	**X**
Saxtons_5.0	Rockingham, below Saxtons River village WWTF	**X**	**X**	**X**
Saxtons_.19	Westminster, "sandy beach", just south of Bellows Falls town line	**X**	**X**	**X**

The mean daily discharge graph that appears below can be used for all Saxtons River sites. They are intended to provide a sense of the volume of water moving through the streams and rivers of the watershed through the 2010, 2011 and 2012 sampling seasons. The lower, right graph shows regional rain data for 2012.









**Flow Rate Data available from the USGS National Water Information System at:
http://waterdata.usgs.gov/usa/nwis/ or http://waterdata.usgs.gov/vt/nwis/dv/?referred_module=sw

Please note from the Mean Daily Discharge graphs (for stream flow information) that the 2010 sampling season, in particular, appeared to be uncharacteristically dry.

***E. coli* results:**

GEOMEAN = geometric mean, MAX = maximum value of season's samples collected,
N = total number of samples collected during the sampling season
(VT Class B *E. coli* standard: single sample or GEOMEAN = 77 *E. coli* per 100 mL;
VT DOH "suitable for swimming" standard (single sample) = 235 per 100 mL;
US EPA standard: single sample = 235 per 100 mL, GEOMEAN = 126 per 100 mL)

2010 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/30/10	7/14/10	7/28/10	8/11/10	8/25/10	9/8/10	9/22/10	GEO-MEAN	MAX	N
Saxtons_5.6	53.8	145.0	52.9	NT	52.8	NT	9.7	46.2	145.0	5
Saxtons_5.0	66.3	NT	73.8	NT	93.4	NT	14.8	51.0	93.4	4
Saxtons_.19	64.4	209.8	42.8	55.6	145.0	NT	21.1	67.9	209.8	6

2011 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/22/11	7/6/11	7/20/11	8/3/11	8/17/11	8/31/11	9/14/11	GEO-MEAN	MAX	N
Saxtons_5.6	46.7	71.2	91.0	63.7	214.2	NT	63.1	79.9	214.2	6
Saxtons_5.0	45.5	NT	91.0	NT	204.6	NT	90.6	101.8	204.6	4
Saxtons_.19	116.2	88.2	156.5	193.5	261.3	NT	101.7	142.1	261.3	6

2012 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/13/12	6/27/12	7/11/12	7/25/12	8/8/12	8/22/12	9/5/12	GEO-MEAN	MAX	N
Saxtons_5.6	435.2	261.3	108.1	131.4	114.5	60.9	NT	149.7	435.2	6
Saxtons_5.0	NT	248.9	123.6	105.0	88.2	123.6	1,413.6	191.8	1413.6	6
Saxtons_.19	770.1	238.2	285.1	260.3	186.0	178.9	260.3	274.7	770.1	7

N=number of samples from site during the monitoring season; NA=results from this site, this date not available;
NT = sample from this site not collected or not tested for this date;
MAX = maximum value for this site for this monitoring season

Table of 2010-2012 Saxtons River *E. coli* GEOMEANS:

SITE	SITE DESCRIPTION	2010 GEO-MEAN	2011 GEO-MEAN	2012 GEO-MEAN
Saxtons_5.6	Rockingham, just above Saxtons River village, Stickney's field	46.2	79.9	149.7
Saxtons_5.0	Rockingham, below Saxtons River village WWTF	51.0	101.8	191.8
Saxtons_.19	Westminster, "sandy beach", just south of Bellows Falls town line	67.9	142.1	274.7

In 2010 *E. coli* GEOMEAN levels at all three monitoring sites along the Saxtons River were below the VT (77) and EPA (126) GEOMEAN standards. Some of the single sample results in 2010 exceeded the VT single sample standard(77) , but none of those exceeded the EPA single sample standard (235). Please keep in mind that 2010 was an unusually dry year.

During the 2011 and 2012 monitoring seasons all three sites' *E. coli* GEOMEAN values exceeded the VT standard of 77 (one site just slightly in 2011). In 2011 only the Saxtons_.19 GEOMEAN exceeded the EPA *E. coli* GEOMEAN standard of 126, but in 2012 all three sites' *E. coli* GEOMEAN values exceeded the EPA *E. coli* GEOMEAN standard of 126.

In 2011only one sample, on 8/17/11 from Saxtons_.19, exceeded the EPA single sample standard of 235 *E. coli* per 100 mL of water. In 2012 two samples from Saxtons_5.6, two samples from Saxtons_5.0 and five samples from Saxtons_.19 exceeded the EPA single sample standard and VT "suitable for swimming" standard of 235 *E. coli* per 100 mL of water.

"Wet" sampling events or rain in the preceding 24-72 hours prior to sampling cannot always explain elevated *E. coli* results. There also are dates when higher *E. coli* values have occurred at some sites with little preceding precipitation – as on 7/14/10 at Saxtons_.19.

Other water quality aspects of possible concern at SeVWA WQMP sites along the Saxtons River appear below.

Total Phosphorous (TP) results:
In 2010, 2011 & 2012 **total phosphorous (TP)** levels were unusually high at only one monitoring location on the Saxtons River (Saxtons_5.0) and the values ranged from a low of 16.1 ppb to a high of 180 ppb. In 2012 there were only 2 samples collected for TP at that site during the monitoring season and both values were greater than 100 ppb. In all three years TP at sites above and below this site of concern (Saxtons_5.0) were significantly lower.

TP (ppb, MEAN value per year)

SITE	2004	2005	2006	2007	2008	2009	2010	2011	2012
Saxtons_5.6	7.3	25.3	8.3	8.2	10.7		8.3	11.0	15.1
Saxtons_5.0					10.3		47.7	30.7	162.0
Saxtons_.19	9.8	15.5	10.2	14.2	16.1		10.7	11.6	12.9

It is possible for TP levels greater than 10 ppb to have an impact on freshwater stream ecosystems.

TP levels at Saxtons_5.0, below the Saxtons River village wastewater treatment facility (WWTF) were remarkably more elevated in 2012 than in 2010 and 2011. In 2012 there were 2 samples collected for TP and the values were 180 on 7/11 and 144 on 9/5. The mean value for those two samples was 162 ppb TP. The mean value in 2008 was 10.3 ppb.

Total Phosphorous (TP) results at Saxtons_5.0, below Saxtons River village WWTF;
2010: 6/30 = 62.1 ppb, 7/28 = 16.1 ppb, 8/25 = 75.9 ppb, 9/22 = 36.6 ppb; MEAN = 47.68 ppb, N = 4
2011: 6/22 = 34.9 ppb, 7/20 = 21.2 ppb, 8/17 = 55.1 ppb; 2011 MEAN = 30.7 ppb, N = 3
2012: 7/11 = 180 ppb, 9/5 = 144 ppb; 2012 MEAN = 162.0 ppb, N = 2
It may be informative to re-examine the location of the WWTF outfall in relation to the sampling site.

Nitrate-Nitrite Nitrogen (NOx) results:
NOx values also appeared to be more elevated at the Saxtons_5.0 site in 2012. TP and NOx are both nutrients that can impact water quality and aquatic habitats if levels are elevated.

In 2012 NOx results for the Saxtons_5.0 site on the 2 days of sampling were elevated compared to other Saxton River results.
On 7/11 NOx = 1.7 mg/L and on 9/5 NOx = 0.63 mg/L.

Water Temperature
Water temperatures that occur above 20 degrees C typically have negative effects on cold water fish species.

Degrees C, Maximum Season Value (sampling typically occurs between 7-8 AM)

SITE	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Saxtons_5.6		18.0	20.5	20.0		20.0		20.0	18.0	18.0
Saxtons_5.0						19.5		19.0	19.0	19.0
Saxtons_.19	21.5	19.0	22.0	22.0	21.0	20.0		20.0	20.0	19.0

At some point over the course of the 2010, 2011 and 2012 monitoring season from late June until mid-September, the maximum water temperatures recorded at the Saxtons River sites approached or reached 20 deg C.

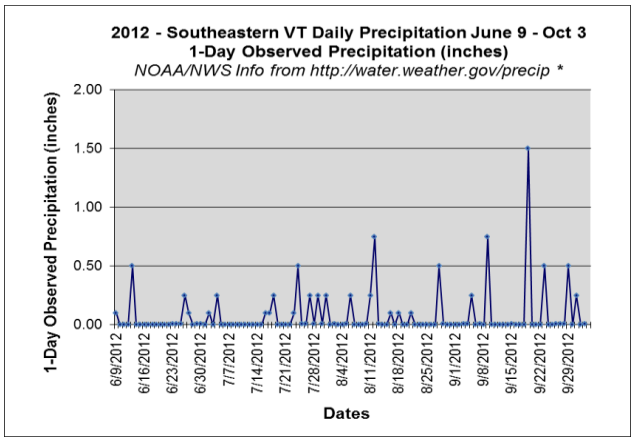
It should be kept in mind that these measurements were typically made between 6-8 AM on sampling days. Site water temperatures on other days or other times later in the day on sampling days probably reached 20 deg C or greater. It may be helpful to further define actual temperature occurrences at some of these sites – especially those possibly considered for cold water fisheries restoration – utilizing season-long, left-in-place monitoring devices.

3.5 Whetstone Brook Summary

(*Please note that scales on each graph can be very different from other graphs.*)

MONITORING SITES	SITE DESCRIPTION	2010	2011	2012
Whetstone_9.6	Brattleboro, Stark Rd., just west of Marlboro town line	**X**	**X**	**X**
Whetstone_6.4	Brattleboro, Dettman Dr.	**X**	**X**	**X**
Whetstone_.2	Brattleboro, downtown, behind Brattleboro Co-op	**X**	**X**	**X**

These sites were scheduled to be sampled on a monthly basis during the 2010, 2011 and 2012 seasons.



There is no readily available data for mean daily discharge for the Whetstone Brook to create a graph for 2010, 2011 or 2012. The graph above shows regional rain data for 2012. 2012 precipitation information was obtained from the NWS website to create the graph for the 2012 SeVWA WQMP season.

Please note that, from previous regional flow/discharge information, the 2010 sampling season appeared to be uncharacteristically dry.

Currently, there is a TMDL project underway in Vermont to address waters impaired by bacterial pollution. A stretch of the Whetstone Brook in Brattleboro is included in that project.

Due to elevated bacteria measurements during the past few years, the Whetstone Brook in Brattleboro is considered impaired from the mouth of the brook upstream to Living Memorial Park, for a length of about 2.5 miles. The Whetstone_6.4 and Whetstone_9.6 sites are upstream of Living Memorial Park and not included in the impaired segment. WRWA's WQMP was instrumental in providing the data for recognizing the impairment and will continue to collect data for the project's use in order to help remedy the impact.

The 303(d) impaired waters listing states that use of Whetstone Brook for contact recreation (i.e., swimming) is impaired. The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with state water quality standards.

For more information and recommendations to address the possible impacts see the VT DEC online publications, **VT DEC Water Quality Division, Vermont Statewide Total Maximum Daily Load (TMDL) *for Bacteria-Impaired Waters*** and **Vermont Statewide Total Maximum Daily Load (TMDL) *for Bacteria* – Appendix 17, Whetstone Brook**.

GEOMEAN = geometric mean, MAX = maximum value of season's samples collected,
N = total number of samples collected during the sampling season
(VT *E. coli* standard: single sample or GEOMEAN = 77 *E. coli* per 100 mL;
US EPA standard: single sample = 235 per 100 mL, GEOMEAN = 126 per 100 mL)

2010 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/30/10	7/14/10	7/28/10	8/11/10	8/25/10	9/8/10	9/22/10	10/13/10	GEO-MEAN	MAX	N
Whetstone_9.6	8.4	NT	5.2	NT	NT	NT	5.2	7.4	6.4	8.4	4
Whetstone_6.4	30.9	NT	44.8	NT	42.6	NT	25.3	9.8	27.1	44.8	5
Whetstone_.2	185.0	NT	307.6	NT	209.8	NT	129.6	185.0	195.6	307.6	5

2011 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/22/11	7/6/11	7/20/11	8/3/11	8/17/11	8/31/11	9/14/11	GEO-MEAN	MAX	N
Whetstone_9.6	866.4	NT	19.7	NT	86.0	NT	NT	113.6	866.4	3
Whetstone_6.4	28.5	NT	37.9	NT	118.7	NT	NT	50.4	118.7	3
Whetstone_.2	99.1	NT	686.7	NT	NT	NT	517.2	327.7	686.7	3

2012 *E. coli* results [MPN *E. coli* per 100 milliliters of water]

SITE	6/13/12	6/27/12	7/11/12	7/25/12	8/8/12	8/22/12	9/5/12	10/3/12	GEO-MEAN	MAX	N
Whetstone_9.6	61.3	NT	15.8	NT	5.2	3.1	280.9	12.1	19.4	280.9	6
Whetstone_6.4	344.8	64.4	32.7	NT	52.0	28.5	290.9	17.3	65.9	344.8	7
Whetstone_.2	1,986.3	NT	325.5	NT	686.7	NT	2,419.6	93.3	631.2	2,419.6	5

To reiterate a previous comment: Please note that the 2010 sampling season appears, from regional stream discharge information, to have been uncharacteristically dry.

Table of 2010-2012 Whetstone Brook *E. coli* GEOMEANS:

SITE	SITE DESCRIPTION	2010 GEO-MEAN	2011 GEO-MEAN	2012 GEO-MEAN
Whetstone_9.6	Brattleboro, Stark Rd., just west of Marlboro town line	6.4	113.6	19.4
Whetstone_6.4	Brattleboro, Dettman Dr.	27.1	50.4	65.9
Whetstone_.2	Brattleboro, downtown, behind Co-op	195.6	327.7	631.2

In 2010 Whetstone_9.6 and 6.4 were well below the VT and EPA standards for single sample and GEOMEANS for *E. coli.* Single samples and the season's GEOMEAN for Whetstone_.2 were over the VT and EPA standards for *E. coli* in 2010. Having elevated *E. coli* values at "low flow" times, especially in a populated and developed watershed such as in-town Brattleboro, indicates that there might be polluted run-of, a faulty septic system, sewer pipe or other sources contributing to the *E. coli* numbers.

The2011 *E. coli* data for the Whetstone_.2 sites should be used carefully, especially the *E. coli* GEOMEAN value. There were 4 sampling dates tentatively scheduled for this site in 2011, but only 3 samples were actually collected. The 3 dates that samples were collected at Whetstone_.2 were not all of the same dates that samples were collected at the other 2 Whetstone Brook sites (see charts above). In 2011 the same general *E. coli* GEOMEAN pattern as in 2010 held for Whetstone_.2 and Whetstone_6.4, but in 2011 Whetstone_9.6's *E. coli* season GEOMEAN value exceeded the VT Class B standard (77), but did not exceed the EPA GEOMEAN standard (126).

In 2012 each sampling day's *E. coli* values for the Whetstone_.2 site exceeded the VT Class B waters standard of 77 and all but one exceeded the VT "suitable for swimming" and EPA standard of 235 for a single sample. There were 5 test samples collected at that site on 5 separate days over the course of the monitoring season. The *E. coli* GEOMEAN for that site in 2012 was well-above the VT Class B standard (77), the VT "suitable for swimming" GEOMEAN standard(126) and the EPA standard.

The 2012 GEOMEAN values for the other 2 Whetstone Brook sites (sites 6.4 and 9.6) were below VT Class B, VT "suitable for swimming" and the EPA standards. Whetstone_6.4 had 2 individual test values out of a total of 7 samples that exceeded the VT and EPA standards. Whetstone_9.6 had 1test values out of a total of 6 samples that exceeded the VT and EPA standards.

Other water quality aspects of possible concern at the SeVWA WQMP sites along the Whetstone Brook are:

Total Phosphorous (TP) results:
It is possible for TP levels greater than 10 ppb to have an impact on freshwater stream ecosystems. In 2012 upper TP values at the Whetstone sites were higher than in the previous 2 years. The highest 2012 values were in the 30 to 40 ppb range.

2010 – TP values at Whetstone_9.6 ranged from 9.8 – 30.3 ppb
– TP values at Whetstone_6.4 ranged from 8.5 – 14.9 ppb
– TP values at Whetstone_.2 ranged from 7.8 – 15.6 ppb
2011 – TP values at Whetstone_9.6 ranged from 10.1 – 13.4 ppb
– TP values at Whetstone_6.4 ranged from 8.9 – 14.1 ppb
– TP values at Whetstone_.2 ranged from 8.5 – 10.2 ppb
2012 – TP values at Whetstone_9.6 ranged from 10.6 – 37.0 ppb
– TP values at Whetstone_6.4 ranged from 7.16 – 29.2 ppb
– TP values at Whetstone_.2 ranged from 11.7 – 35.7 ppb

Water Temperature:
Water temperatures that occur above 20 degrees C typically have negative effects on cold water fish species.

2010 – Maximum temperature measured on a sampling date at Whetstone_9.6 was 14 deg C
– Maximum temperature measured on a sampling date at Whetstone_6.4 was 16 deg C
– Maximum temperature measured on a sampling date at Whetstone_.2 was 17 deg C
2011 – Maximum temperature measured on a sampling date at Whetstone_9.6 was 15 deg C
– Maximum temperature measured on a sampling date at Whetstone_6.4 was 14 deg C
– Maximum temperature measured on a sampling date at Whetstone_.2 was 17 deg C
2012 – Maximum temperature measured on a sampling date at Whetstone_9.6 was 17.5 deg C
– Maximum temperature measured on a sampling date at Whetstone_6.4 was 17.5 deg C
– Maximum temperature measured on a sampling date at Whetstone_.2 was 18 deg C

Conductivity:
During sampling in 2010, 2011 and 2012 conductivity values at the 3 Whetstone sites showed a pattern of increasing as the sites approached downtown Brattleboro. Though an indication of anthropogenic sources, the highest value of 265.3 uS/cm (2010), which was at the most downstream site (Whetstone_.2), does not really indicate a serious impact at those 3 sites during the sampling dates. The lowest conductivity value on a monitoring day was 45 uS/cm at the most upstream site, Whetstone_9.6 (2011).

4. 0 DISCUSSION & FUTURE MONITORING PROGRAM PLANS

Some of the most significant water quality issues that have been identified by the monitoring program from 2003-2012 have been related to *E. coli* levels in the Whetstone Brook, West River and Williams River. A statewide, VT DEC managed *E. coli* TMDL project is now underway that includes the West River in Londonderry and the Whetstone Brook in Brattleboro. Since 2003 there have also been incidents of elevated *E. coli* and total phosphorous results along the Saxtons River and Williams River. Additionally, there have been measurements of water temperatures that exceed that for healthy cold water fisheries in the West, Williams and Saxtons Rivers. Some total phosphorous (TP) results have also reached levels of concern, particularly at a site on the Saxtons River, and in 2012 nitrate-nitrite (NOx) levels were detected at ranges above 0.5 mg/L at several sites during the monitoring season. All of these sites and parameters warrant some level of further investigation, follow-up assessment or remediation.

See the information in previous sections (3.2-3.6) and the compiled data tables for 2010, 2011 and 2012 in Appendix D for more details about each river and its monitoring sites. This report and summary is to provide a very basic, limited review of results from the past three years of the SeVWA stream monitoring program.

E. coli

Currently, there is a TMDL project underway in Vermont to address waters impaired by bacterial pollution. A stretch of the Whetstone Brook in Brattleboro and a section of the West River in South Londonderry are included in that project. The 303(d) listing for impaired waters states that use of these 2 river segments for contact recreation (i.e., swimming) is impaired. The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality, with the goal of complying with state water quality standards. WRWA/SeVWA's WQM data has been instrumental in defining the scope of this project along these 2 river segments and hopes to continue to collect data for the project's use in order to help remedy the impacts.

Due to elevated bacteria measurements during the past few years, the Whetstone Brook is considered to be impaired from the mouth of the brook upstream to Living Memorial Park, for a length of about 2.5 miles. The Whetstone_6.4 and Whetstone_9.6 sites are upstream of Living Memorial Park and are not included in the impaired segment. There are several likely sources of bacterial contamination to Whetstone Brook. These sources include: failing or malfunctioning onsite septic systems, leaking sanitary sewer pipes, storm water runoff from developed areas and illicit discharges.

The West River from approximately half a mile above to about one mile below South Londonderry's village center did not meet Vermont's water quality standards because of *E. coli* contamination. The segment was identified as impaired and placed on the 303(d), impaired waters list. The 303(d) listing states that use of the West River for contact recreation (i.e., swimming or other recreational contact) is impaired. Potential sources of *E. coli* along this segment of the West River in South Londonderry are failing septic systems, failing storm drainage systems, animal waste run-off or manure management related sources.

As mentioned above, the Clean Water Act requires that all 303(d) listed waters undergo a TMDL (Total Maximum Daily Load) assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with state water quality standards. For more information and recommendations to address the possible impacts at the Whetstone Brook and the West River segments see the VT DEC online publications, **VT DEC Water Quality Division, Vermont Statewide Total Maximum Daily Load (TMDL) *for Bacteria-Impaired Waters,* Vermont Statewide Total Maximum Daily Load (TMDL) *for Bacteria* – Appendix 15, West River** and **Appendix 17, Whetstone Brook**.

Other sites in the WRWA/SeVWA WQMP where there are some concerns about *E. coli* levels:

(1) a segment of Williams River in Chester in vicinity of Rainbow Rock, a popular local swimming hole
(2) a segment of Williams River in the vicinity of Bartonsville bridge in Rockingham, a local swimming hole
(3) the Saxtons River in Westminster (Saxtons_.19), and perhaps the other 2 upstream sites that appear to be showing a trend of increasing E. coli values over the past 3 monitoring seasons.

(4) And, perhaps, the Milkhouse Meadows site in Brattleboro, which is the location of the Brattleboro Outing Club's rowing dock on the West River; this site had *E. coli* issues in 2010 that have not been seen again in 2011 or 2012

There are some other concerns related to high *E. coli* results during and after rain events along sections of the monitored rivers and there have also been some unusual "high *E. coli*" events that seem to be sporadic. These sites should be reviewed during future monitoring seasons to check if those events become more of a trend. See the information in previous sections (3.2-3.6) and the compiled data tables in Appendix D for more details about each river and its monitoring sites.

Temperature

Temperature readings at most of the monitoring sites in 2010, 2011 and 2012 are cause for concern. Water temperatures at a number of sites reached or approached values that exceeded a level optimal for cold water fisheries. Some readings on the lower portion of the West River exceeded 20 deg C and some Williams R., Saxtons R. and lower portion of Whetstone Brook temperature measurements approached 20 deg C. It must be kept in mind that these measurements were typically made between 6-8 AM on sampling days. Site water temperatures on other days or other times later in the day on sampling days probably reached 20 deg C or greater. It may be helpful to further define actual temperature occurrences at some of these sites – especially those considered for cold water fisheries restoration – utilizing season-long, left-in-place monitoring devices. See the information in previous sections (3.2-3.6) and the compiled data tables in Appendix D for more details about each river and its monitoring sites.

Total Phosphorous

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." It has been asserted that phosphorous concentrations of 0.01 mg/L (10µg/L or 10 ppb), or possibly less, may have measurable impact on nutrient poor upland streams, similar to those rivers and streams in Basin 11.

Many of the monitoring sites in 2010, 2011 and 2012 approached, reached or exceeded 10 ppb and Saxtons_5.0, below the village WWTF, had the highest values of any site in 2010, 2011 and especially in 2012. Many values over the 3 monitoring seasons were in the range of 10-40 ppb. See the information in previous sections (3.2-3.6) and the compiled data tables in Appendix D for more details about each river and its monitoring sites.

TP levels at Saxtons_5.0, below the Saxtons River village wastewater treatment facility (WWTF) were remarkably more elevated in 2012 than in 2010 and 2011. This trend should be scrutinized. (The mean value in 2008 was 10.3 ppb.) Has something changed significantly at the WWTF? After the effects of Irene is the SeVWA sampling location no longer in an appropriate location? Is it too close to the WWTF outflow? Have the stream bed or flow changed in this stretch of the river? Checking with the Saxtons River WWTF regarding their monitoring data for TP in their discharge would be helpful to possibly address this situation.

For more information about water quality above and below WWTF's in VT, see VT DEC Water Quality Division's December 2011publication, **Water Quality and Chemistry Above and Below the Effluent Discharges of Twenty Wastewater Treatment Facilities in Vermont.** It can be found on the internet at http://www.vtwaterquality.org/mapp/docs/mp_wwtf2011report.pdf.

See the information in previous sections (3.2-3.6) and the compiled data tables in Appendix D for more details about each river and its monitoring sites.

NO_X

The nitrate level in freshwater is usually found in the range of 0.1 to 4 mg/L NO_3^--N. Unpolluted waters generally have nitrate levels below 1 mg/L. The highest value measured from the WRWA/SeVWA monitoring sites in 2010 was 0.69 mg NO_X/L, the highest in 2011 was 0.6 mg/L and the highest in 2012 was 1.7 mg/L (Saxtons_5.0). 2012 results contained several of the highest seen in the past 3 monitoring seasons. Some of those highest results were at the Saxtons_5.0 site, Williams_7.0 site and Williams_8.7 site.

See the information in previous sections (3.2-3.6) and the compiled data tables in Appendix D for more details about each river and its monitoring sites.

Conductivity

Studies of inland fresh waters indicate that streams supporting good mixed fisheries have a range between 150 and 500 µhos/cm. Conductivity outside this range could indicate that the water is not suitable for certain species of fish or macroinvertebrates. Industrial waters can range as high as 10,000 µmhos/cm. Conductivity levels less than 300 uS/cm is typically not a concern.

The highest values for monitoring sites in 2010, 2011 and 2012 were approximately 200 uS/cm at NBranchBrk_4.5 and Whetstone_.2. Most readings from sampling days during the 2010, 2011 and 2012 monitoring season were well below 200. Conductivity does not seem to be a major concern at program sites during the timeframe of the program's scheduled monitoring.

Conductivity in the data spreadsheets appears as specific conductance.

See the information in previous sections (3.2-3.6) and the compiled data tables in Appendix D for more details about each river and its monitoring sites.

Turbidity

As with conductivity, turbidity did not appear to be a water quality issue for most of the sites on most of the days. There were some samples with very high values that were collected and analyzed 2.5 weeks after Irene in 2011. On September 14, 2011 river samples were collected at a number of sites and most had turbidity measurements performed on them, but many of the samples collected were very turbid and were not submitted for *E. coli* analysis. LaRosa Lab had suspended receiving any samples for the partnership program as the DEC's facilities were heavily impacted in Waterbury and the lab was not able to accept samples for analysis. Some samples collected on September 14, 2011 were submitted to the CRWC lab for E. coli analysis and WRWA/SeVWA was able to perform some pH and conductivity measurements. Increased turbidity in local rivers has continued to be observed with each major rainfall along rivers in southeastern VT since Irene's impact on those rivers and streams, though not as marked as in the first few weeks and months after Irene's visit. The disruption and erosion of riverbanks was a widespread effect of Irene in 2011 that continues to present.

See the information in previous sections (3.2-3.6) and the compiled data tables in Appendix D for more details about each river and its monitoring sites.

pH

pH has not been a significant issue at SeVWA's monitoring sites in Basin 11 and the Whetstone Brook. There are ponds in Basin 11 and 13 that are acid-impaired (such as South Pond, Sunset Lake and Lily Pond). All of the monitoring sites' samples collected in 2010-2012 had pH values between 6.6 and 8.05. In 2010 the lowest value was 6.64 and the highest was 7.51. In 2011 the lowest value was 6.82 and the highest was 8.05 and in 2012 the lowest was 6.97 and highest 7.69.

See the information in previous sections (3.2-3.6) and the compiled data tables in Appendix D for more details about each river and its monitoring sites.

General Overview & Future Monitoring Program Plans

Laurie Callahan will not be continuing in the role of WQMP coordinator in 2012. The present plan is for WRWA/SeVWA to continue some sort of water quality monitoring program in 2013. That plan will, however, depend on the procurement of analytical services support, funding to support essential aspects of the program and finding a program coordinator or director. There may be a modification of sites monitored or parameters analyzed in 2012.

Hopefully SeVWA will be able to continue to provide state and local entities and individuals with data from area sites that appear to have persistent problems, such as to support the efforts of the *E. coli* TMDL project, and will also continue collecting long term water quality data from sites in Basin 11 and 13. If the WQMP continues, contact with Health Officers from several towns that have sampling sites within their boundaries should continue as has been done in past monitoring seasons. A number of sites sampled experience high levels of *E. coli* bacteria. Some of those were during storm events, to the point of being unsafe for contact recreation during, and even for a period of time after, the event.

As of 2012 the WRWA/SeVWA WQMP has existed for 10 years. Since monitoring was not performed in 2009, there are 9 years of data instead of 10 after the conclusion of the 2012 monitoring season. It may be an appropriate and useful time for an analysis and summary of the long-term data collected to-date, from 2003-2012.

Developing a sustainable source of funding and support, volunteers, interns and coordinating staff for the program is also an important goal to try to achieve in the near future. Additionally, finding a physical "home" for program equipment, supplies and other materials is another important goal to attain.

Local and state agencies, such as the Windham County Natural Resources Conservation District, Vermont DEC Water Quality Division, VT DEC Watershed Coordinator for Basin 11, The Windham Regional Commission and local municipal planners and conservation commissions can be encouraged, or be partnered with, to assist town governments with developing strategies and finding solutions to the identified water quality problems. Those partners can also provide input to develop or design the monitoring program each year, to define projects for protection, remedial action or restoration and to also assist with and identify needs for public education and outreach activities.

In 2010-2012 WRWA/SeVWA has made additional connections with members of Basin 11 and 13 conservation commissions or conservation-focused groups. These partnerships will provide more continuity and strength in communication between the monitoring program and local communities.

This report presents the 2010 through 2012 WRWA/SeVWA Water Quality Monitoring Program as it was implemented, its sampling results and its intent to continue monitoring southeastern Vermont surface waters to fulfill its mission "*to protect and restore watershed resources through educating and engaging communities*". This summary is intended to provide a very basic, limited review of results from the past three years of the SeVWA stream monitoring program and some basic background information about the program since 2003.

It is recommended that a more thorough review and analysis of the data from 2003 through 2012 be undertaken. This will assist in recognizing long term trends and will enhance planning for future monitoring program activities.

The information provided in this report is a cursory summary of the 2010-2012 SeVWA WQMP data. A more thorough review and analysis of the data should occur when additional time and funds are available. It will be useful to perform a review and analysis of all the years of data – 2003 to 2008 and 2010 to 2012.

5.0 PROGRAM CONTACT INFORMATION

WRWA/SeVWA Board of Directors:
Southeastern Vermont Watershed Alliance (SeVWA, previously known as WRWA)
P.O. Box 402
Brattleboro, VT 05302
sevwa.mail@gmail.com
Website - https://sites.google.com/site/vtsevwa/

SeVWA Water Quality Monitoring Program Coordinator (2010, 2011 & 2012):
Laurie Callahan
61 Oak St.
Brattleboro, VT 05301
(802) 258-1877
therivermist@hotmail.com

VT DEC, Water Quality Division – Monitoring, Assessment & Planning, Basins 11 & 13 Watershed Coordinator:
Marie Levesque Caduto, 100 Mineral St., Suite 303, Springfield, VT 05156; Phone: 802-885-8958;
marie.caduto@state.vt.us

VT DEC, Water Quality Division - Monitoring, Assessment & Planning, Aquatic Biologist & LaRosa Analytical Laboratory Partnership Program:
Jim Kellogg, 103 South Main St., Building 10 N, Waterbury, VT 05671; Phone: 802- 249-9370;
jim.kellogg@state.vt.us

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Appendix A

2010 West River Watershed Alliance (WRWA),
dba Southeastern Vermont Watershed Alliance (SeVWA)
LAROSA PARTNERSHIP PROGRAM FINAL REPORT
Prepared by Laurie G. Callahan
December 27, 2010

INTRODUCTION

West River Watershed Alliance's (WRWA's) water quality monitoring program was made possible in 2010 by the LaRosa Partnership Program and a dedicated team of local volunteers. There were 15 regular volunteer river monitors and 6 "back-up" volunteer monitors. The program was organized and run by a volunteer coordinator (Laurie Callahan) assisted by an unpaid VT DEC intern (Soren Paris) who divided his hours of services between WRWA, the Ottauquechee River Group (ORG) and Marie Caduto, VT DEC Watershed Coordinator for Basins 10, 11 & 13. The internship helped Soren to meet practicum requirements of his graduate program at Antioch New England.

There were 20 sites chosen for monitoring in WRWA's 2010 program – 9 sites were to be sampled once per month and 11 sites every 2 weeks.

A collaborative effort was established with Connecticut River Watershed Council (CRWC) in Greenfield, MA to perform WRWA's *E. coli* analyses. A services exchange was set-up between CRWC and VT DEC Water Quality Division/LaRosa Lab. Laurie Callahan donated time to assist with processing of samples at the CRWC lab on days that she delivered samples to them. Callahan was also successful at procuring an incubator to be utilized by the CRWC lab through the EPA Region 1 Equipment Loan grant program. This incubator - as an addition to CRWC's incubator - ensures that CRWC will have adequate capacity for incubating WRWA samples along with any other samples they process.

On the following pages are tables and figures with information about various aspects of WRWA's 2010 water quality monitoring program. Here are some general descriptions of those items in the order they appear on the following pages:

Table 1 lists the 2010 monitoring sites' locations. West 1.42 was the only new site added in 2010.

Figure 1 is a map showing all of the 2010 WRWA water quality monitoring site locations and the various rivers' watershed boundaries.

Table 2 lists all of WRWA's 2010 monitoring sites with dates and parameters sampled and analyzed.

Table 3 shows the number of sampling events per site for each parameter and also contains data completeness information.

Table 4 is a chart of Relative Percent Difference (RPD) calculations for all 2010 WRWA field duplicate parameters.

Quality assurance aspects of the information presented in tables 3 and 4 are addressed in the section titled "QUALITY ASSURANCE RESULTS & DETERMINATIONS" and WRWA's 2010 monitoring results and a brief overview of the results are presented in "OVERVIEW OF PROJECT RESULTS ".

Also, as noted in the title at the top of this page, West River Watershed Alliance (WRWA) is now doing business as Southeastern Vermont Watershed Alliance (SeVWA).

Table 1. Roster of Sites:

SITE CODE	SITE LOCATION	LAT	LON
West_.08	Milkhouse Meadows (just upstream of the Marina)	42.86940	-72.56050
West_1.42 *	Behind the Brattleboro Professional Center	42.87967	-72.57383
West_6.4	Dummerston covered bridge	42.93550	-72.61350
West_13	Brookline bridge/Hill Road bridge	42.99590	-72.63710
West_16	Ellen Ware Rd. swim hole	43.01923	-72.65024
West_36	South Londonderry, Rowes Rd.	43.18500	-72.80260
West_36.2	Cobb's swim hole, Winhall Hollow Road, So. Lndndry.	43.19624	-72.82146
BallMtBrk_.58	Jamaica village swim hole, below Rte 30	43.10141	-72.77943
BallMtBrk_1.7	Ball Mt. Brk. at Broken Glass Lane	43.07650	-72.81595
NBranchBrk_4.5	Pikes Falls	43.09760	-72.85150
FloodBrk_6.7	Flood Brk below Hapgood Pond	43.25240	-72.88653
Saxtons_.19	Bellows Falls/Westminster "Sandy Beach"	43.12300	-72.44240
Saxtons_5.0	Below Saxtons River village WWTF	43.13743	-72.50382
Saxtons_5.6	Saxtons River, Rte 121 W of village center, swim hole	43.13750	-72.51570
Williams_7.0	Bartonsville bridge, Lower Bartonsville Rd.	43.22400	-72.53690
Williams_10.3	Below Chester village WWTF	43.25537	-72.57410
Williams_10.7	Rainbow Rock swim hole, Chester village	43.25903	-72.57848
Whetstone_.2	Whetstone Brk., downtown Brattleboro behind Bboro Coop	42.85070	-72.55940
Whetstone_6.4	Whetstone Brk. & Dettman Drive	42.86705	-72.55942
Whetstone_9.6	Whetstone Brk. & Stark Road	42.86993	-72.65733

***** West_1.42 was the only new site for 2010 monitoring sites.

Figure 1. Map of 2010 Sampling Sites:

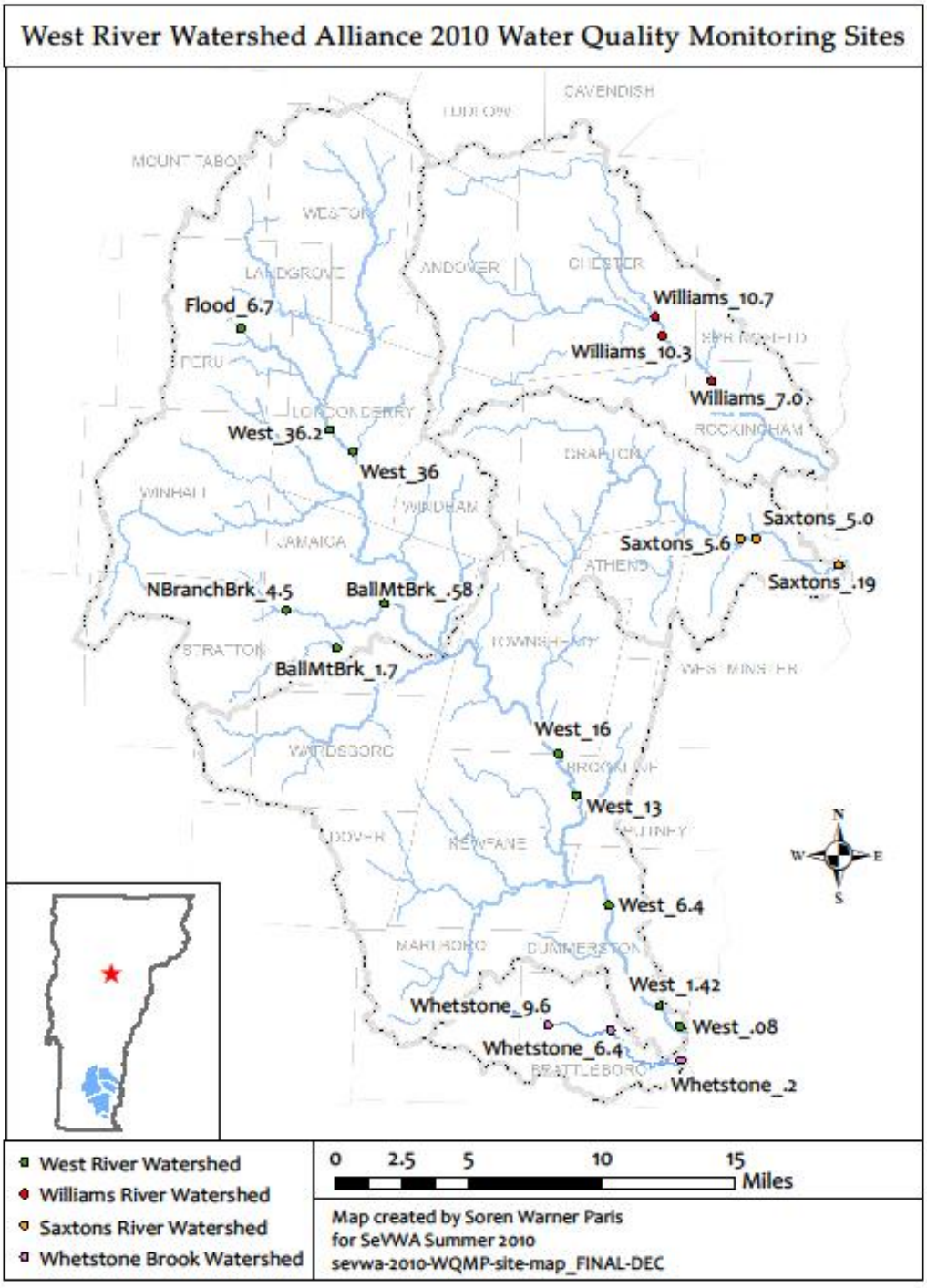

Table 2. Sampling Dates & Parameters Measured, Sampled or Analyzed:

Site ID	E. coli, TP, NOx, Turb, pH, Cond, Air & H2O temperatures	TP, NOx, Turb, pH, Cond, Air & H2O temperatures	E. coli, Air & H2O temperatures
West_.08	6/30, 7/28, 8/25, 9/22		7/14, 8/11, 9/8
West_1.42	6/30, 7/28, 8/25, 9/22		7/14, 8/11, 9/8
West_6.4	6/30, 7/28, 8/25, 9/22		7/14, 8/11, 9/8
West_13	6/30, 7/28, 8/25, 9/22		7/14, 8/11, 9/8
West_16	6/30, 7/28, 8/25, 9/22		
West_36	6/30, 7/28, 8/25, 9/22		7/14, 8/11, 9/8
West_36.2	6/30, 7/28, 8/25, 9/22		7/14, 8/11, 9/8
BallMtBrk_.58	6/30 (air temp. rejected), 7/28, 8/25, 9/22		7/14, 8/11, 9/8
BallMtBrk_1.7		6/30, 7/28, 8/25, ~~9/22~~, 10/12	
NBranchBrk_4.5		6/30, 7/28, 8/25, ~~9/22~~, 10/12	
FloodBrk_6.7		6/30, 7/28, 8/25, 9/22	
Saxtons_.19	6/30, 7/28, 8/25, 9/22		7/14, 8/11, ~~9/8~~
Saxtons_5.0	6/30, 7/28, 8/25, 9/22		
Saxtons_5.6	6/30, 7/28, 8/25, 9/22		7/14, ~~8/11~~, ~~9/8~~
Williams_7.0	6/30, 7/28, 8/25, 9/22		7/14, 8/11, 9/8
Williams_10.3	~~6/30~~, 7/28, ~~8/25~~, 9/22		
Williams_10.7	6/30, ~~7/28~~(*E.coli* result rejected), 8/25, 9/22	7/28	7/14, 8/11, 9/8
Whetstone_.2	6/30, 7/28 (no temps), 8/25, 9/22, 10/12		
Whetstone_6.4	6/30, 7/28, 8/25, 9/22, 10/12		
Whetstone_9.6	6/30, 7/28, ~~8/25~~, 9/22, 10/12	8/25	

Note: Dates with "*strike-through*" (~~X/XX~~) indicate samples that were intended to be submitted, but were not submitted, for analysis.

Table 3. Number of Sampling Events per Site & Data Completeness Information [as percentage; number of tests that were anticipated (A) & number of tests actually collected, analyzed and/or were determined to meet data quality objectives (B)].

	CRWC	*CRWC*	*LaRosa*	*LaRosa*	*LaRosa*	*LaRosa*	*LaRosa*	*LaRosa*	*WRWA*	*WRWA*	*WRWA*	*WRWA*
Site	**E.coli (A)**	**E.coli (B)[1]**	**NOx (A)**	**NOx (B)**	**TP (A)**	**TP (B)**	**Turb (A)**	**Turb (B)[2]**	**pH (A)**	**pH (B)**	**Cond (A)**	**Cond (B)**
BallMtBrk_.58	7	7	4	4	4	4	4	4	4	4	4	4
BallMtBrk_1.7	0	0	4	4	4	4	4	4	4	4	4	4
Flood_6.7	0	0	4	4	4	4	4	4	4	4	4	4
NBranchBrk _4.5	0	0	4	4	4	4	4	4	4	4	4	4
Saxtons_.19	7	6[4]	4	4	4	4	4	4[2]	4	4	4	4
Saxtons_5.0	4	4	4	4	4	4	4	4	4	4	4	4
Saxtons_5.6	7	5[4]	4	4	4	4	4	4	4	4	4	4
West_.08	7	7	4	4	4	4	4	4[2]	4	4	4	4
West_1.42	7	7[3]	4	4	4	4	4	4	4	4	4	4
West_6.4	7	7	4	4	4	4	4	4[2]	4	4	4	4
West_13	7	7	4	4	4	4	4	4	4	4	4	4
West_16	4	4	4	4	4	4	4	4	4	4	4	4
West_36	7	7	4	4	4	4	4	4	4	4	4	4
West_36.2	7	7	4	4	4	4	4	4	4	4	4	4
Whetstone_.2	5	5	5	5	5	5	5	5	5	5	5	5
Whetstone_6.4	5	5	5	5	5	5	5	5	5	5	5	5
Whetstone_9.6	5	4[4]	5	5	5	5	5	5	5	5	5	5
Wiliams_7.0	7	7	4	4	4	4	4	4	4	4	4	4
Wiliams_10.3	4	2[4]	4	2	4	2	4	2	4	2	4	2
Wiliams_10.7	7	6[5]	4	4	4	4	4	4	4	4	4	4
Total Number	104	97	83	81	83	81	83	81	83	81	83	81
% Complete		93.3		97.6		97.6		97.6		97.6		97.6
Blanks	12	12	9	9	9	9	9	9	0	0	9	10
Field Duplicates	12	12	9	9	9	9	9	9	9	9	9	9

Note 1: On 6/30/10 *E. coli* samples were > 4 deg C range [see Table 4 & "QUALITY ASSURANCE (QA) RESULTS & DETERMINATIONS"]
Note 2: Turbidity field duplicate RPD value for these 3 sites was > 15% (see Table 4 & "QA RESULTS & DETERMINATIONS")
Note 3: One *E. coli* field duplicate RPD value was 58.2% (see Table 4 and "QA RESULTS & DETERMINATIONS")
Note 4: One or more samples not collected/submitted from these sites **Note 5:** Lab error on one sample for this site; no media added to the sample

Table 4. Relative Percent Difference (RPD)* as calculated for all field duplicates.

* RPD formula used: $RPD_{\text{field duplicate pair 1}}$ = absolute value ($sample_1$ - $sample_2$) / average ($sample_1$ and $sample_2$)

	CRWC	***LAROSA***	***LAROSA***	***LAROSA***	***WRWA***	***WRWA***
Site	**E.coli**	**NOx**	**TP**	**Turb**	**pH**	**Cond.**
BallMtBrk_.58	8.4	0	13.8	4.7	0.3	0.2
Saxtons_.19	1.6	3.9	4.1	**71.8**[a]	0.6	1.2
Saxtons_5.6	20.9					
West_.08	10.2	0.0	1.7	**25.2**[a]	0.1	1.0
West_1.42	**58.2**[a]					
West_6.4	17.1	0.0	6.4	**52.5**[a]	0.4	2.0
West_13	7.1					
West_36	27.4	0.0	4.7	14.3	0.0	0.1
Whetstone_6.4	31.1	0.0	4.6	0.0	0.1	0.1
Whetstone_9.6	81.9	0.0	4.9	2.9	0.3	0.3
Wiliams_7.0	34.1	0.0	8.4	5.2	0.4	0.2
Wiliams_10.7	5.3	0.0	14.6	3.0	0.3	0.1
Average RPD	25.3%	0.4%	7.0%	20.0%	0.3%	0.6%
RPD GOAL	50% (>25 mpn) 125 % (< 25 cfu)	≤10%	≤30%	≤15%		

a – For more information see "QUALITY ASSURANCE RESULTS & DETERMINATIONS" below.

QUALITY ASSURANCE RESULTS & DETERMINATIONS

WRWA has not rejected any values for samples analyzed by LaRosa Lab, only one *E. coli* value was rejected due to lab error, no pH or conductivity results have been rejected and one air temperature value was rejected due to possible incorrect value recorded by volunteer. The 2 values rejected by WRWA (the one *E. coli* and one air temperature) are not included in the data submission Excel file provided to VT DEC.

Following are some QA anomalies that occurred, but data have not been rejected:

- June 30 *E. coli* samples: Upon receipt at CRWC individual lab samples measured between 10.9 to 17.0 deg C, with most being around 13 deg C. All samples held/transported between sampling time and pick-up time, and then pick-up time to delivery to CRWC lab were kept on frozen cold paks in coolers except during the time that samples were sorted for delivery to Waterbury/Larosa and Greenfield/CRWC; then it was about another 45 minutes, on frozen cold paks and in coolers, for delivery to CRWC lab for *E. coli* testing. On all sampling dates after this - after picking-up samples from volunteers or from drop-off locations - samples were transported in coolers with ice. Volunteers continued to use their small coolers with frozen ice paks. On all sampling dates, conditions to promote/ensure cooling of samples was evident.
- All *E. coli* samples during the season were set-up for testing at the CRWC lab within the 8 hour timeframe, though occasionally receipt at the lab may have been beyond the 6 hour timeframe.
- The *E. coli* field duplicate RPD value for the Sep. 8 West 1.42 sample was 58.2%. The field duplicate result was 71.2 MPN and the test sample result was 39.1 MPN.
- The turbidity field duplicate RPD value for the Saxtons .19 sample was 71.8%. The field duplicate result was .7 NTU and the test sample results was .33 NTU.
- The turbidity field duplicate RPD value for the West .08 sample was 25.2%. The field duplicate result was .59 NTU and the test sample results was .76 NTU.
- The turbidity field duplicate RPD value for the West 6.4 sample was 52.5%. The field duplicate result was .97 NTU and the test sample results was 1.66 NTU
- % completeness as shown in Table 3 is based on the premise that there are no values to be rejected for samples analyzed by LaRosa Lab, only one to be rejected performed by CRWC lab due to lab error and no pH or conductivity results to be rejected. A few scheduled samples at various sites were not collected during the sampling season.

OVERVIEW OF RESULTS & PROJECT

This overview is intended as a preliminary synopsis of the results generated by the project. More thorough data analysis, with graphing and river flows/discharge information, will be performed over the next 1-2 months by WRWA volunteers, with input from Marie Caduto, Watershed Coordinator.

Listed below are parameters and sites of interest/concern based on a preliminary look at 2010 monitoring results:

E. coli:

West River, 2 South Londonderry sites, West 36 & West 36.2:

West 36 *E. coli* GEOMEAN* = 167.8 MPN (n=7); max. season value = 1986.3 MPN, 7/14/10

West 36.2 *E. coli* GEOMEAN* = 147.1 MPN (n=7); max. season value = 866.4 MPN, 7/14/10

West River, Milkhouse Meadows site just above confluence with CT River in Brattleboro, West .08:

West .08 *E. coli* GEOMEAN* = 163.1 MPN (n=7); maximum season value = 866.4 MPN, 9/8/10

Whetstone Brook, downtown Brattleboro site behind Coop., Whetstone .2:

Whetstone .2 *E. coli* GEOMEAN* = 195.6 MPN (n=5); max. season value = 307.69 MPN, 7/28

Williams River, Chester - Rainbow Rock, Williams 10.7:

Williams 10.7 *E. coli* GEOMEAN* = 158.9 MPN (n=6); max. season value = 290.9 MPN, 7/14

Williams River, Rockingham - Bartonsville bridge, Williams 7.0:

Williams 7.0 *E. coli* GEOMEAN*= 173.8 MPN (n=7); max. season value= >2419.6 MPN, 8/11

(* The GEOMEAN calculations for these values do not include the use of field duplicate sample results.)

Total Phosphorous (TP):

Saxtons River, below Saxtons River village WWTF, Saxtons 5.0:

6/30 = 62.1 ppb, 7/28 = 16.1 ppb, 8/25 = 75.9 ppb, 9/22 = 36.6 ppb; MEAN = 47.68 ppb

Flood Brook, below Hapgood Pond, Flood 6.7:

6/30 = 13.4 ppb, 7/28 = 14.7 ppb, 8/25 = 18.8 ppb, 9/22 = 16.9 ppb; MEAN = 15.95 ppb

Williams River, Rockingham - Bartonsville bridge, Williams 7.0:

6/30 = 11.2 ppb, 7/28 = 13.0 ppb, 8/25 = 17.3 ppb, 9/22 = 16.1 ppb; MEAN = 14.4 ppb

West River sites:

At the sites along the West River TP values ranged from 8.5 – 14.7 ppb over the sampling season.

Whetstone Brook sites:

On 8/25 the 3 Whetstone Brook sites' TP results were remarkably higher than other dates sampled.

Temperature:

At some point over the course of the monitoring season from late June until early September, water temperatures at sites along all rivers in the program measured in ranges above optimal for cold water fisheries.

2011 West River Watershed Alliance (WRWA),
dba Southeastern Vermont Watershed Alliance (SeVWA)
LAROSA PARTNERSHIP PROGRAM FINAL REPORT
Prepared by Laurie G. Callahan
January 9, 2012

INTRODUCTION

West River Watershed Alliance's (WRWA's) water quality monitoring program was made possible in 2011 by the LaRosa Partnership Program and a dedicated team of local volunteers. There were 18 regular volunteer river monitors and 6 "back-up" volunteer monitors. The program was organized and run by a program coordinator (Laurie Callahan) with help from a program assistant (Rebecca Salem) and with the additional assistance of an unpaid VT DEC intern (Daniel Bougie) who divided his hours of services between WRWA, the Ottauquechee River Group (ORG) and Marie Caduto, VT DEC Watershed Coordinator for Basins 10, 11 & 13. Dan's internship was part of his program requirements at Vermont Law School.

There were 22 sites chosen for monitoring in WRWA's 2011 program – 5 sites were to be sampled once per month and 17 sites every 2 weeks.

A collaborative effort was established in 2010 with Connecticut River Watershed Council (CRWC) in Greenfield, MA to perform WRWA's *E. coli* analyses and that collaboration continued in 2011. A services exchange was set-up between CRWC and VT DEC Water Quality Division/LaRosa Lab. Laurie Callahan assisted with processing of WRWA samples at the CRWC lab on days that she delivered samples to them. Her services were provided free-of-charge to CRWC. In 2010 Callahan was successful at procuring an incubator to be utilized by the CRWC lab through the EPA Region 1 Equipment Loan grant program. This incubator - as an addition to CRWC's incubator - ensures that CRWC will have adequate capacity for incubating WRWA *E. coli samples* along with any other samples the CRWC lab processes.

On the following pages are tables and figures with information about various aspects of WRWA's 2011 water quality monitoring program. Here are some general descriptions of those items in the order they appear on the following pages:

Table 1 lists the 2011 monitoring sites' locations. There were seven new sampling sites added in 2011. Those sites were West_0.5, West_36.1, West_38.5, West_39, Williams_10.8, Williams_8.7 and MBrWilliams_.02.

Figure 1 is a map showing all of the 2011 WRWA water quality monitoring site locations and the various rivers' watershed boundaries. Map was provided by Marie Caduto, VT DEC Basin 11 Watershed Coordinator.

Table 2 lists all of WRWA's 2011 monitoring sites with dates and parameters sampled and analyzed.

Table 3 shows the number of sampling events per site for each parameter and also contains data completeness information.

Table 4 is a chart of Relative Percent Difference (RPD) calculations for all 2011 WRWA field duplicate parameters.

Quality assurance aspects of the information presented in Tables 3 and 4 are addressed in the section titled "QUALITY ASSURANCE RESULTS & DETERMINATIONS" and WRWA's 2011 monitoring results and a brief overview of the results are presented in "OVERVIEW OF PROJECT RESULTS ".

Also, as noted in the title at the top of this page, since 2010 West River Watershed Alliance (WRWA) has been doing business as Southeastern Vermont Watershed Alliance (SeVWA).

Continued on the next page

Table 1. Roster of Sites:

Site ID Code	Site Location	LAT	LON
West_.08	Brattleboro, Milk House Meadows	42.86940	-72.56050
West_.5*	New 2011 site just above West_.08	42.87062	-72.56232
West_1.42	Behind Bboro Prof. Center, Rte. 30	42.87967	-72.57383
West_6.4	Dummerston covered bridge	42.93550	-72.61350
West_13	Brookline bridge	42.99590	-72.63710
West_36	So. Londonderry, Rowes Rd.	43.18500	-72.80260
West_36.1*	So. L'derry, below Cobb's swim hole, just above Rte 100 bridge in village	43.19310	-72.81630
West_38.5*	L'derry, below Mountain Marketplace, Rte 100	43.22291	-72.81944
West_39*	L'derry village, below dam at park	43.22634	-72.80786
NBranchBrk_4.5	Pikes Falls	43.09760	-72.85150
Williams_7.0	Bartonsville bridge	43.22400	-72.53690
Williams_8.7*	Missing Link Rd. bridge, above Williams_7.0	43.23971	-72.55799
Williams_10.3	Below Chester WWTF	43.25537	-72.57410
Williams_10.7	Chester, Rainbow Rock	43.25903	-72.57848
Williams_10.8*	Just above confluence with Middle Branch Williams R., just above Rainbow Rock	43.26020	-72.57890
MBrWilliams_.02*	Mid. Br. Williams R., just above Rainbow Rock	43.25990	-72.57980
Saxtons_.19	Bellows Falls/Westminster "sandy beach"	43.12300	-72.44240
Saxtons_5.0	Below SR WWTF	43.13743	-72.50382
Saxtons_5.6	Saxtons River, above village, Stickney's field	43.13750	-72.51570
Whetstone_.2	Behind Bboro Coop	42.85070	-72.55940
*Whetstone_6.4***	Dettman Dr.	42.86705	*-72.61485***
Whetstone_9.6	Stark Rd.	42.86993	-72.65733

***** New sites for 2011 monitoring sites. ** LON coordinate value corrected in 2011.

Continued on the next page

Figure 1. Map of 2011 Sampling Sites:

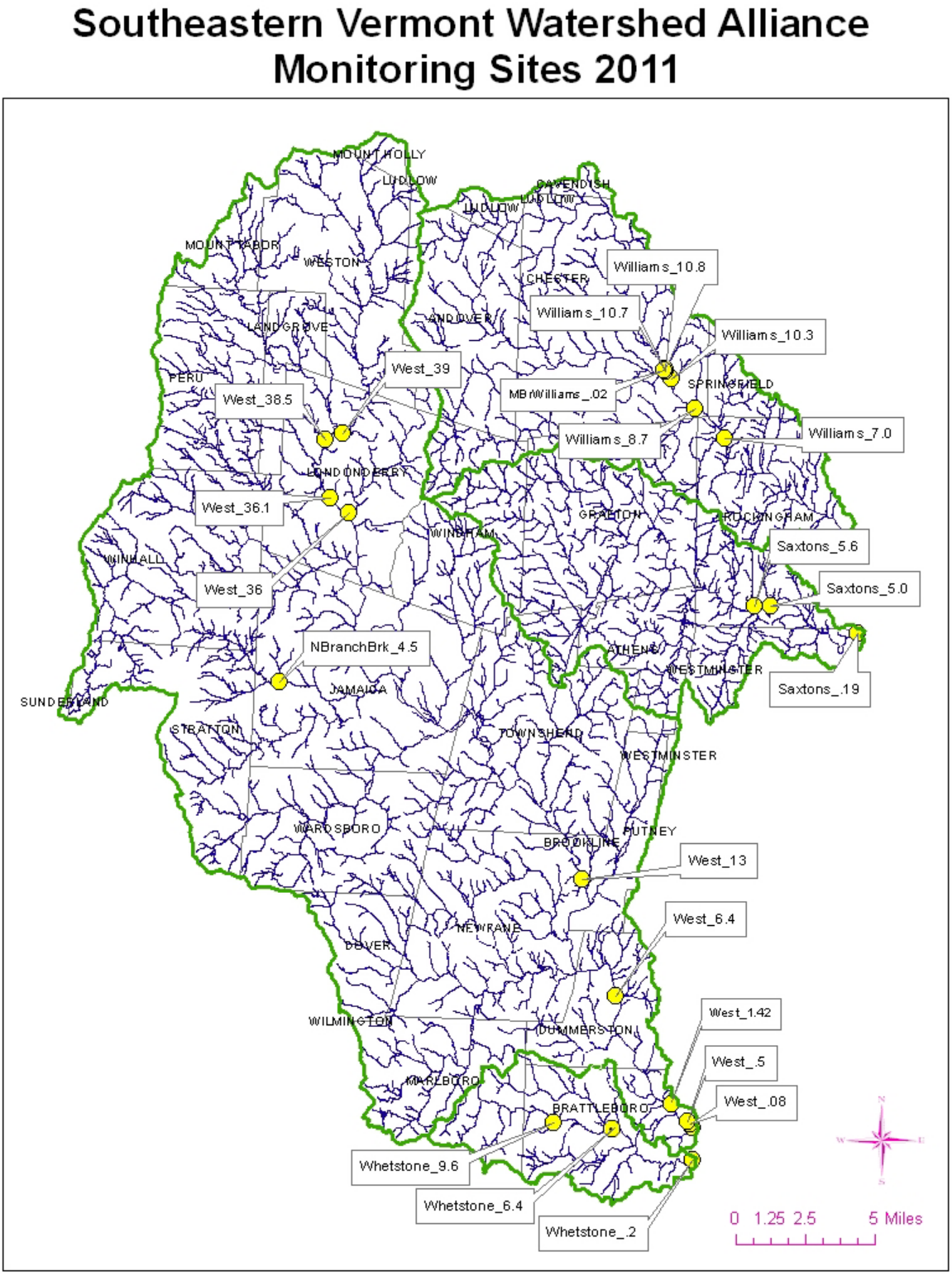

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Table 2. Sampling Dates & Parameters Measured, Sampled or Analyzed (see **Note** below**):**

Site ID	TP, NOx	Turb	E. coli	pH, Cond
West_.08	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, 9/14	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, ~~9/14~~ c/nt	6/22, 7/20, 8/17, ~~9/14~~ c/nt
West_0.5*	NA	NA	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, ~~9/14~~	NA
West_1.42	6/22, ~~7/20~~, 8/17, ~~9/14~~	6/22, ~~7/20~~, 8/17, ~~9/14~~ c/nt	6/22, 7/6, ~~7/20~~, 8/3, 8/17, ~~8/31~~, ~~9/14~~ c/nt	6/22, ~~7/20~~, 8/17, ~~9/14~~ c/nt
West_6.4	6/22, 7/20, ~~8/17~~, ~~9/14~~	6/22, 7/20, ~~8/17~~, 9/14	6/22, 7/6, 7/20, 8/3, ~~8/17~~, ~~8/31~~, ~~9/14~~ c/nt	6/22, 7/20, ~~8/17~~, ~~9/14~~ c/nt
West_13	6/22, 7/20, ~~8/17~~, ~~9/14~~	6/22, 7/20, 8/17, 9/14	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, ~~9/14~~ c/nt	6/22, 7/20, 8/17, ~~9/14~~ c/nt
West_36	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, 9/14	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, 9/14	6/22, 7/20, 8/17, 9/14
West_36.1	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, 9/14	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, 9/14	6/22, 7/20, 8/17, 9/14
West_38.5	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, 9/14	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, 9/14	6/22, 7/20, 8/17, 9/14
West_39	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, 9/14	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, 9/14	6/22, 7/20, 8/17, 9/14
NBranchBrk_4.5	~~6/22~~, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~
Williams_7.0	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, 9/14	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, 9/14	6/22, 7/20, 8/17, 9/14
Williams_8.7	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~
Williams_10.3	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, 9/14	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, 9/14	6/22, 7/20, 8/17, 9/14
Williams_10.7	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~
Williams_10.8	6/22, 7/20, ~~8/17~~, ~~9/14~~	6/22, 7/20, ~~8/17~~, ~~9/14~~	6/22, 7/6, 7/20, 8/3, ~~8/17~~, ~~8/31~~, ~~9/14~~	6/22, 7/20, ~~8/17~~, ~~9/14~~
MBrWilliams_.02	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~
Saxtons_.19	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, 9/14	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, 9/14	6/22, 7/20, 8/17, 9/14
Saxtons_5.0	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, 9/14	6/22, 7/20, 8/17, 9/14	6/22, 7/20, 8/17, 9/14
Saxtons_5.6	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, 9/14	6/22, 7/6, 7/20, 8/3, 8/17, ~~8/31~~, 9/14	6/22, 7/20, 8/17, 9/14
Whetstone_.2	6/22, 7/20, ~~8/17~~, ~~9/14~~	6/22, 7/20, ~~8/17~~, 9/14	6/22, 7/20, ~~8/17~~, 9/14	6/22, 7/20, ~~8/17~~, 9/14
Whetstone_6.4	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~
Whetstone_9.6	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~	6/22, 7/20, 8/17, ~~9/14~~

Note: Unhighlighted dates with "*strike-through*" (~~X/XX~~) indicate samples that were intended to be sampled, but were not submitted for analysis; on 8/31/11 no scheduled samples were collected as effects of Irene were still being determined; on 9/14/11 many of the scheduled samples were collected, but LaRosa Lab was not accepting samples from volunteer programs due to Irene's impact on the State complex in Waterbury (some E. coli samples were submitted and processed by the CRWC Lab, most of the conductivity and pH samples collected were run by WRWA/ SeVWA, and highlighted samples had turbidity testing performed at Nelson Analyitcal in Kennebunk, ME; no 9/14/11samples were analyzed for TP or NOx; c/nt with highlight indicates that the sample was collected, but was not tested; ~~X/XX~~ indicates a TP value was rejected on this date due to RPD value being exceeded (see Table 4 for more info).

Continued on the next page

Table 3. Number of Sampling Events per Site & Data Completeness Information [as percentage; number of tests that were anticipated (A) & number of tests actually collected, analyzed and/or were determined to meet data quality objectives (B)].

	CRWC	*CRWC*	*LaRosa*	*LaRosa*	*LaRosa*	*LaRosa*	*LaRosa*	*LaRosa*	*Nelson*	*WRWA*	*WRWA*	*WRWA*	*WRWA*
Site	**E.coli (A)**	**E.coli (B)[1]**	**NOx (A)**	**NOx (B)[2]**	**TP (A)**	**TP (B)[2]**	**Turb (A)**	**Turb (B)[3]**	**Turb (B)[3]**	**pH (A)**	**pH (B)[4]**	**Cond (A)**	**Cond (B)[4]**
West_.08	7	5	4	3	4	3	4	3	1	4	3	4	3
West_0.5	7	5	0	0	0	0	0	0	0	0	0	0	0
West_1.42	7	4	4	2	4	2	4	2	0	4	2	4	2
West_6.4	7	4	4	2	4	2	4	2	1	4	2	4	2
West_13	7	5	4	3	4	3	4	3	1	4	3	4	3
West_36	7	6	4	3	4	3	4	3	1	4	4	4	4
West_36.1	7	6	4	3	4	3	4	3	1	4	4	4	4
West_38.5	7	6	4	3	4	3	4	3	1	4	4	4	4
West_39	7	6	4	3	4	3	4	3	1	4	4	4	4
NBranchBrk_4.5	4	3	4	3	4	2	4	3	0	4	3	4	3
Williams_7.0	7	6	4	3	4	3	4	3	1	4	4	4	4
Williams_8.7	7	5	4	3	4	3	4	3	0	4	3	4	3
Williams_10.3	7	6	4	3	4	3	4	3	1	4	4	4	4
Williams_10.7	7	5	4	3	4	3	4	3	0	4	3	4	3
Williams_10.8	7	4	4	2	4	2	4	2	0	4	2	4	2
MBrWilliams_.02	7	5	4	3	4	3	4	3	0	4	3	4	3
Saxtons_.19	7	6	4	3	4	3	4	3	1	4	4	4	4
Saxtons_5.0	4	4	4	3	4	3	4	3	1	4	4	4	4
Saxtons_5.6	7	6	4	3	4	3	4	3	1	4	4	4	4
Whetstone_.2	4	3	4	2	4	2	4	2	1	4	3	4	3
Whetstone_6.4	4	3	4	3	4	3	4	3	0	4	3	4	3
Whetstone_9.6	4	3	4	3	4	3	4	3	0	4	3	4	3
Total Number	139	106	84	59	84	58	84	59	13	84	69	84	69
% Complete		76.3%		70.2%		69.1%		70.2%[3]	85.7%[3]		82.1%		82.1%
Blanks	14	12	8	6	8	6	8	6	2	NA	NA	8	8
Field Duplicates	14	11	8	5	8	5	8	5	2	8	8	8	8

Note 1, 2, & 4: A couple of sites not sampled on 8/17/11 due to high water levels; all sites NOT sampled on 8/31/11 due to conditions created by TS Irene; again, due to effects of Irene, some sites not sampled or sampled-but-not-tested on 9/14/11; and 2 samples not collected by volunteers during the 2011 season for various other reasons and, due to lack of notice to coordinator, unable to schedule substitute monitor for those samples.

Note 3: Many monitoring sites were still very turbid on 9/14/11 and since LaRosa Lab was not accepting volunteer samples for analysis, most sites samples were tested for turbidity at Nelson Analytical in Kennebunk, ME. Those analyses were done "gratis"at that NELAC accredited lab. The 70.2% completion rate is for the seasons' turbidity analyses performed at LaRosa lab and the 85.7% completion rate is for the 2011 turbidity analyses performed at LaRosa Lab and Nelson combined.

Continued on next page

Table 4. Relative Percent Difference (RPD)* as calculated for all field duplicates.

* RPD formula used: $RPD_{\text{field duplicate pair 1}}$ = absolute value ($sample_1$ - $sample_2$) / average ($sample_1$ and $sample_2$)

	CRWC	LAROSA	LAROSA	LAROSA	NELSON	WRWA	WRWA
Site	**E.coli**	**NOx**	**TP**	**Turb**	**Turb**	**pH**	**Cond.**
NBranchBrk 4.5	21.5%	0.0%	**82.7%** [a]	**26.9%** [b]	NA	0.4%	0.4%
Williams 10.7	19.5%	6.9%	10.6%	**66.7%** [b]	NA	0.3%	0.5%
West 6.4	13.5%	NA	NA	NA	NA	NA	NA
MBrWilliams.02	2.9%	NA	NA	NA	NA	NA	NA
West 36.1	2.1%	0.0%	17.0%	3.0%	NA	0.1%	0.2%
Saxtons 5.6	5.2%	0.0%	3.6%	12.5%	NA	0.1%	2.1%
West 1.42	12.1%	NA	NA	NA	NA	NA	NA
Williams 8.7	47.6%	NA	NA	NA	NA	NA	NA
West 13	17.2%	0.0%	**47.9%** [a]	**23.5%** [b]	NA	0.1%	0.6%
West 36	33.6%	NA	NA	NA	8.3%	0.3%	0.8%
Saxtons 5.0	NA	NA	NA	NA	0.1%	0.4%	2.0%
Whetstone .2	67.7%	NA	NA	NA	**21.6%** [b]	0.1%	1.1%
Average RPD	**22.1%**	**1.4%**	**32.4.0%**	**26.5%**	**10.0%**	**0.2%**	**1.0%**
Average RPD w/o rejected items	**NA**	**NA**	**10.4%**	**NA**	**NA**	**NA**	**NA**
Combined Turbidity Average RPD	**NA**	**NA**	**NA**	**20.3%**		**NA**	**NA**
RPD GOAL	**50% (>25 mpn) 125 % (< 25 cfu)**	**≤10%**	**≤30%**	**≤15%**	**≤15%**	**ND**	**ND**

Note a: NBranchBrk_4.5 TP 18.2 ppb, 7.55 ppb, RPD % difference = 82.7, rejected value; West_13, TP 26.2 ppb, 42.7 ppb, RPD % difference = 47.9, rejected value

Note b: None of theses values rejected; NBranchBrk_4.5 Turb RPD % difference = 26.9, Williams_10.7 RPD % difference = 66.7, West_13 RPD % difference = 23.5, Whetstone_.2 RPD % difference = 21.6

Notes a,b – For more information see "QUALITY ASSURANCE RESULTS & DETERMINATIONS" below.

QUALITY ASSURANCE RESULTS & DETERMINATIONS

WRWA has not rejected any *E. coli* values for samples analyzed by CRWC laboratory in 2011. For analyses performed by LaRosa Lab in 2011, 2 TP values were rejected based on RPD values calculated for those samples and 4 turbidity values exceeded "RPD Goal" values, but data values were not rejected. For pH and conductivity analyses performed by WRWA/SeVWA, no results were rejected. Descriptions regarding QA anomalies appear below. Part 1 lists anomalies occurred, but results not rejected. Part 2 lists anomalies that resulted in data rejection.The data values rejected by WRWA are included as "flagged" entries in the data submission Excel file provided to VT DEC. Data completeness below 80% due to effects of Irene, including cancellation of 8/31 sampling.

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2011 West River Watershed Alliance (WRWA),
dba Southeastern Vermont Watershed Alliance (SeVWA)
LAROSA PARTNERSHIP PROGRAM FINAL REPORT
(continued)

Part 1: Following are some QA anomalies that occurred, but data have not been rejected:

- CRWC *E. coli* samples: Upon receipt at CRWC a number of individual lab samples measured > 4.0 deg C. All samples held/transported between sampling time and pick-up time were kept on frozen cold paks or on ice in coolers, and then all samples from pick-up time to delivery to CRWC lab were transported on ice in coolers. On all sampling dates evidence of cooling of all samples from time of collection through delivery to CRWC lab in Greenfield was observed and documented.
- All *E. coli* samples during the season were set-up for testing at the CRWC lab within the 8 hour timeframe, though an occasional sample receipt at the lab may have been beyond the 6 hour timeframe.
- 4 turbidity values exceeded "RPD Goal" values, but none of those values were rejected
- NBranchBrk_4.5, 6/22/11, test sample Turb (turbidity) = 0.76 NTU, field duplicate Turb = 0.58 NTU, RPD % difference = 26.9%; both samples < 1.0 NTU
- Williams_10.7, 6/22/11, test sample Turb (turbidity) = 0.4 NTU, field duplicate Turb = 0.8 NTU, RPD % difference = 66.7%; both samples < 1.0 NTU
- West_13, 8/1711, test sample Turb (turbidity) = 3.76 NTU, field duplicate Turb = 4.76NTU, RPD %, difference = 23.5%; both samples < 10.0 NTU
- Whetstone_.2, 9/14/11, test sample Turb (turbidity) = 4.57 NTU, field duplicate Turb = 3.68 NTU, RPD % difference = 21.6%; both samples < 10.0 NTU
- % completeness for turbidity is shown in Table 3 for both LaRosa and Nelson Analytical samples separately and then also as a % completeness for all of those samples combined.

Part 2: Following are some QA anomalies that occurred and resulted in data rejection:

- The TP (total phosphorous) field duplicate RPD value for the June 22, 2011 NBranchBrk_4.5 sample was 82.7%. The field duplicate result was 7.55 ppb and the test sample result was 18.2 ppb.
- The TP (total phosphorous) field duplicate RPD value for the August 17, 2011 West_13 sample was 47.9%. The field duplicate result was 42.7 ppb and the test sample result was 26.2 ppb.
- Both of these samples and field duplicate samples were collected by "veteran" volunteer monitors that have been WQM samplers for a number of years. There is no reason to question their sampling technique, but for some reason there seems to have been an issue with these particular samples. These were 2 different volunteers that only sampled at these separate sites during the 2011 season.

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OVERVIEW: PRELIMINARY SYNOPSIS OF PROJECT RESULTS

This overview is intended as a preliminary synopsis of results generated by the project. More descriptive data review for 2010 and 2011, with graphing and river flows/discharge information, will be reported in the very near future. Listed below are items of interest/concern based on a preliminary look at 2011 monitoring results:

E. coli:

West River, 2 Londonderry and 2 South Londonderry sites (TMDL project area):

West 39 *E. coli* GEOMEAN* = 109.8 MPN (n = 6); max. season value = 228.2 MPN, 8/17/11
West 38.5 *E. coli* GEOMEAN* = 66.0 MPN (n = 6); max. season value = 139.6 MPN, 8/17/11
West 36.1 *E. coli* GEOMEAN* = 57.4 MPN (n = 6); max. season value = 161.6 MPN, 8/17/11
West 36 *E. coli* GEOMEAN* = 107.5 MPN (n = 6); max. season value = 387.3 MPN, 8/3/11

[West 39, West 38.5 and West 36.2 (just downstream from 36.2) were newly located sites in 2011.]

West River, Milkhouse Meadows site (West .08), a new 2011 site just upstream (West .5) & West 1.42:

West 1.42 *E. coli* GEOMEAN* = 76.5 MPN (n = 4); max. season value = 579.4 MPN, 8/17/11
West .5 *E. coli* GEOMEAN* = 67.7 MPN (n = 5); max. season value = 387.3 MPN, 8/17/11
West .08 *E. coli* GEOMEAN* = 74.5 MPN (n = 5); max. season value = 307.6 MPN, 8/17/11

(In 2010 West .08 *E. coli* GEOMEAN* = 163.1 MPN (n = 7); max. seas. value = 866.4 MPN, 9/8/10/10)

[West .5 (just upstream from .08) was a newly chosen site in 2011 due to 2010 *E. coli* levels at West.08 .]

Whetstone Brook, Whetstone_.2, Whetstone_6.4 and Whetstone_9.6 (TMDL project area):

Whetstone 9.6 *E. coli* GEOMEAN* = 113.6 MPN (n = 3); max. seas. val.= 866.4 MPN, 6/22/11
Whetstone 6.4 *E. coli* GEOMEAN* = 50.4 MPN (n = 3); max. seas. value = 118.7 MPN, 8/17/11
Whetstone .2 *E. coli* GEOMEAN* = 327.7 MPN (n = 3); max. seas. value = 686.7 MPN, 7/20/11
(In 2010, Whetstone .2, *E. coli* GEOMEAN* = 195.6 MPN (n=5); max. season value = 307.69 MPN)

Williams R., Chester – Rainbow Rock, Williams 10.7, upstream sites – Williams 10.8, MBrWilliams .02:
MBrWilliams .02 *E. coli* GEOMEAN* = 65.3 MPN (n=5); max. seas. val. = 104.3 MPN, 8/17/11
Williams 10.8 *E. coli* GEOMEAN* = 143.4 MPN (n=4); max. seas. value = 410.6 MPN, 6/22/11
Williams 10.7 *E. coli* GEOMEAN* = 95.3 MPN (n=5); max. season value = 142.1 MPN, 8/17/11
Williams River, Rockingham - Bartonsville bridge, Williams 7.0:
Williams 7.0 *E. coli* GEOMEAN* = 94.9 MPN (n=6); max. season value = 222.4 MPN, 8/17/11
(In 2010, Williams 7.0 GEOMEAN = 173.8 MPN (n=7) and max. seas. val. = >2419.6 MPN on 8/11/10)

Saxtons River, Rockingham – Saxtons River and Westminster GEOMEANS:
Saxtons 5.6, 2011 *E. coli* GEOMEAN* = 79.9 (n=6); max. season value = 214.2 MPN, 8/17/11
Saxtons 5.0, 2011 *E. coli* GEOMEAN* = 101.7 (n=4); max. season value = 204.6 MPN, 8/17/11
Saxtons .19 2011 *E. coli* GEOMEAN* = 142.1 (n=6); max. season value = 261.3 MPN, 8/17/11
(* The GEOMEAN calculations for these values do not include the use of field duplicate sample results.)

Total Phosphorous (TP):
Saxtons River, Saxtons 5.0, below Saxtons River village WWTF:
2011 MEAN = 30.7 ppb, n = 3 (2010 MEAN = 47.68 ppb);
6/22 = 34.9 ppb, 7/20 = 21.2 ppb, 8/17 = 55.1 ppb;
2011 season's TP MEANS for sites above and below this location were 11.6 and 11.0 ppb (respectively, Saxtons 5.6, n = 3 and Saxtons .19, n = 3).
West River:
TP MEANS for all 2011 sites on the West River were > 10 ppb, < 20 ppb

Temperature:
At some point over the course of the monitoring season from late June until early September, water temperatures at sites along the lower portion of the West River measured in ranges above 20 deg C. Some Williams R., Saxtons R. and lower portion of Whetstone Brook temperature measurements approached that 20 deg C value. It must be kept in mind that these measurements were typically made between 7-8 AM on sampling days. Site water temperatures on other days or other times later in the day on sampling days probably reached 20 deg C or greater. It may be helpful to further define actual temperature occurrences at some of these sites – especially those expected to support cold water fisheries restoration – with longer term data collection utilizing HOBO temperature monitoring devices.

As stated at the beginning of this section, this overview is intended as a preliminary synopsis of results generated by the project. More descriptive data review for 2010 and 2011, with graphing and river flows/discharge information, will be reported in the very near future and WRWA/SeVWA water quality monitoring program's 2011 data will also be submitted in the appropriate Excel format.

2012 Southeastern Vermont Watershed Alliance (SeVWA),
Formerly known as West River Watershed Alliance (WRWA)
LAROSA PARTNERSHIP PROGRAM FINAL REPORT
LAROSA PROGRAM # 137-09
Prepared by Laurie G. Callahan
December 27, 2012

INTRODUCTION

Southeastern Vermont Watershed Alliance's (SeVWA's) water quality monitoring program was made possible in 2012 by the LaRosa Partnership Program, a dedicated team of local volunteers and *E. coli* analysis services provided by the lab at Connecticut River Watershed Council (CRWC) in Greenfield (MA). There were 18 regular volunteer river monitors and 6 "back-up" volunteer monitors. The program was organized and run by a program coordinator (Laurie Callahan). In 2012 there was not a coordinator's assistant or intern for the program.

There were 22 sites chosen for monitoring in SeVWA's 2012 program. The original plan for 2012 was to sample 5 sites once per month and 17 sites every 2 weeks. When a few sites were not sampled on the first sampling day of the season, the plan was revised to 4 sites sampled once per month and 18 sampled every 2 weeks. All sites were sampled for all parameters – *E.coli*, pH, conductivity, turbidity, NOx and total phosphorous – once every 4 weeks and 18 sites were sampled for *E. coli* only on the 2 week interval between the 4 week cycle. Monitoring days were Wednesdays and sampling began began on June 13th. The last sampling date for 18 sites was September 5th and October 3rd for the 4 once-per-month monitoring sites.

A collaborative effort was established in 2010 with Connecticut River Watershed Council (CRWC) in Greenfield, MA to perform SeVWA's *E. coli* analyses and that collaboration continued in 2011 and in 2012. A services exchange was set-up between CRWC and VT DEC Water Quality Division/LaRosa Lab. Laurie Callahan assisted with processing of SeVWA samples at the CRWC lab on days that she delivered samples to them. Her services were provided free-of-charge to CRWC. In 2010 Callahan was successful at procuring an incubator to be utilized by the CRWC lab through the EPA Region 1 Equipment Loan grant program. This incubator - as an addition to CRWC's incubator - ensures that CRWC will have adequate capacity for incubating SeVWA *E. coli samples* along with any other samples the CRWC lab processes.

On the following pages are tables and figures with information about various aspects of SeVWA's 2012 water quality monitoring program. Here are some general descriptions of those items in the order they appear on the following pages:

Table 1 lists the 2012 monitoring sites' locations. There was one new sampling site added in 2012. That was a site on the Rock River in Newfane – Rock_.38. A site that was not monitored in 2011 was "reactivated" in 2012 – that was West_16. Two sites that were new in 2011 were dropped from SeVWA's monitoring sites in 2012. Those sites were West_0.5 and West_39.

Figure 1 is a map showing all of the 2012 WRWA water quality monitoring site locations and the various rivers' watershed boundaries. The map was provided by Marie Caduto, VT DEC Basin 11 Watershed Coordinator.

Table 2 lists all of SeVWA's 2012 monitoring sites with dates and parameters sampled and analyzed.

Table 3 shows the number of sampling events per site for each parameter and also contains data completeness information.

Table 4 is a chart of Relative Percent Difference (RPD) calculations for all 2012 SeVWA field duplicate parameters.

Quality assurance aspects of the information presented in Tables 3 and 4 are addressed in the section titled "QUALITY ASSURANCE RESULTS & DETERMINATIONS" and SeVWA's 2012 monitoring results and a brief overview of the results are presented in "OVERVIEW OF PROJECT RESULTS ".

Also, please not that "SeVWA" has been used in this report instead of WRWA - noted in the title at the top of this page. Since 2010, West River Watershed Alliance (WRWA) has been in the process of changing its name to Southeastern Vermont Watershed Alliance (SeVWA).

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Table 1. Roster of Sites with LAT & LON coordinates:

Site ID Code	Site Location	LAT	LON
West_.08	Brattleboro, Milk House Meadows	42.86940	-72.56050
West_1.42	Behind Bboro Prof. Center, Rte. 30	42.87967	-72.57383
West_6.4***	Dummerston covered bridge	42.93680	-72.61350
West_13	Brookline bridge	42.99590	-72.63710
West_16	Ellen Ware Rd.	43.01923	-72.65024
West_36	So. Londonderry, Rowes Rd.	43.18500	-72.80260
West_36.1	So. L'derry, below Cobb's swim hole, just above Rte 100 bridge in village	43.19310	-72.81630
West_38.5	L'derry, below Mountain Marketplace, Rte 100	43.22291	-72.81944
NBranchBrk_4.5	Pikes Falls	43.09760	-72.85150
Rock_.38*	General area of Indian Love Call, above Rte 30	42.94678	-72.64671
Williams_7.0	Bartonsville bridge	43.22400	-72.53690
Williams_8.7	Missing Link Rd. bridge, above Williams_7.0	43.23971	-72.55799
Williams_10.3	Below Chester WWTF	43.25537	-72.57410
Williams_10.7	Chester, Rainbow Rock	43.25903	-72.57848
Williams_10.8	Just above confluence with Middle Branch Williams R., just above Rainbow Rock	43.26020	-72.57890
MBrWilliams_.02	Mid. Br. Williams R., just above Rainbow Rock	43.25990	-72.57980
Saxtons_.19	Bellows Falls/Westminster "sandy beach"	43.12300	-72.44240
Saxtons_5.0	Below SR WWTF	43.13743	-72.50382
Saxtons_5.6	Saxtons River, above village, Stickney's field	43.13750	-72.51570
Whetstone_.2	Behind Bboro Coop	42.85070	-72.55940
*Whetstone_6.4***	Dettman Dr.	42.86705	*-72.61485***
Whetstone_9.6	Stark Rd.	42.86993	-72.65733

***** New site for 2012 monitoring sites.
** LON coordinate value corrected in 2011.
***Coordinate values corrected in 2012; previously N 42.9355, W -72.6135

Continued on the next page

Figure 1. Map of 2012 Sampling Sites:

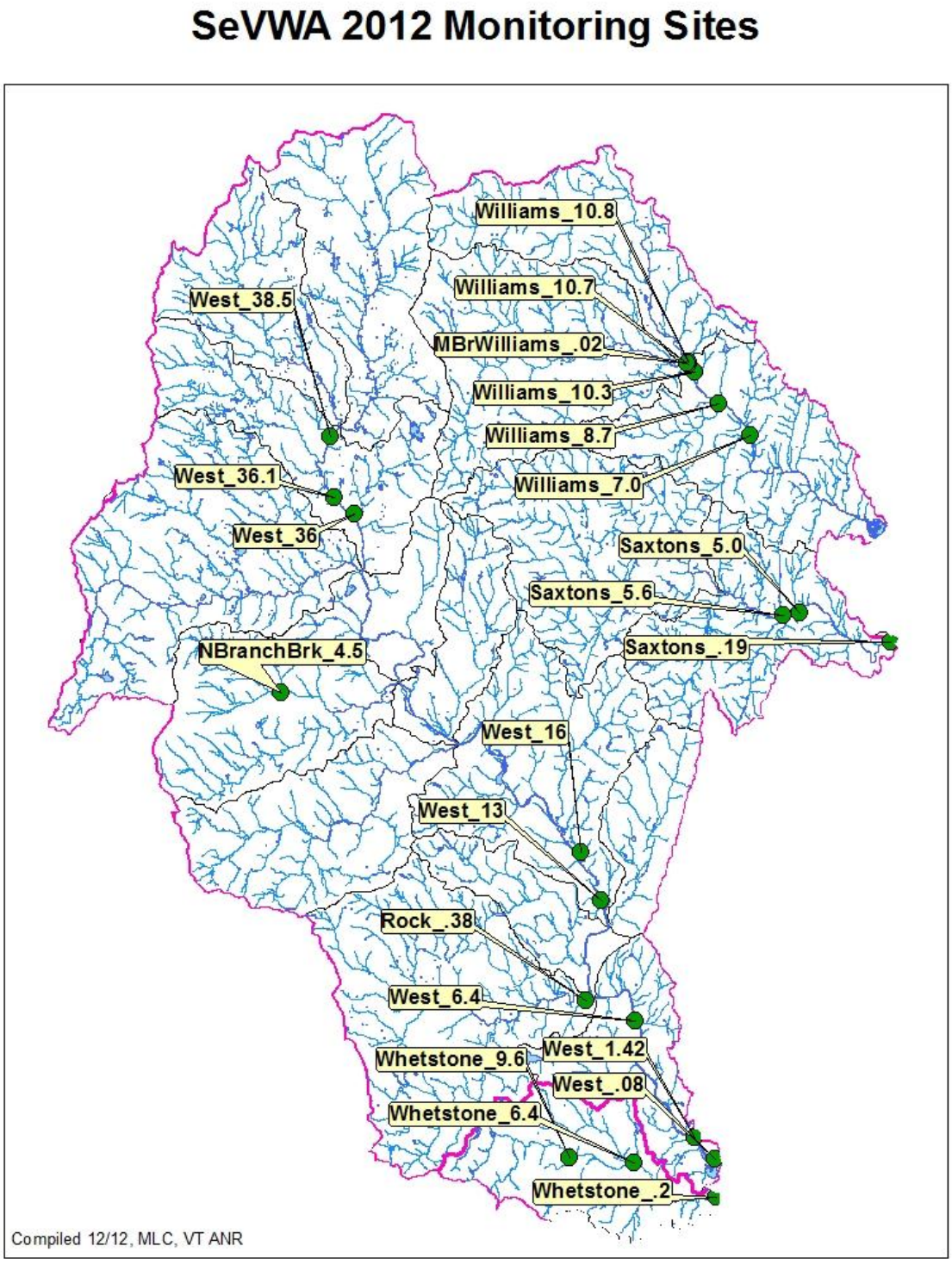

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Table 2. Sampling Dates & Parameters Measured, Sampled or Analyzed (see **Note** below**):**

Site ID	TP, NOx	E. coli	pH, Cond, Turb
West_.08	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
West_1.42	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
West_6.4	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, ~~7/25~~, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
West_13	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
West_16	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
West_36	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
West_36.1	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
West_38.5	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
NBranchBrk_4.5	~~6/13~~, 7/11, 8/8, 9/5, 10/3	6/13, 7/11, 8/8, 9/5, 10/3	6/13, 7/11, 8/8, 9/5, 10/3
Rock_.38	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
Williams_7.0	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
Williams_8.7	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
Williams_10.3	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
Williams_10.7	~~6/13~~, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
Williams_10.8	~~6/13~~, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
MBrWilliams_.02	~~6/13~~, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
Saxtons_.19	6/13, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
Saxtons_5.0 *****	~~6/13~~, 7/11, 8/8, 9/5	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
Saxtons_5.6	6/13, 7/11, 8/8, ~~9/5~~	6/13, 6/27, 7/11, 7/25, 8/8, 8/22, 9/5	6/13, 7/11, 8/8, 9/5
Whetstone_.2	6/13, 7/11, 8/8, 9/5, 10/3	6/13, 7/11, 8/8, 9/5, 10/3	6/13, 7/11, 8/8, 9/5, 10/3
Whetstone_6.4	6/13, 7/11, 8/8, 9/5, 10/3	6/13, (6/27), 7/11, 8/8,(8/22), 9/5, 10/3	6/13, 7/11, 8/8, 9/5, 10/3
Whetstone_9.6	6/13, 7/11, 8/8, 9/5, 10/3	6/13, 7/11, 8/8,(8/22), 9/5, 10/3	6/13, 7/11, 8/8, 9/5, 10/3

Note: Dates with "*strike-through*" (~~X/XX~~) indicate samples that were scheduled to be sampled, but samples were not collected; NOx only missed – sample tube cap lost; *E. coli* sample only collected, other parameters not collected; on 10/3 unable to analyze pH samples collected; Whetstone_6.4 on (6/27) & (8/22) and Whetstone_9.6 on (8/22) – Lab DUP *E.coli* samples not scheduled, but were needed to replace uncollected Lab DUPs on those days.
*****This site (Saxtons_5.0) was not originally scheduled to be monitored every 2 weeks during the WQMP season, but with missed sampling at a few sites on 6/13/12 the decision was made to add the extra *E. coli* sampling dates to this site's sampling schedule.

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Table 3. Number of Sampling Events per Site & Data Completeness Information [as percentage; number of tests that were scheduled (A) & number of tests actually collected, analyzed and/or were determined to meet data quality objectives (B)].

	CRWC	*CRWC*	*LaRosa*	*LaRosa*	*LaRosa*	*LaRosa*	*WRWA*	*WRWA*	*WRWA*	*WRWA*	*WRWA*	*WRWA*
Site	**E.coli (A)**	**E.coli (B)**	**NOx (A)**	**NOx (B)**	**TP (A)**	**TP (B)**	**Turb (A)**	**Turb (B)**	**pH (A)**	**pH (B)**	**Cond (A)**	**Cond (B)**
West_.08	7	7	4	4	4	4	4	4	4	4	4	4
West_1.42	7	7	4	4	4	4	4	4	4	4	4	4
West_6.4	7	6	4	3	4	4	4	4	4	4	4	4
West_13	7	7	4	4	4	4	4	4	4	4	4	4
West_16	7	7	4	4	4	4	4	4	4	4	4	4
West_36	7	7	4	4	4	4	4	4	4	4	4	4
West_36.1	7	7	4	4	4	4	4	4	4	4	4	4
West_38.5	7	7	4	4	4	4	4	4	4	4	4	4
NBranchBrk_4.5	5	4	5	4	5	4	5	4	5	3	5	4
Rock_.38	7	7	4	4	4	4	4	4	4	4	4	4
Williams_7.0	7	7	4	4	4	4	4	4	4	4	4	4
Williams_8.7	7	7	4	4	4	4	4	4	4	4	4	4
Williams_10.3	7	7	4	4	4	4	4	4	4	4	4	4
Williams_10.7	7	5	4	3	4	3	4	3	4	3	4	3
Williams_10.8	7	6	4	3	4	3	4	3	4	3	4	3
MBrWilliams_.02	7	6	4	3	4	3	4	3	4	3	4	3
Saxtons_.19	7	7	4	4	4	4	4	4	4	4	4	4
Saxtons_5.0	7	6	4	3	4	3	4	3	4	3	4	3
Saxtons_5.6	7	6	4	3	4	3	4	3	4	3	4	3
Whetstone_.2	5	5	5	5	5	5	5	5	5	4	5	5
Whetstone_6.4	5	5	5	5	5	5	5	5	5	4	5	5
Whetstone_9.6	5	5	5	5	5	5	5	5	5	4	5	5
Total Number	146	138	92	85	92	86	92	86	92	82	92	86
% Complete		94.5%[1]		92.4%[1,2]		93.5%[1]		93.5%[1]		89.1%[1, 3]		93.5%[1]
Blanks	15	15	9	9	9	9	9	9	NA	NA	9	9
Field Duplicates	15	14[4]	9	9	9	7[5]	9	9	9	8[3]	9	9

Note 1: A total of 8 sites were not sampled on a total of 4 days due to volunteers not having enough time to notify coordinator about their inability to sample at their scheduled sites on a particular morning.
Note 2: One NOx sample was not submitted for analysis on 07/11/12; the sample tube cap was lost in the current during sample collection.
Note 3: The pH parameter for 4 sites sampled on 10/3were collected, but were not analyzed.
Note 4: An *E. coli* field duplicate and sample result from 07/25/12 were rejected; RPD value exceeded the limit of 50%.
Note 5: A TP field duplicate and sample result from 06/13/12 were rejected; RPD value exceeded the limit of 30%.
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Table 4. Relative Percent Difference (RPD)* as calculated for all field duplicates.

* RPD formula used:

$RPD_{\text{field duplicate pair 1}}$ = absolute value ($sample_1$ - $sample_2$) / average ($sample_1$ and $sample_2$)

		CRWC	*LAROSA*	*LAROSA*	*WRWA*	*WRWA*	WRWA
Site	**Date**	**E.coli**	**NOx**	**TP**	**Turb**	**pH**	**Spec. Cond.**
West_1.42	9/5/12	41.2%	0.0%	7.9%	7.1%	0.0%	0.3%
West 6.4	6/13/12	19.4%	0.0%	**35.0%**	3.0%	0.4%	0.8%
West 36	7/11/12	13.8%	0.0%	3.0%	0.0%	0.3%	0.1%
West 38.5	6/27/12	9.0%					
MBrWilliams.02	9/5/12	41.8%	0.0%	8.3%	4.8%	0.1%	0.4%
Rock_.38	7/25/12	6.2%					
Williams_7.0	6/13/12	0.0%	0.0%	NA	0.0%	0.3%	2.7%
Williams 8.7	6/27/12	18.2%					
Williams 10.3	8/8/12	35.2%	0.0%	4.1%	12.5%	0.1%	0.1%
Williams 10.7	7/25/12	**60.1%**					
Saxtons_.19	7/11/12	38.3%	0.0%	4.6%	5.4%	0.3%	0.3%
Whetstone .2	10/3/12	0.0%	0.0%	4.2%	0.0%	0.3%	0.1%
Whetstone _6.4	8/22/12	33.3%					
Whetstone _9.6*	8/22/12	102.4%					
Whetstone _9.6	8/8/12	19.1%	0.0%	27.6%	**20.2%**	0.4%	2.3%
Average RPD		**29.2%**	**0.0%**	**11.8%**	**5.9%**	**0.24%**	**0.79%**
RPD GOAL		**50% (>25 mpn) 125 % (< 25 cfu)**	**≤10%**	**≤30%**	**≤15%**	**ND**	**ND**

* *E. coli* values this day were in the <25 cfu range

Note: These sample results were rejected based on RPD values; West_6.4 on 6/13/12, TP sample 16.1 ppb, field DUP 11.3 ppb, RPD % difference = 35.0% (RPD Goal = 30%); Williams_10.7, E. coli sample 248.1 mpn/100 mL, field DUP 461.1 mpn/100 mL, RPD % difference = 60.1% (RPD Goal = 50%).

Note: This result value was not rejected; Whetstone_9.6, Turb sample 0.98, field DUP 1.2, RPD % difference = 20.2% (RPD Goal = 15%).

For more information see "QUALITY ASSURANCE RESULTS & DETERMINATIONS" below.

QUALITY ASSURANCE RESULTS & DETERMINATIONS

SeVWA rejected one *E. coli* result in 2012 because the RPD exceeded the suggested "RPD Goal" for that parameter analyzed by the CRWC lab. For analyses performed by LaRosa Lab in 2012, one TP value was rejected based the RPD value calculated for that sample exceeded the TP "RPD Goal" value.

For turbidity samples one sample exceeded the suggested RPD, but the sample result as not rejected. For pH and conductivity analyses performed by WRWA/SeVWA, no results were rejected.

Descriptions regarding QA anomalies appear below. Part 1 lists anomalies occurred, but results not rejected. Part 2 lists anomalies that resulted in data rejection. The data values rejected by WRWA are included as "flagged" entries in the data submission Excel file provided to VT DEC.

Data completeness for all of SeVWA's 2012 monitoring parameters was between 89.1 – 94.5%, well-above the required value of at least 80%. 80% is the value designated in the QAPP for the percentage of the anticipated number of samples to be collected, analyzed and determined to meet data quality objectives for the project to be considered successful. See Table 4 (above) for more information and, also, SeVWA's WQMP's Excel spreadsheet for all 2012 data.

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QUALITY ASSURANCE RESULTS & DETERMINATIONS

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As part of its 2012 WQMP, SeVWA performed pH, conductivity and turbidity analysis on the samples that were collected during the monitoring season. All equipment is maintained to function reliably, external controls are utilized, blanks and field duplicate samples are collected and run with each monitoring day's samples, sample analysis run rechecks are done, external QC standards are run with each sample batch and calibration of meters is performed as needed and according to description in SeVWA's QAPP as submitted to VT DEC and LaRosa program. All blanks, duplicates, repeats and external controls performed were within acceptable ranges for pH, conductivity and turbidity

All thermometers used for air and water temperatures were calibrated with a NIST thermometer at the CRWC laboratory before the WQMP season began. The procedure used for thermometer calibration is included with final 2012 QAPP document.

Also, all QA criteria were met at the CRWC lab for *E. coli* testing during the 2012 monitoring season.

Part 1: Following are some QA anomalies that occurred, but data have not been rejected:

- CRWC *E. coli* samples: Upon receipt at CRWC a some samples measured > 4.0 deg C. All samples held/transported between sampling time and pick-up time were kept on frozen cold paks or on ice in coolers, and then all samples from pick-up time to delivery to CRWC lab were transported on ice in a cooler. On sampling dates evidence of cooling of all samples - collection through delivery to CRWC - was documented.
- All *E. coli* samples during the season were set-up for testing at the CRWC lab within the 8 hour timeframe, though for an occasional sample receipt at the lab may have been beyond the 6 hour timeframe.
- One turbidity duplicate and sample RPD value (Whetstone_9.6, 8/8/12) exceeded the upper limit of the "RPD Goal" value of 15%, but the sample result was not rejected. The sample turbidity value was .98 NTU and the field duplicate value was 1.2 NTU; RPD = 20.2%.
- On 10/03/12 the TP value for the field blank was 6.13 ppb. This blank value was a very unusual occurrence. All other blank values were acceptable during the 2012 sampling season. No TP values were rejected from this date.

Part 2: Following are some QA anomalies that occurred and resulted in data rejection:

- Williams_10.7, 7/25/11, *E. coli* test sample = 248.1 mpn/100 mL, field duplicate E. coli = 461.1 mpn/100 mL, RPD = 60.1%; for *E. coli* results > 25 mpn/100 mL the RPD calculation should be no greater than 50%; this Williams_10.7, 7/25/11, *E. coli* sample result was rejected.
- The TP (total phosphorous) field duplicate RPD value for the June 13, 2012 West_6.4 sample was 35.0%. The field duplicate result was 11.3 ppb and the test sample result was 16.1 ppb. This sample and field duplicate sample was collected by a "veteran" volunteer monitor that has been WQM sampler for a number of years. There is no reason to question their sampling technique – other samples and duplicates they have collected on past occasions have been fine. For some reason there seems to have been an issue with this particular sampling event. The West_6.4 sample result from 06/13/12 was rejected.

OVERVIEW: PRELIMINARY SYNOPSIS OF PROJECT RESULTS

This overview is intended as a preliminary synopsis of results generated by the project. More descriptive data review for 2012, with data graphing and charts, along with rivers' flow/discharge and precipitation information, will be reported in the very near future.

Below is a preliminary overview of some results of the 2012 monitoring season and some additional items of possible interest/concern. High *E. coli* counts at a number of sites (using single sample or geomean Class B or "swimmability" standards), a few NOx results above 0.5 mg/L and a Saxtons River site with very elevated TP results are some of the concern highlights of the 2012 SeVWA WQMP season. Also, as in previous years, water temperatures continue to approach and exceed 20 deg C at a number of locations.

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OVERVIEW: PRELIMINARY SYNOPSIS OF PROJECT RESULTS
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E. coli:

A. West River (State of VT TMDL project area) - 1 Londonderry and 2 South Londonderry sites:
West_38.5 *E. coli* GEOMEAN* = 131.7 MPN (n = 7); maximum season value = 727.0 MPN, 6/13/12
West_36.1 *E. coli* GEOMEAN* = 261.7 MPN (n = 7); maximum season value = 920.8 MPN, 6/13/12
West_36 *E. coli* GEOMEAN* = 212.0 MPN (n = 7); maximum season value = 920.8 MPN, 6/13/12
[West_38.5 & West_36.1 were new sites in 2011; West_39, also a new site in 2011, not monitored in 2012.]

B. West River - Ellen Ware Rd. (West_16), Brookline bridge (West_13), Dummerston covered bridge (West_6.4), behind the Brattleboro Professional Center (West_1.42) and Milkhouse Meadows (West .08):
West_16 *E. coli* GEOMEAN* = 73.5 MPN (n = 7); maximum season value = 166.4 MPN, 7/25/12
West_13 *E. coli* GEOMEAN* = 81.8 MPN (n = 7); maximum season value = 189.1 MPN, 7/25/12
West_6.4 *E. coli* GEOMEAN* = 55.7 MPN (n = 6); maximum season value = 129.6 MPN, 9/05/12
West 1.42 *E. coli* GEOMEAN* = 84.5 MPN (n = 7); maximum season value = 1046.2 MPN, 7/25/12
West .08 *E. coli* GEOMEAN* = 63.4 MPN (n = 7); maximum season value = 178.5 MPN, 9/05/12
[West_16 was not a part of SeVWA's WQMP 2011, in recent years, it was a program site in 2010, 2012; West_.5 (just upstream from West_.08), a new site in 2011, was not included in the WQMP in 2012.]

C. Whetstone Brook (State of VT TMDL project area) – Behind Brattleboro Co-op (Whetstone_.2), Dettman Drive (Whetstone_6.4) and Stark Rd. (Whetstone_9.6):
Whetstone_9.6 *E. coli* GEOMEAN* = 19.4 MPN (n = 6); max. season value = 280.9 MPN, 9/05/12
Whetstone_6.4 *E. coli* GEOMEAN* = 65.9 MPN (n = 7); max. season value = 344.8 MPN, 6/13/12
Whetstone_.2 *E. coli* GEOMEAN* = 631.2 MPN (n = 5); max. season value = 2419.6 MPN, 9/05/12

D. Williams R., Chester – Middle Branch Williams River just above Rainbow Rock (MBrWilliams_.02), Williams River just above Rainbow Rock Rainbow Rock (Williams 10.8), Rainbow Rock (Williams 10.7) and just below Chester WWTF (Williams_10.3):
MBrWilliams_.02 *E. coli* GEOMEAN* = 371.0 MPN (n = 6); max. season value = 1413.6 MPN, 9/05/12
Williams_10.8 *E. coli* GEOMEAN* = 289.8 MPN (n = 6); max. season value = 488.4 MPN, 7/25/12
Williams_10.7 *E. coli* GEOMEAN* = 331.3 MPN (n = 6); max. season value = 1413.6 MPN, 9/05/12
Williams_10.3 *E. coli* GEOMEAN* = 369.2 MPN (n = 7); max. season value = >2419.6 MPN, 6/27/12

E. Williams River – 2 sites below Williams_10.3; Chester, Missing Link Rd. crossing (Williams_8.7) and Rockingham, Bartonsville bridge (Williams_7.0):
Williams_8.7 *E. coli* GEOMEAN* = 400.3 MPN (n = 7); max. season value = 1986.3 MPN, 6/13/12
Williams_7.0 *E. coli* GEOMEAN* = 402.4 MPN (n = 7); max. season value = >2419.6 MPN, 6/27/12

F. Saxtons River - Saxtons River and Westminster:
Saxtons 5.6 *E. coli* GEOMEAN* = 149.7 (n = 6); max. season value = 435.6 MPN, 6/13/12
Saxtons 5.0 *E. coli* GEOMEAN* = 191.8 (n = 6); max. season value = 1413.6 MPN, 9/5/12
Saxtons .19 *E. coli* GEOMEAN* = 274.7 (n = 7); max. season value = 770.1 MPN, 6/13/12

G. North Branch Brook – Pikes Falls:
NBranchBrk_4.5 *E. coli* GEOMEAN* = 23.0 (n = 4); max. season value = 344.1 MPN, 9/05/12

H. Rock River – Vicinity of Indian Love Call, above Rte 30 bridge:
Rock_.38 *E. coli* GEOMEAN* = 77.5 (n = 7); max. season value = 307.6 MPN, 6/13/12

(* GEOMEAN calculations for *E. coli* values that appear above do not include duplicate samples results.)

Continued on the next page

OVERVIEW: PRELIMINARY SYNOPSIS OF PROJECT RESULTS

(continued)

Nitrate-Nitrite (NOx) Values Gretaer Than 0.5 mg/L:

In general, during SeVWA's 2012 WQMP, NOx results for most samples were below 0.5 mg/L - typically in the range of <0.05 up to about 0.3 mg/L. Some exceptions to this were:

A. Saxtons River, Saxtons 5.0, below Saxtons River village WWTF:
7/11/2012 NOx = 1.7 mg/L
9/05/2012 NOx = 0.63 mg/L

B. Williams River, Williams_8.7, MissingLink Road, Chester:
7/11/2012 NOx = 0.80 mg/L
8/08/2012 NOx = 0.53 mg/L
9/05/2012 NOx = 0.72 mg/L

C. Williams River, Williams_7.0, Bartonsville bridge, Rockingham:
7/11/2012 NOx = 0.78 mg/L
8/08/2012 NOx = 0.54 mg/L
9/05/2012 NOx = 0.78 mg/L

Total Phosphorous (TP):

During SeVWA's 2012 WQMP, total phosphorous (TP) sample results were typically in the range of 7 ppb up to approximately 30 ppb. There were several samples during the 2012 monitoring season that were greater than 30 ppb. Those samples are listed below:

A. West River, West_1.42, behind Brattleboro Professional Center:
8/08/2012 TP = 32.3 ppb

B. Whetstone Brook, Whetstone_9.6, Stark Road:
6/13/2012 TP = 37.0 ppb

C. Whetstone Brook, Whetstone_.2, behind Brattleboro Food Co-op:
6/13/2012 TP = 35.7 ppb

D. Williams River, Williams_8.7, MissingLink Road, Chester:
6/13/2012 TP = 43.4 ppb
9/05/2012 TP = 53.7 ppb

E. Williams River, Williams_7.0, Bartonsville bridge, Rockingham:
6/13/2012 TP = 34.4 ppb

F. Saxtons River, Saxtons_5.0, below Saxtons River village WWTF (2 of the 4 TP sampling dates were missed at this site:
7/11/2012 TP = 180 ppb
9/05/2012 TP = 144 ppb

Water Temperature:

At some point over the course of the monitoring season from late June until early September, water temperatures at sites along all river reaches in SeVWA's WQMP approached 20 deg C and along the lower portion of the West River water temperatures measured in ranges above 20 deg C. It should be kept in mind that these measurements were typically made between 7-8 AM on sampling days. Many of the sites' water temperatures on other days or other times later in the day on sampling days probably reached 20 deg C or greater. As mentioned in last year's report, it may be helpful to further define actual temperature occurrences at some of these sites – especially those possibly still considered for cold water fisheries restoration – with longer term data collection utilizing HOBO temperature monitoring devices. SeVWA's WQMP was not able to initiate or carry-out this aspect to more closely document water temperatures in 2012.

Continued on the next page

2012 Southeastern Vermont Watershed Alliance (SeVWA),
Formerly known as West River Watershed Alliance (WRWA)
LAROSA PARTNERSHIP PROGRAM FINAL REPORT
LAROSA PROGRAM # 137-09

OVERVIEW: PRELIMINARY SYNOPSIS OF PROJECT RESULTS

(continued)

Some of the most significant water quality issues that have been identified by the WRWA/SeVWA monitoring program from 2003-2012 have been related to *E. coli* levels in the Whetstone Brook, West River and Williams River. A statewide, VT DEC managed *E. coli* TMDL project is now underway that includes the West River in Londonderry and the Whetstone Brook in Brattleboro. Since 2003 there have also been incidents of elevated *E. coli* , total phosphorous and, most recently in 2012, NOx results along the Saxtons River and Williams River. Total phosphorous (TP) results have reached levels of concern, particularly at a site on the Saxtons River and in 2012 NOx levels were detected at ranges above 0.5 mg/L at several sites during the monitoring season. Additionally, there have been measurements of water temperatures that exceed that for healthy cold water fisheries in the West, Williams and Saxtons Rivers. Water temperature (TEMP) is a parameter that may warrant further investigation in the upcoming seasons.

In 2010-2012 E. coli data results, as they were available, were published in local print and on line media, were posted at kiosks erected at the Retreat Meadows and the Dummerston covered bridge and were provided to all volunteers so that they could post them in their communities. In 2012 the E. coli results charts were also available at the newly created SeVWA website (https://sites.google.com/site/vtsevwa/). In 2012, at the invitation of CRWC, some of SeVWA's *E. coli* monitoring results were made available as public information at a new CRWC and Pioneer Valley Planning Commission (MA) website – www.connecticutriver.us. The website provides information about recreational resources in the Connecticut River watershed and part of that information is about water-based recreation and water quality.

As stated at the beginning of this section, this overview is intended as a preliminary synopsis of results generated by the project. This report is produced to meet requirements of the LaRosa Lab Services Partnership Program and is included in a SeVWA WQMP summary report that will be produced soon. That summary report will contain more descriptive data review, with some graphs and tables to present WQMP data, rivers' flow/discharge and precipitation information. The plan is to provide a basic summary of the last 3 years of data from WRWA/SeVWA's WQMP. Those are the years that Laurie Callahan has been the program's coordinator. SeVWA's water quality monitoring program's 2012 data will also be submitted to the VT DEC LaRosa program in the appropriate spread sheet format.

Appendix B.

Description of WRWA/SeVWA 2010, 2011 & 2012 Monitoring Parameters

The following information is from Earth Force, **Background on Chemical Parameters**, (http://www.earthforce.org/files/573_file_Chem_Parameters.htm); **Rice University, Center for Biological and Environmental Nanotechnology** (http://www.ruf.rice.edu/~cbensa/explists2005.html); **Vermont Volunteer Surface Water Monitoring Guide** and **Testing the Waters: Chemical & Physical Vital Signs of a River**

Escherichia coli (E. coli)

E. coli is a species of fecal coliform bacteria that is specific to fecal material from humans and other warm blooded animals. It occurs naturally in the human digestive tract. EPA recommends *E. coli* as the best indicator of health risk from water contact in recreational waters. The EPA standard for a single sample for *E. coli* at swimming beaches is 235 colonies/100mL of sample water. The EPA standard for geometric mean for *E. coli* is 126 colonies/100 mL. of 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 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.

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* bacteria are living organisms, unlike other conventional water quality parameters. *E. coli* bacteria can multiply rapidly when conditions are good for growth and die in large quantities when they are not.

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." River Network information* asserts that phosphorous concentrations of 0.01 mg/L (10µg/L) may have measurable impact on nutrient poor upland streams, similar to those rivers and streams in Basin 11. Larger rivers could respond when concentrations approach 100 µg/L.

Combined Nitrate/NitriteNitrogen ***(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 current 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.

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.

Suspended particles, such as silt and clay, 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.

Natural range for turbidity in freshwater is 1-10 NTU; in VT, cold water fisheries should not exceed 10 NTU.

pH
pH is determined by the concentration 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 plant and animal life. Most animals are adapted to living in neutral conditions.

The level of acidity can be changed by human's actions. 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 of 7 is considered to be neutral. When the pH is less than 7, it is acidic; a pH greater than 7 is basic. A pH value between 7.0 and 8.0 are optimal for supporting a diverse aquatic ecosystem; a range between 6.5 and 8.5 is generally suitable. 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.

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 (salts or other ions) 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 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. Ground water inflows can have the same effects depending on the bedrock they flow through. Discharges to streams can change the conductivity depending on their make-up. A failing sewage system would raise the conductivity due to chloride, phosphate, and nitrate. 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. These dissolved salts (i.e. calcium, sodium, etc.) can directly affect plants health and over time, render even the best soil useless. By comparing conductivity readings on a regular basis it is possible to monitor changes that occur.

Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. For this reason, conductivity is reported as conductivity at 25 degrees Celsius (25 C).

Conductivity is measured in micromhos per centimeter (µmhos/cm) or microsiemens per centimeter (µs/cm). Distilled water has a conductivity in the range of 0.5 to 3 µmhos/cm. The conductivity of rivers in the United States generally ranges from 50 to 1500 µmhos/cm, depending on the geology of the watershed. Studies of inland fresh waters indicate that streams supporting good mixed fisheries have a range between 150 and 500 µhos/cm. Conductivity outside this range could indicate that the water is not suitable for certain species of fish or macroinvertebrates. Industrial waters can range as high as 10,000 µmhos/cm. Conductivity levels less than 300 uS/cm is typically not a concern.

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 toxins, 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. 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.

Appendix C.

2010 West River Watershed Alliance
Bi-weekly *E.coli* Level Report

Recreational Sites or Swimming Holes	***Escherichia coli* (*E. coli*) per 100 ml. water**						
West River	*June 30*	*July 14*	*July 28*	*Aug. 11*	*Aug. 25*	*Sep. 8*	**Sep. 22**
Milk House Meadows, Brattleboro	36 & 40	89*	128*	649*	22	867*	**580***
Brattleboro Professional Center	23	52	50	72	144*	40 & 72	**18**
Dummerston Covered Bridge	19	12	31 & 37	59	94*	52	**35 & 36**
Brookline Bridge	52	26	52	67 & 72	96*	273*	**22**
Ellen Ware Road, Townsend	43	Not Available	53	Not Available	70	Not Available	**34**
Rowes Road, So. Londonderry	102 *	1987*	117*	167 & 103*	153 & 202*	99*	**64**
Cobb's swim hole, So. Lndndry	51	613 & 867*	162*	134*	96*	123*	**136***
Whetstone Brook							
Behind Brattleboro Food Coop	185 *	Not Available	308 & 388*	Not Available	210*	Not Available	**130***
Ball Mountain Brook							
Jamaica village	6	60	58	80*	48	53	**17 & 15**
Williams River							
Bartonsville bridge, Rockingham	145 & 205 *	138*	96*	Greater than 2420*	166*	134*	**34**
Rainbow Rock, Chester	112 *	291*	Not Available	144*	207*	305 & 388*	**55 & 58**
Saxtons River							
Bellows Falls "sandy beach"	65	210*	43 & 44	56	145*	Not Available	**22**
Saxtons River Center	54	145 & 179*	53	Not available	53	Not Available	**10**

(*Updated September 25, 2010*)

* State of Vermont Standard = **77** *Escherichia coli (E. coli)* organisms per 100 ml. of water sample.
EPA's National Standard **= 235** *E. coli* organisms per 100 ml. of water sample.

E. coli is a species of fecal coliform bacteria found in fecal material from humans and other warm-blooded animals.
EPA recommends *E. coli* as an indicator of health risk from water contact in recreational waters.
Elevated *E.coli* levels are most likely due to excessive rain prior to sampling. Swim at your own discretion.
Please note that changes in river conditions will alter bacterial levels over time.

Testing results are provided as a public service by the West River Watershed Alliance (WRWA),
also known as Southeastern Vermont Watershed Alliance (SeVWA),
and is supported by State of VT's LaRosa Environmental Testing Laboratory and Connecticut River Watershed Council (CRWC).
E. coli information for VT State parks and Army Corps of Engineers facilities is available through those agencies.

Contact Laurie Callahan, Program Coordinator (volunteer), with questions or if you would like to volunteer for WRWA programs. 802-258-1877

2011 Southeastern Vermont Watershed Alliance
Bi-weekly *E.coli* Level Report - *Updated September 15, 2011*

Recreational Sites or Swimming Holes	***Escherichia coli* (*E. coli*) per 100 ml. water**							
West River	**Site Code**	***June 22***	***July 6***	***July 20***	***Aug. 3***	***Aug. 17 [1]***	***Aug. 31***	***Sep. 14***
Brattleboro, Milk House Meadows	West_.08	42	53 & 56	43	79*	308*	NT[3]	NT[2]
Brattleboro, above Milk House Meadows & below I-91 bridge	West_.5	31	39	45	70	388*	NT[3]	NT[2]
Brattleboro Professional Center	West_1.42	96*	26	NA	25 & 28	580*	NT[3]	NT[3]
Dummerston covered bridge	West_6.4	40	35 & 40	26	36	NA	NT[3]	NT[2]
Brookline bridge	West_13	33	41	53	45	518* & 436*	NT[3]	NT[2]
So. Londonderry, Rowes Road	West_36	67	80*	99*	388*	326*	NT[3]	24
So. Londonderry, village (below Cobb's swim hole & above Rte 100 bridge)	West_36.1	61	48	74 & 73	40	162*	NT[3]	27
Londonderry, below Mountain Marketplace	West_38.5	65	53	102*	42	140*	NT[3]	41
Londonderry, village (below dam)	West_39	161*	78*	150*	63	229*	NT[3]	67
North Branch Brook								
Jamaica, Pike's Falls	NBranchBrk_4.5	14 & 11	NT	11	NT	96*	NT	NT[3]
Williams River								
Rockingham, Bartonsville bridge	Williams_7.0	64 & 81*	80*	176*	88*	223*	NT[3]	43
Chester, Missing Link Rd. bridge	Williams_8.7	84*	68	128* & 109*	47 & 76	202*	NT[3]	NT[3]
Chester, Rainbow Rock swimming hole	Williams_10.7	77* & 94*	108*	89*	76	143*	NT[3]	NT[3]
Chester, just above Rainbow Rock & Middle Branch Williams River confluence	Williams_10.8	411*	84*	123*	102* & 105*	NA	NT[3]	NT[3]
Middle Branch Williams River								
Chester, just above Rainbow Rock & Williams River confluence	MBrWilliams_.02	32	91* & 94*	87*	46	105*	NT[3]	NT[3]
Saxtons River								
Bellows Falls/Westminster "sandy beach"	Saxtons_.19	117*	89*	157*	194*	262*	NT[3]	102*
Saxtons River, Stickney's field swimming hole, west of village	Saxton_5.6	47	72	91*& 96*	64	215*	NT[3]	64
Whetstone Brook								
Behind Brattleboro Food Coop	Whetstone_.2	100*	NT	687*	NT	NA	NT	518* & 1047*
West Brattleboro, Dettman Drive	Whetstone_6.4	29	NT	38	NT	119*	NT	NT[3]
Stark Rd., approx. 2 mi. W of Dettman Dr.	Whetstone_9.6	867*	NT	20	NT	86* & 70	NT	NT[3]

NA = Not Available, NT = Not Tested, NT[2] = Not tested due to water appearance as "muddy" (post-Irene), NT[3] = Not tested due to various post-Irene impacts

Aug. 17[1]: elevated E. coli results this day may have been due to heavy rains during the previous 48-72 hours

* State of Vermont Standard = **77** *Escherichia coli (E. coli)* organisms per 100 ml. of water sample. EPA's National Standard **= 235** *E. coli* organisms per 100 ml. of water sample.

E. coli is a species of fecal coliform bacteria found in fecal material from humans and other warm-blooded animals.

EPA recommends *E. coli* as an indicator of health risk from water contact in recreational waters. Elevated *E.coli* levels are most likely due to excessive rain prior to sampling. Swim at your own discretion. Please note that changes in river conditions will alter bacterial levels over time.

Results provided as a public service by Southeastern Vermont Watershed Alliance (SeVWA), also known as West River Watershed Alliance (WRWA).
and is supported by State of VT's LaRosa Environmental Testing Laboratory and Connecticut River Watershed Council (CRWC).

E. coli info for State parks and Army Corps of Engineers facilities is available through those agencies.

Contact Laurie Callahan, SeVWA/WRWA Water Quality Monitoring Program Coordinator, with questions or if you would like to volunteer for SeVWA/WRWA programs (802-258-1877)

2012 Southeastern Vermont Watershed Alliance <<<< >>>> Bi-weekly *E.coli* Level Report - *Chart Updated October 4, 2012*

***** = results exceed the standard, NA = Not Available, NT = Not Tested, WWTF = waste water treatment facility***

General Water Quality Monitoring, Recreational or Swimming Hole Sites	*Escherichia coli* (*E. coli*) per 100 ml. water								
West River	**Site Code**	*June 13* [1]	*June 27* [2]	*July 11* [3]	*July 25* [2]	*August 8*	*Aug. 22*	*Sep. 5* [1]	***Oct. 3*** [4]
Brattleboro, Milk House Meadows	West_.08	157	60	10	69	60	64	179	NT
Brattleboro Professional Center	West_1.42	150	96	25	***1047****	70	31 & 22	39 & 59	NT
Dummerston covered bridge	West_6.4	116 & 141	55	18	NA	63	35	130	NT
Brookline bridge	West_13	134	57	34	190	86	80	77	NT
Ellen Ware Road, swim hole	West_16	80	69	41	167	94	51	68	NT
So. Londonderry, Rowes Road	West_36	***921****	***345****	94 & 108	***687****	89 & 128	91	118	NT
So. Londonderry, village (above Rte 100 bridge)	West_36.1	***921****	***299****	109	***771* & 771****	157	163	144	NT
Londonderry, below Mountain Marketplace	West_38.5	***727****	***273* & 249****	86	***548****	53	28	52	NT
Rock River									
Indian Love Call, above Rte 30 bridge	Rock_.38	***308****	82	29	59 & 55	23	89	207	NT
North Branch Brook									
Jamaica, Pike's Falls	NBranchBrk_4.5	NA	NT	2 & 4	NT	43	NT	***345****	10
Williams River									
Rockingham, Bartonsville bridge	Williams_7.0	***1047* & 1047****	***> 2420****	156	***687****	207	118	202	NT
Chester, Missing Link Rd. bridge	Williams_8.7	***1987****	***249* & 299****	***276****	***326****	117	225	***462****	NT
Chester, below WWTF	Williams_10.3	***1554****	***> 2420****	126	225	117 & 166	***291****	***361****	NT
Chester, Rainbow Rock swimming hole	Williams_10.7	NA	***329****	130	NA	229	***291****	***518****	NT
Chester, above Middle Br. Wms. R. confluence	Williams_10.8	NA	215	210	***489****	225	***462****	***1300****	NT
Middle Branch Williams River									
Chester, just above confluence with Williams R.	MBrWilliams_.02	NA	***518****	***326****	***299****	161	229	125 & 191	NT
Saxtons River									
Bellows Falls/Westminster "sandy beach"	Saxtons_.19	***771****	***239****	***286*** & 194	***261****	186	179	***261****	NT
Saxtons River, below WWTF	Saxtons_5.0	NA	***262****	124	105	89	124	***1414 & 1554****	NT
Saxtons River, Stickney's field swimming hole	Saxton_5.6	***436****	***249****	109	132	115	61	NT	NT
Whetstone Brook									
Behind Brattleboro Food Coop	Whetstone_.2	***1987****	NT	***326****	NT	***687****	NT	***> 2420****	94 & 94
West Brattleboro, Dettman Drive	Whetstone_6.4	***345****	NT	33	NT	52	29 & 40	***291****	18 & 19
Stark Rd., approx. 2 mi. W of Dettman Dr.	Whetstone_9.6	62	NT	16	NT	6 & 7	4 & 1	***281****	13

State of VT & EPA National Standard for "suitability for swimming"** (single sample) = **No higher than 235** ***Escherichia coli (E. coli) **organisms per 100 ml. of water sample.**

E. coli is a species of fecal coliform bacteria found in fecal material from humans and other warm-blooded animals.

The US EPA recommends *E. coli* as an indicator of health risk from water contact in recreational waters.

Elevated *E.coli* levels are most likely due to excessive rain prior to sampling. Swim at your own discretion. Changes in conditions affecting rivers can alter bacterial levels over time.

" * " = Results exceeded the "suitable for swimming" single sample standard. *(>2420 indicates the E. coli count exceeded the upper limit of the test method used.)*

June 13, Sep. 5 [1]: elevated results this day may have been due to significant rainfall 18-24 hrs before sampling;

June 27& July 25 [2]: some elevated results on these days may have been related to significant rainfall within 24-48 hrs before sampling;

July 11 [3]: several days of hot, dry weather preceded this sampling day *Oct. 3 [4]: this was a "wet" sampling session; rain during the previous 18-24 hours (or more)*

Results provided by Southeastern Vermont Watershed Alliance (SeVWA). *E. coli* info for State Parks and Army Corps of Engineers facilities is available through those agencies.

SeVWA's water quality monitoring program is supported by SeVWA donors and volunteers, State of VT DEC's LaRosa Environmental Testing Laboratory, Green Mountain Coffee Roasters & Connecticut River Watershed Council (CRWC).

Contact Laurie Callahan (802-258-1877), Coordinator, SeVWA/WRWA Water Quality Monitoring Program for more info about SeVWA's monitoring program. Visit SeVWA's website -

https://sites.google.com/site/vtsevwa/

Appendix D.

(Contact Laurie Callahan, 2010 & 2011 Program Coordinator,
for Excel spreadsheets of the data shown on the following pages.)

2010 WRWA COMPILED WQM DATA - Does NOT include Field Duplicates

(LaRosa Nox, TP & Turbidity data; WRWA pH, Cond. & temp.'s and CRWC E. coli)

Location	Collection Date	NO2-NO3 (mg-N/l)	TP (ug P/L)	Turbidity (NTU)	E. coli cfu/100ml	pH Units	Conductivity uS/cm	H2O Temp. deg. C	Air Temp. deg. C	Weather Comments current/past 48 hrs	SAMPLE or QA NOTES:
BallMtBrk_.58	6/30/2010	0.12	7.7	< 0.2	5.1	7.44	121.9	15	NA	sunny/sunny, windy, rained over night	Air temp. = 22 ??; *See Item 2 on Sheet 2*
BallMtBrk_.58	7/14/2010				59.1			14	18	cloudy, drizzle/sunny at times, cloudy, rain	See FldDupsRPD worksheet
BallMtBrk_.58	7/28/2010	0.08	< 5	< 0.2	57.3	7.11	143.5	14	13	sunny/sunny	
BallMtBrk_.58	8/11/2010				79.4			16	15.5	sunny/hot, muggy, occasional brief rainfall	
BallMtBrk_.58	8/25/2010	0.07	8.57	< 0.2	47.1	7.25	143.9	12	11.5	raining/cloudy, light rain	
BallMtBrk_.58	9/8/2010				52.8			18	18	cloudy/light rain	
BallMtBrk_.58	9/22/2010	< 0.05	5.74	0.65	16.1	7.21	129.9	12	10	sunny	
BallMtBrk_1.7	6/30/2010	0.08	6.19	< 0.2	NA	7.15	49.3	15	13	sunny/clear	E. coli testing not a part of testing at this site in 2010
BallMtBrk_1.7	7/28/2010	0.09	7.2	0.29	NA	6.84	54.7	17	15	sunny/sunny, clear	E. coli testing not a part of testing at this site in 2010
BallMtBrk_1.7	8/25/2010	0.05	11.2	0.36	NA	6.9	55.2	16	15	drizzle/cloudy, overcast, rain	E. coli testing not a part of testing at this site in 2010
BallMtBrk_1.7	10/13/2010	< 0.05	7.67	1.98	NA	6.64	43.2	7	5	sunny/cool, dry	E. coli testing not a part of testing at this site in 2010
Flood_6.7	6/30/2010	< 0.05	13.4	0.34	NA	7.33	30.5	19.5	16.5	sunny	E. coli testing not a part of testing at this site in 2010
Flood_6.7	7/28/2010	< 0.05	14.7	1.13	NA	6.74	42.2	19	14	sunny/wndy, sunny	E. coli testing not a part of testing at this site in 2010
Flood_6.7	8/25/2010	< 0.05	18.8	1.13	NA	6.89	34.8	16	15	cloudy, drizzle/cloudy, rain, partly sunny	E. coli testing not a part of testing at this site in 2010
Flood_6.7	9/22/2010	< 0.05	16.9	1.71	NA	7.07	44	12	11.5	sunny/sunny	E. coli testing not a part of testing at this site in 2010
NBranchBrk_4.5	6/30/2010	0.16	5.76	< 0.2	NA	7.35	228.5	15	12	sunny/clear	E. coli testing not a part of testing at this site in 2010
NBranchBrk_4.5	7/28/2010	0.15	9.05	0.25	NA	7.28	277.8	15	16	sunny/sunny, clear	E. coli testing not a part of testing at this site in 2010
NBranchBrk_4.5	8/25/2010	0.13	11.6	0.3	NA	7.5	240.2	15	14	drizzle/cloudy, overcast, rain	E. coli testing not a part of testing at this site in 2010
NBranchBrk_4.5	10/13/2010	0.09	8.24	0.89	NA	7.26	195.7	8	7	sunny/cool, dry	E. coli testing not a part of testing at this site in 2010
Saxtons_.19	6/30/2010	0.15	8.69	0.28	64.4	7.33	152.7	18.5	15	sunny/sunny, clear	
Saxtons_.19	7/14/2010				209.8			19.5	20	cloudy, drizzle/sunny, hot, humid, rain	

Saxtons_.19	7/28/2010	0.26	8.74	0.33	42.8	7.14	201.1	19	16	sunny/sunny	See Item 6 on Notes worksheet & FldDupsRPD worksheet; Turbidity field dup RPD = 71.8%
Saxtons_.19	8/11/2010				55.6			20	19	partly cloudy/hot, humid, some rain last night	
Saxtons_.19	8/25/2010	0.31	15.1	2.32	145	7.4	205.5	18	15	cloudy/rain off-&-on	
Saxtons_.19	9/8/2010				NA			NA	NA	NA	sample not collected
Saxtons_.19	9/22/2010	0.3	10.4	1.59	21.1	7.43	236	14	11.5	partly cloudy/clear, no prcip.	
Saxtons_5.0	6/30/2010	0.14	62.1	0.21	66.3	7.45	124.6	16	15	sunny/clear, cool, nice	
Saxtons_5.0	7/28/2010	0.06	16.1	1.26	73.8	7.27	135.9	19	14	sunny/sunny, cool AM, hot afternoon	
Saxtons_5.0	8/25/2010	0.2	75.9	0.41	93.4	7.44	135.3	18	15	cloudy/rain off-&-on	
Saxtons_5.0	9/22/2010	0.06	36.6	0.56	14.8	7.43	154.3	12	10	sunny/clear, cool	
Saxtons_5.6	6/30/2010	0.1	8.07	0.33	53.8	7.28	105.8	15.5	15	sunny/sunny, cool, slight breeze	
Saxtons_5.6	7/14/2010				145			20	19.5	cloudy, drizzle, raining/sunny, hot, humid, rain	
Saxtons_5.6	7/28/2010	0.05	6.63	0.61	52.9	7.17	125.1	18	14	sunny/sunny	
Saxtons_5.6	8/11/2010				NA			NA	NA	NA	sample not collected
Saxtons_5.6	8/25/2010	0.05	10.7	0.59	52.8	7.42	116.4	18	16	cloudy, drizzle/rain off-&-on	
Saxtons_5.6	9/8/2010				NA			NA	NA	NA	sample not collected
Saxtons_5.6	9/22/2010	< 0.05	7.58	0.67	9.7	7.4	143.6	12	10	sunny/clear, cool	
West_.08	6/30/2010	0.07	11.8	0.76	39.3	7.51	82.5	23	14	sunny/sunny, partly cloudy	See Item 5 on Notes worksheet & FldDupsRPD worksheet; Turbidity field dup RPD = 25.2%
West_.08	7/14/2010				88.4			26	22	cloudy/light rain showers, sun, warm	
West_.08	7/28/2010	0.08	10.3	1.21	127.4	7.08	99.8	23	19.5	sunny/sun & clouds	
West_.08	8/11/2010				648.8			26	26	partly cloudy/sun, humid, warm, partly cloudy, heavyy overnight rain shower	
West_.08	8/25/2010	0.13	13.8	0.65	21.3	7.36	120	23	20	cloudy/rain	
West_.08	9/8/2010				866.4			22	24	partly cloudy, humid/sun, warm, partly cloudy, overnight rain	
West_.08	9/22/2010	0.07	12.3	0.97	579.4	7.35	113.5	16.5	17	sunny, partly cloudy/sunny, warm days, cool nights	
West_1.42	6/30/2010	0.1	10.5	0.32	22.8	7.46	82	19	12	sunny/sunny, partly cloudy, warm	

West_1.42	7/14/2010				51.2			25	22	cloudy/rain, intermittent & light, sun, warm	
West_1.42	7/28/2010	0.09	12.3	1.98	49.6	7.07	97.2	22	17	sunny/sun, warm	
West_1.42	8/11/2010				71.7			24	27	partly cloudy/sun, humid, warm, partly cloudy, heavyy overnight rain shower	
West_1.42	8/25/2010	0.08	14.2	0.55	143.9	7.41	91.4	19	16	drizzle/rainy	
West_1.42	9/8/2010				39.1			21.5	23	partly cloudy, humid/sun, warm, partly cloudy, overnight rain	See Item 4 on Notes worksheet & FldDupsRPD worksheet: E. coli RPD = 58.2%
West_1.42	9/22/2010	0.11	13.3	0.79	17.5	7.37	103.2	14.5	15	sunny/sunny, warm days, cool nights	
West_6.4	6/30/2010	0.11	10.3	0.29	18.7	7.32	78.3	19	10	sunny/sunny	
West_6.4	7/14/2010				12			23.5	22	cloudy/hot, sunny then cloudy, light rain	
West_6.4	7/28/2010	0.11	8.9	1.66	30.9	7.17	95.4	20	15	sunny/clear	See Item 7 on Notes worksheet & FldDupsRPD worksheet; Turbidity field dup RPD = 52.5%
West_6.4	8/11/2010				58.3			22	20	sunny/hot dry	
West_6.4	8/25/2010	0.09	13.1	0.34	93.4	7.31	90.6	19	15	cloudy, drizzle/rain & showers	
West_6.4	9/8/2010				51.2			20	19	cloudy/clear, hot	
West_6.4	9/22/2010	0.13	8.22	0.56	34.1	7.41	100.9	13	9	sunny/clear & chilly - drought conditions	
West_13	6/30/2010	0.11	12.1	0.44	52	6.99	78.2	18	11.5	sunny/sunny	
West_13	7/14/2010				25.6			24	22.5	cloudy/light rain, drizzle	
West_13	7/28/2010	0.09	9.74	1.01	52	7.12	93.4	21.5	21.5	sunny/sunny	
West_13	8/11/2010				66.3			24.5	20.5	partly cloudy/sunny, light rain	
West_13	8/25/2010	0.1	12.3	0.55	95.9	7.32	91.9	18	18	raining/rainy	
West_13	9/8/2010				272.3			20	20	partly cloudy/sunny, then rain	
West_13	9/22/2010	0.13	9.76	2.35	21.8	7.06	101.7	18.5	15	sunny, partly cloudy/sunny	
West_16	6/30/2010	0.08	12.9	0.49	42.2	7.45	79.1	19	10	sunny/sunny, partly cloudy, warm	
West_16	7/28/2010	< 0.05	10.2	0.93	52.9	7.11	90.5	20	17	sunny/sun, warm	
West_16	8/25/2010	0.07	13.5	0.78	69.1	7.3	93.2	19	17	drizzle/rainy	
West_16	9/22/2010	0.06	9.19	1.36	33.1	7.22	100.8	14.5	13	sunny/sunny, warm days, cool nights	
West_36	6/30/2010	0.06	13.8	0.58	101.7	7.49	66.8	18	17	sunny	

West_36	7/14/2010				1986.3			20	19	cloudy, raning/hot, sunny, humid, rain last 24 hrs	
West_36	7/28/2010	< 0.05	8.5	1.13	116.9	7.15	73.9	17.5	19.5	sunny/sunny	
West_36	8/11/2010				166.4			19.5	17	sunny/mostly sunny, humid, 80's	
West_36	8/25/2010	< 0.05	14.7	0.6	152.9	7.42	73.8	15.5	13	raining/light, intermittent rain	
West_36	9/8/2010				98.7			20	19.5	partly cloudy/quite warm, then light rain & clearing	
West_36	9/22/2010	< 0.05	11.6	0.76	63.1	7.35	97.6	11	13	sunny/cool, clear	
West_36.2	6/30/2010	0.06	13.7	0.64	50.4	7.24	60.7	20	18	sunny	
West_36.2	7/14/2010				866.4			21	19	cloudy, raning/hot, sunny, humid, off-&-on rain	
West_36.2	7/28/2010	< 0.05	9.34	0.64	161.6	7.2	72.7	17.5	20	sunny/sunny	
West_36.2	8/11/2010				133.4			19.5	17.5	sunny/mostly sunny, humid, 80's	
West_36.2	8/25/2010	< 0.05	14.3	0.59	95.8	7.42	71.4	15.5	14.5	raining/light, intermittent rain	
West_36.2	9/8/2010				122.3			21	20.5	partly cloudy/quite warm, then light rain & clearing	
West_36.2	9/22/2010	< 0.05	10.7	3.29	135.4	7.32	93.4	13	11	sunny/cool, clear	
Whetstone_.2	6/30/2010	0.4	9.08	< 0.2	185	7.43	235.2	14.5	16	sunny/humid, hazy, 70's	
Whetstone_.2	7/28/2010	0.38	7.82	0.57	307.6	7.26	265.3	NA	NA	sunny/sunny, comfortable	No thermometer this day
Whetstone_.2	8/25/2010	0.42	15.6	0.7	209.8	7.49	226.3	17	17	cloudy/cloudy, rain	
Whetstone_.2	9/22/2010	0.43	7.84	1.32	129.6	7.47	327.8	13.5	15.5	sunny/beautiful	
Whetstone_.2	10/12/2010	0.22	11.4	1.28	185	7.26	189.3	10.5	8	partly cloudy/cool, dry	
Whetstone_6.4	6/30/2010	0.24	9.26	< 0.2	30.9	7.55	110.9	12	9	partly cloudy/clear	
Whetstone_6.4	7/28/2010	0.18	6.84	1	44.8	7.28	111.2	15	16	sunny	
Whetstone_6.4	8/25/2010	0.17	14.9	< 0.2	42.6	7.51	104.7	14	15	cloudy/cloudy, rainy	
Whetstone_6.4	9/22/2010	0.06	8.49	< 0.2	25.3	7.39	117.6	10	11	dark (5:41 AM)	
Whetstone_6.4	10/12/2010	0.07	9.51	2	9.8	7.28	98.8	10	8.5	partly cloudy/cool, dry	
Whetstone_9.6	6/30/2010	0.39	10.2	< 0.2	8.4	7.68	99.6	12	8	partly cloudy/clear	
Whetstone_9.6	7/28/2010	0.31	11.2	0.59	5.2	7.31	102.6	15	13	sunny	

Whetstone_9.6	8/25/2010	0.14	30.3	0.34	NA	7.49	90.7	14	14	cloudy/cloudy, rainy	E. coli sample not collected
Whetstone_9.6	9/22/2010	0.26	12.5	1.19	5.2	7.35	118.4	10	10	dark (5:52 AM)	
Whetstone_9.6	10/12/2010	0.05	9.84	1.04	7.4	7.17	78.7	10	8	partly cloudy/cool, dry	
Williams_7.0	6/30/2010	0.41	11.2	0.79	204.6	7.27	123.1	16	14	sunny/mostly clear last 24, cloudy, humid Mon.	
Williams_7.0	7/14/2010				137.6			21	21	drizzle/humid, cloudy, light rain	
Williams_7.0	7/28/2010	0.61	13	1.07	96	7.15	152.2	18.5	15	mostly sunny, partly cloudy/warm & dry	
Williams_7.0	8/11/2010				2419.6			21	19	cloudy/cloudy, humid, little rain	> 2419.6
Williams_7.0	8/25/2010	0.45	17.3	0.93	165.8	7.36	141	17	17	cloudy/cloudy, showers	
Williams_7.0	9/8/2010				133.4			18	18.5	partly cloudy/clear, then thundersorms	
Williams_7.0	9/22/2010	0.69	16.1	2.56	33.1	7.22	172.4	14	9	sunny/dry, cool	
Williams_10.3	6/30/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	sample not collected
Williams_10.3	7/28/2010	0.13	6.92	0.86	93.3	7.2	137.8	16	14	partly cloudy/clear,sunny, warm-hot, low humidity	
Williams_10.3	8/25/2010	NA	NA	NA	NA	NA	NA	NA	NA	NA	sample collected, but sample and field sheet not provided by volunteer
Williams_10.3	9/22/2010	0.12	12.2	0.95	34.5	7.34	158.6	11	9	partly cloudy/clear & warm	
Williams_10.7	6/30/2010	0.13	7.94	0.55	111.9	7.24	116.9	15	13.5	sunny/sunny, fair weather	
Williams_10.7	7/14/2010				290.9			21	22	raining/warm, varable clouds, some ran	
Williams_10.7	7/28/2010	0.13	5.88	0.71	NA	7.2	139.3	18.5	15	sunny/sunny	E. coli testing not valid - no media added to sample; *see Item 3 on Sheet 2*
Williams_10.7	8/11/2010				143.9			21	19	partly cloudy/mostly clear, daytime high 80's	
Williams_10.7	8/25/2010	0.09	8.84	0.35	206.4	7.48	130.2	18	17	cloudy/cloudy, rainy	
Williams_10.7	9/8/2010				304.4			18	18	partly cloudy/light showers, hot	
Williams_10.7	9/22/2010	0.13	8.53	0.67	54.6	7.2	159.2	12	10	sunny/dry & cool	

2011 WRWA COMPILED WQM DATA - Does NOT include Field Duplicates * *See note below and at bottom of page*

(LaRosa Nox, TP & Turbidity data; WRWA pH, Cond. & temp.'s and CRWC *E. coli*)

Note 1: **Lavender highlighted** cells are values from analyses performed at Nelson Analytical in Kennebunk, ME
For RED (RPD goal exceeded, data rejected) and BLUE (RPD goal exceeded, data not rejected) font items please see "Sample or QA Notes" column and 2011WRWA-DUP-RPDs worksheet

Location	Date	NO2-NO3 (mg-N/l)	TP (ug P/L)	Turbidity[1] NTU	Final E. Coli. (mpn/100ml)	Air Temp.	Water Temp.	Cond. (uS/cm)	pH units	Weather Comments - Current/past 48 HRS	Sample or QA Notes:
BLANK1	6/22/2011	< 0.05	< 5	< 0.2	<1	NA	NA	2.8	NA	NA	
BLANK1	7/6/2011				<1	NA	NA		NA	NA	
BLANK1	7/20/2011	< 0.05	< 5	< 0.2	<1	NA	NA	2.2	NA	NA	
BLANK1	8/3/2011				<1	NA	NA		NA	NA	
BLANK1	8/17/2011	< 0.05	< 5	< 0.2	<1	NA	NA	2.3	NA	NA	
BLANK1	9/14/2011			< 0.2	<1	NA	NA	2.8	NA	NA	No samples to LaRosa - Irene; Turbidity done at Nelson Analytical, Kennebunk, ME
BLANK2	6/22/2011	< 0.05	< 5	< 0.2	<1	NA	NA	2.5	NA	NA	
BLANK2	7/6/2011				<1	NA	NA		NA	NA	
BLANK2	7/20/2011	< 0.05	< 5	< 0.2	<1	NA	NA	2.6	NA	NA	
BLANK2	8/3/2011				<1	NA	NA		NA	NA	
BLANK2	8/17/2011	< 0.05	< 5	< 0.2	<1	NA	NA	2.4	NA	NA	
BLANK2	9/14/2011			< 0.2	<1	NA	NA	2.6	NA	NA	No samples to LaRosa - Irene; Turbidity done at Nelson Analytical, Kennebunk, ME
West .08	6/22/2011	0.08	11.9	1.28	42	18	20	70.5	6.82	current= drizzle, no geese obsv'd; past 48=prtly cldy	
West .08	7/6/2011				52.8	18.5	21			current= sunny; past 48=warm	
West .08	7/20/2011	0.1	10.5	0.42	42.8	17.5	24.5	85.3	8.05	current= sunny; past 48=trace rain (6AM-noon, 7/19)	
West .08	8/3/2011				78.5	17	23.5			current= sunny	
West .08	8/17/2011	< 0.05	22.5	3.7	307.6	16	17.5	52.9	6.93	current=cloudy; past 48=rain yesterday	current running fast down river
West .08	9/14/2011			22.7	NA	19	17.5			current=partly cloudy	No samples to LaRosa - Irene; E. coli not submitted to CRWC - river very low and turbid; Turbidity done at Nelson Analytical, Kennebunk, ME
West .5	6/22/2011				30.5					current=drizzle, no geese obsv'd; past 48=prtly cldy	E. coli only collected at this site in 2011
West .5	7/6/2011				38.9					current= sunny; past 48=warm	E. coli only collected at this site in 2011
West .5	7/20/2011				44.8					current= sunny; past 48=trace rain (6AM-noon, 7/19)	E. coli only collected at this site in 2011
West .5	8/3/2011				69.1					current= sunny	E. coli only collected at this site in 2011

West .5	8/17/2011				387.3					current=cloudy; past 48=rain yesterday	E. coli only collected at this site in 2011; current running fast down river
West .5	9/14/2011				NA					current=partly cloudy	E. coli sample collected at dock (West_.08), water level very low, current fast, moderatley turbid, not submitted for testing
West 1.42	6/22/2011	0.12	15.6	2.95	96	19	19	74	6.98	current=drizzle; past 48=sunny, warm	
West 1.42	7/6/2011				25.6	21	20			current=sunny; past 48=sunny, warm	
West 1.42	8/3/2011				24.1	23	24			current=partly cloudy; past 48=hot, sunny w/ T-storms	
West 1.42	8/17/2011	0.05	21.4	3.74	579.4	17	17.5	57.8	6.98	current=early fog, sunny later; past 48=heavy, persistent rain, 8/14PM-8/16PM	
West 1.42	9/14/2011			NA	NA	NA	NA	NA	NA	current= sunny; past 48=sunny, partly cloudy	Sample collected, but misplaced; no analyses performed; river very turbid; vol. did not have thermometer
West 6.4	6/22/2011	0.08	10.7	0.56	39.3	17	19	65.3	7	current=cloudy, light rain; past 48=clear	
West 6.4	7/6/2011				34.5	18	20			current=sunny, partly cloudy; past 48=sunny, warm	
West 6.4	7/20/2011	0.12	10.6	1.18	25.9	17	20	78.8	7.69	current=partly cloudy; past 48=hot, sunny, hazy	
West 6.4	8/3/2011				35.5	16.5	20			current=sunny; past 48=sunny & warm	
West 6.4	9/14/2011			16.5	NA	16.5	19	NA	NA	current=partly cloudy; past 48=sunny, warm	No samples to LaRosa - Irene; E. coli not submitted to CRWC - river very turbid; Turbidity done at Nelson Analytical, Kennebunk, ME
West 13	6/22/2011	0.08	11.1	1.1	32.7	18	18	69.4	6.92	current=cloudy, drizzle, light rain; past 48=sunny/prtly cldy	
West 13	7/6/2011				40.4	18	19.5			current=partly cloudy; past 48=sunny	
West 13	7/20/2011	0.12	12.2	0.54	52.8	16.5	20.5	81.6	7.29	current=partly cloudy; past 48=sunny	
West 13	8/3/2011				45	18	20			current=sunny; past 48=sunny	
West 13	8/17/2011	< 0.05	26.2	3.76	517.2	17	17	52.5	6.94	current=cloudy, fog; past 48=Rain! 8/15 AM-8/16 aft.	Rejected TP values based on RPD; Turb RPD Goal exceeded, but value not rejected; extremely high flow
West 13	9/14/2011			30.3	NA	19	NA	NA	NA	current=partly cloudy; past 48=sunny	No samples to LaRosa - Irene; E. coli not submitted to CRWC - river very turbid; Turbidity done at Nelson Analytical, Kennebunk, ME
West 36	6/22/2011	0.06	10.5	0.67	67	15.5	18	69.6	7.05	current=cloudy, light rain; past 48=sunny	
West 36	7/6/2011				79.4	17	18.5			current=sunny; past 48=sunny	
West 36	7/20/2011	< 0.05	13.3	1.18	98.7	15	18.5	61.3	7.36	current=partly cloudy/cloudy, hazy; past 48=?	
West 36	8/3/2011				387.3	11	15.5			current=sunny; past 48=sunny/cloudy	
West 36	8/17/2011	< 0.05	15.2	2.2	325.5	14	15	43	6.96	current=heavy fog; past 48=heavy rainfall, 8/14 eve.-8/16 AM	
West 36	9/14/2011			0.69	23.3	20	15.5	62.1	7.15	current=partly cloudy; past 48=clear	No samples to LaRosa - Irene; Turbidity done at Nelson Analytical, Kennebunk, ME
West 36.1	6/22/2011	0.06	10.1	0.66	60.9	16	17	72.7	6.98	current=cloudy, light rain; past 48=sunny	
West 36.1	7/6/2011				47.3	15.5	18			current=sunny; past 48=sunny	

West 36.1	7/20/2011	< 0.05	13.4	1	73.8	NA	NA	59.1	7.25	current=partly cloudy/cloudy, hazy; past 48=?	
West 36.1	8/3/2011				39.9	11	15.5			current=sunny; past 48=sunny/cloudy	
West 36.1	8/17/2011	< 0.05	16.1	1.95	161.6	14	15	46.9	6.87	current=heavy fog; past 48=heavy rainfall, 8/14 eve.-8/16 AM	
West 36.1	9/14/2011			0.8	26.2	20	15	61.8	7.11	current=partly cloudy; past 48=clear	No samples to LaRosa - Irene; Turbidity done at Nelson Analytical, Kennebunk, ME
West 38.5	6/22/2011	0.06	12.1	1.07	65	15.5	19	65.4	7.17	current=cloudy; past 48=sunny	
West 38.5	7/6/2011				52.8	15.5	18			current=partly cloudy; past 48=sunny	
West 38.5	7/20/2011	< 0.05	14.4	1.15	101.7	17	19	56.7	7.25	current=partly cloudy, hazy; past 48=?	
West 38.5	8/3/2011				41.4	11	16.5			current=sunny; past 48=sunny/cloudy	
West 38.5	8/17/2011	< 0.05	14.8	1.79	139.6	14	14.5	34.1	6.82	current=sunny, heavy fog; past 48=heavy rainfall, 8/14 eve.-8/16 AM	
West 38.5	9/14/2011			0.97	41	20	15	57.9	7.14	current=partly cloudy; past 48=sunny	No samples to LaRosa - Irene; Turbidity done at Nelson Analytical, Kennebunk, ME
West 39	6/22/2011	0.06	12.6	1.31	160.7	16	19.5	87.1	7.12	current=cloudy; past 48=sunny	
West 39	7/6/2011				77.1	15.5	19.5			current=partly cloudy; past 48=sunny	
West 39	7/20/2011	< 0.05	14.5	2.35	150	20	17.5	73.3	7.29	current=cloudy, hazy; past 48=fog, ?	
West 39	8/3/2011				62.4	11	18			current=sunny; past 48=clear/cloudy	
West 39	8/17/2011	< 0.05	15.1	2.1	228.2	14.5	15	53.1	6.87	current=sunny, foggy; past 48=heavy rainfall, 8/14 eve.-8/16 AM	
West 39	9/14/2011			2.18	66.3	20	15	72.8	7.12	current=partly cloudy; past 48=sunny	No samples to LaRosa - Irene; Turbidity done at Nelson Analytical, Kennebunk, ME
NBranchBrk 4.5	6/22/2011	0.13	18.2	0.58	13.4	12	11.5	227.5	7.64	current=cloudy; past 48=clear	Rejected TP value based on RPD; Turb RPD Goal exceeded, but value not rejected
NBranchBrk 4.5	7/20/2011	0.16	8.25	0.38	10.9	12	14	279.4	7.65	current=sunny; past 48=sunny, v. warm, rain 7/18 AM, HiPr	
NBranchBrk 4.5	8/17/2011	0.12	11	1.44	95.9	9.5	12	168.4	7.26	current=sunny; past 48=heavy rain, 8/14 PM-8/16 aft.	
Saxtons .19	6/22/2011	0.41	9.36	0.6	116.2	18	16	174.3	7.3	current=cloudy; past 48=clear	
Saxtons .19	7/6/2011				88.2	25	19			current=sunny; past 48=sunny	
Saxtons .19	7/20/2011	0.6	10	0.63	156.5	16	17	221.6	7.39	current=sunny, fog; past 48=clear	
Saxtons .19	8/3/2011				193.5	20	20			current=partly cloudy	
Saxtons .19	8/17/2011	0.13	15.3	2.39	261.3	15	16	90.3	7.24	current=sunny; past 48=rain, evening 8/15 thru aft. 8/16	
Saxtons .19	9/14/2011			11.9	101.7	17	17	106.7	7.36	current=sunny; past 48=clear	No samples to LaRosa - Irene; Turbidity done at Nelson Analytical, Kennebunk, ME
Saxtons 5.0	6/22/2011	0.27	34.9	0.94	45.5	17	15	102.7	7.64	current=cloudy; past 48= sunny	
Saxtons 5.0	7/20/2011	0.21	21.2	0.91	91	17	19	113.6	7.68	current=cloudy; past 48=hot & humid, cool overnight, fog burning-off	

Saxtons 5.0	8/17/2011	< 0.05	55.1	2.15	204.6	16	15	67.2	7.32	current=partly cloudy; past 48=hard rain Monday	
Saxtons 5.0	9/14/2011			8.35	90.6	16	16	123.2	7.33	current=cloudy, looks like will burn-off; past 48=sunny to partly cloudy	No samples to LaRosa - Irene; 3 DUPs collected this date - no E. coli test on this sample; Turb. done at Nelson Analytical, Kennebunk, ME
Saxtons 5.6	6/22/2011	0.09	9.63	1.02	46.7	17	15	81.6	7.6	current=cloudy; past 48= sunny	
Saxtons 5.6	7/6/2011				71.2	15	17			current=sunny to partly cloudy; past 48=mostly sunny, hot	
Saxtons 5.6	7/20/2011	0.11	9.83	0.68	91	15	18	108.6	7.68	current=sunny; past 48= sunny	
Saxtons 5.6	8/3/2011				63.7	14	18			current=sunny; past 48= sunny, 80's	
Saxtons 5.6	8/17/2011	< 0.05	13.5	2.01	214.2	15	14	68.1	7.28	current=partly cloudy; past 48=hard rain Monday	
Saxtons 5.6	9/14/2011			7.5	63.1	15	15	81.7	7.33	current=partly cloudy; past 48=sunny	No samples to LaRosa - Irene; Turbidity done at Nelson Analytical, Kennebunk, ME
Williams 7.0	6/22/2011	0.4	11.4	0.52	63.1	17	16	110.4	7.21	current=cloudy; past 48= sunny, clear 80 deg	
Williams 7.0	7/6/2011				79.4	15.5	16			current=partly cloudy; past 48= clear, hot	
Williams 7.0	7/20/2011	0.4	11.7	0.96	175.2	15	17	115.3	7.37	current=partly cloudy; past 48=warm, humid, rained on 7/18 AM	
Williams 7.0	8/3/2011				88	12	17			current=sunny; past 48=clear Tues., small showers on Mon., noon-1PM	
Williams 7.0	8/17/2011	0.11	14.5	1.28	222.4	14	15	70.8	7.06	current=cloudy; past 48=rain, 8/14 eve. - 8/16 5PM	
Williams 7.0	9/14/2011			5.81	42.6	17	15	88.2	7.23	current=partly cloudy; past 48=partly cloudy, warm	No samples to LaRosa - Irene; Turbidity done at Nelson Analytical, Kennebunk, ME
Williams 8.7	6/22/2011	0.4	11.2	0.63	83.3	19	16	113.7	7.22	current=cloudy; past 48= sunny, dry, mid- 80's	
Williams 8.7	7/6/2011				67.7	18	17			current=partly cloudy; past 48= hot & sunny, some clouds	
Williams 8.7	7/20/2011	0.41	12.3	0.88	127.4	15	18	118	7.27	current=sunny; past 48= some rain 7/18 AM, mostly sunny	
Williams 8.7	8/3/2011				46.4	17	18			current=sunny; past 48= sunny, 80+ deg.	
Williams 8.7	8/17/2011	0.11	14	2.82	201.4	15	15	71.3	7.08	current=foggy; past 48=rain, 8/14/15-8/16 @ 3PM	
Williams 10.3	6/22/2011	0.15	10.9	0.62	90.8	NA	NA	106.1	7.29	current=cloudy; past 48= dry, hot	vol. did not have thermometer
Williams 10.3	7/6/2011				107.6	19	16			current=partly cloudy; past 48=warm, humid, mostly clear	
Williams 10.3	7/20/2011	0.12	8.13	0.6	116.2	15	18	109	7.37	current=cloudy; past 48= partly cloudy, dry, warm	
Williams 10.3	8/3/2011				66.3	14	17			current=sunny; past 48=sunny, warm, dry, passing T-storms Mon., 11-4PM	
Williams 10.3	8/17/2011	0.06	12.2	1.53	129.6	15	15	68.8	7.1	current=cloudy/foggy; past 48=rainy, mild, rain 8/15 7AM-8/16 3PM	
Williams 10.3	9/14/2011			4.32	38.9	16	19	84.8	7.12	current=cloudy; past 48=warm & clear, brief rain early in AM	No samples to LaRosa - Irene; Turbidity done at Nelson Analytical, Kennebunk, ME
Williams 10.7	6/22/2011	0.15	8.63	0.4	76.7	15.5	16	105.7	7.31	current=cloudy; past 48= sunny, dry	Turb RPD Goal exceeded, but value not rejected
Williams 10.7	7/6/2011				108.1	14	16			current=partly cloudy; past 48=mostly sunny &	

										warm	
Williams 10.7	7/20/2011	0.12	8.47	0.53	88.4	14	17	113.2	7.53	current=partly cloudy; past 48=sunny, warm w/ T-storms, rain 7/18 3-4 hrs	
Williams 10.7	8/3/2011				75.4	NA	NA			current=sunny; past 48=T-storm, isolated	vol. did not have thermometer
Williams 10.7	8/17/2011	0.06	11.5	2.58	142.1	13	15	68.2	7.11	current=sunny, foggy; past 48=heavy rain, 8/14-8/16	
Williams 10.8	6/22/2011	0.18	8.99	0.92	410.6	15.5	NA	109	7.43	current= partly cloudy; past 48= sunny, dry	
Williams 10.8	7/6/2011				83.3	16	15			current= partly cloudy; past 48= sunny & warm	
Williams 10.8	7/20/2011	0.16	9.83	0.97	122.3	15	17	99.4	7.43	current=partly cloudy; past 48=sunny, warm w/ T-storms, rain 7/18 3-4 hrs	
Williams 10.8	8/3/2011				101.2	NA	NA			current=sunny; past 48=T-storm, isolated	vol. did not have thermometer
MBrWilliams.02	6/22/2011	0.13	8.65	0.32	31.8	15	15	98.5	7.3	current= partly cloudy	
MBrWilliams.02	7/6/2011				90.6	15	15			current= partly cloudy; past 48= sunny & warm	
MBrWilliams.02	7/20/2011	0.11	8.56	0.53	86.2	15	17	117.7	7.82	current=partly cloudy; past 48=sunny, warm w/ T-storms, rain 7/18 3-4 hrs	
MBrWilliams.02	8/3/2011				45.7	NA	NA			current=sunny; past 48=T-storm, isolated	vol. did not have thermometer
MBrWilliams.02	8/17/2011	< 0.05	11.2	1.7	104.3	15	15	74.2	7.22	current=sunny, foggy; past 48=heavy rain, 8/14-8/16	
Whetstone .2	6/22/2011	0.27	10.2	0.26	99.1	18	15	159.6	7.61	current= cloudy ; past 48=sunny, hot	
Whetstone .2	7/20/2011	0.39	8.54	0.48	686.7	18.5	17	232.4	8.05	current= partly cloudy; past 48=hot, no rain	
Whetstone .2	9/14/2011			4.57	517.2	20	15.5	150.6	7.68	current=sunny; past 48=sunny and some rain (?)	No samples to LaRosa - Irene; Turbidity done at Nelson Analytical, Kennebunk, ME; Turb RPD Goal exceeded, but value not rejected
Whetstone 6.4	6/22/2011	0.15	10.3	0.36	28.5	16	14	88.8	7.56	current= partly cloudy; past 48= dry	
Whetstone 6.4	7/20/2011	0.19	8.92	0.45	37.9	16	14	103.5	7.83	current= sunny; past 48= hazy, hot, humid, no rain	
Whetstone 6.4	8/17/2011	0.08	14.1	1.77	118.7	13	13	65.1	7.23	current=sunny; past 48=rain to clearing	
Whetstone 9.6	6/22/2011	0.17	10.1	0.75	866.4	15	13	68.8	7.2	current= partly cloudy	
Whetstone 9.6	7/20/2011	0.35	12.1	0.53	19.7	14	15	99.1	7.81	current= sunny; past 48= hazy, hot, humid, no rain	
Whetstone 9.6	8/17/2011	< 0.05	13.4	2.2	86	13	13	45	7.01	current=sunny; past 48=rain to clearing	

Note 1: **Lavender highlighted** cells are values from analyses performed at Nelson Analytical in Kennebunk, ME
For RED (RPD goal exceeded, data rejected) and BLUE (RPD goal exceeded, data not rejected) font items please see "Sample or QA Notes" column and 2011WRWA-DUP-RPDs worksheet

2012 WRWA/SeVWA COMPILED WQM DATA - Does NOT include Blanks or Field Duplicates
(LaRosa Nox & TP data; WRWA/SeVWA pH, Cond., Turbidity & temperatures and CRWC *E. coli*)

LaRosa Sample Number	CRWC Sample Number	Location	Date	Time	Final E. Coli. (mpn/ 100ml)	NO2-NO3 (mg-N/l)	TP (ug P/L)	Turbidity NTU	Spec. Cond. (uS/cm)	pH units	Air Temp.	Water Temp.	Weather Comments Current/past 48 HRS	Sample or QA Notes:
120272-10	11-10-12	NBranchBrk 4.5	7/11/2012	7:35 AM	2.0	0.24	5.78	0.4	237.8	7.45	11.0	13.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
120390-10	19-11-12	NBranchBrk 4.5	8/8/2012	7:15 AM	42.2	0.18	5.16	0.75	305.3	7.74	11.0	15.0	"Dry" sampling date	
120471-10	27-22-12	NBranchBrk 4.5	9/5/2012	7:05 AM	344.1	0.16	8.97	1.65	212.3	7.50	17.0	15.0	"Wet" sampling date	
120585-01	32-01-12	NBranchBrk 4.5	10/3/2012	7:20 AM	9.7	see below	14	0.9	248.8		12.0	11.0	"Wet" sampling date	Not able to do pH analysis within appropriate timeframe
120472-01		NBranchBrk 4.5	10/3/2012	7:20 AM		0.16							"Wet" sampling date	Same water samples as above - TP & NOX orders were processed separately by LaRosa lab, hence the separate LaRosa Lab # 's
120273-09	04-13-12	Rock .38	6/13/2012	7:45 AM	307.6	0.06	12.5	6	56.6	7.36	20.5	15.5	"Wet" sampling date	Originally entered as Rock_TBD
	08-09-12	Rock .38	6/27/2012	7:30 AM	81.6						19.5	15.5	"Wet" sampling date	
120272-09	11-09-12	Rock .38	7/11/2012	7:30 AM	28.2	0.1	7.17	1	88.3	7.40	17.0	17.5	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-09-12	Rock .38	7/25/2012	7:30 AM	58.3						15.5	15.5	"Wet" sampling date	Originally entered as Rock_.38
120390-09	19-10-12	Rock .38	8/8/2012	7:30 AM	22.3	< 0.05	7.7	2.05	95.0	7.58	15.0	18.5	"Dry" sampling date	
	23-10-12	Rock .38	8/22/2012	7:30 AM	88.2						12.5	15.5	"Dry" sampling date	
120471-09	27-21-12	Rock .38	9/5/2012	7:30 AM	206.4	< 0.05	9.75	2.25	96.4	7.46	20.5	19.5	"Wet" sampling date	
120273-17	04-18-12	Saxtons .19	6/13/2012	7:30 AM	770.1	0.13	23.2	7.9	101.4	7.48	17.0	15.0	"Wet" sampling date	
	08-16-12	Saxtons .19	6/27/2012	7:45 AM	238.2						17.0	15.0	"Wet" sampling date	
120272-17	11-18-12	Saxtons .19	7/11/2012	8:04 AM	285.1	0.31	8.9	0.95	178.3	7.16	17.0	18.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-16-12	Saxtons .19	7/25/2012	7:15 AM	260.3						12.0	19.0	"Wet" sampling date	
120390-17	19-18-12	Saxtons .19	8/8/2012	7:50 AM	186.0	0.23	9.07	5.65	183.5	7.45	14.0	18.0	"Dry" sampling date	
	23-17-12	Saxtons .19	8/22/2012	8:05 AM	178.9						13.0	18.0	"Dry" sampling date	
120471-17	27-29-12	Saxtons .19	9/5/2012	9:10 AM	260.3	0.26	10.8	3.35	195.7	7.54	20.5	18.0	"Wet" sampling date	
	08-22-12	Saxtons 5.0	6/27/2012	6:14 AM	248.9						14.0	15.0	"Wet" sampling date	
120272-18	11-19-12	Saxtons 5.0	7/11/2012	6:18 AM	123.6	1.7	180	1.1	163.2	7.31	12.0	17.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-17-12	Saxtons 5.0	7/25/2012	8:00 AM	105.0						17.5	18.5	"Wet" sampling date	
	19-19-12	Saxtons 5.0	8/8/2012	5:56 AM	88.2						13.0	18.0	"Dry" sampling date	Vol. collected E. coli sample only
	23-18-12	Saxtons 5.0	8/22/2012	6:17 AM	123.6						10.0	16.0	"Dry" sampling date	
120471-18	27-30-12	Saxtons 5.0	9/5/2012	6:51 AM	1,413.6	0.63	144	17	158.8	7.65	20.0	19.0	"Wet" sampling date	
120273-19	04-19-12	Saxtons 5.6	6/13/2012	6:32 AM	435.2	0.08	31	7.75	74.6	7.43	18.0	15.0	"Wet" sampling date	
	08-17-12	Saxtons 5.6	6/27/2012	6:32 AM	261.3						14.0	15.0	"Wet" sampling date	
120272-19	11-20-12	Saxtons 5.6	7/11/2012	6:55 AM	108.1	0.16	7.08	0.9	125.6	7.28	15.0	16.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-18-12	Saxtons 5.6	7/25/2012	6:05 AM	131.4						13.0	18.0	"Wet" sampling date	

120390-19	19-20-12	Saxtons 5.6	8/8/2012	6:12 AM	114.5	< 0.05	7.21	1.85	125.7	7.54	13.0	17.0	"Dry" sampling date	
	23-19-12	Saxtons 5.6	8/22/2012	6:02 AM	60.9						11.0	16.0	"Dry" sampling date	
120273-01	04-05-12	West .08	6/13/2012	7:20 AM	156.5	0.06	9.4	1.8	72.8	7.23	18.0	18.5	"Wet" sampling date	
	08-01-12	West .08	6/27/2012	7:50 AM	59.1						20.0	18.0	"Wet" sampling date	
120272-01	11-01-12	West .08	7/11/2012	7:50 AM	9.7	0.1	10.3	1.25	102.7	7.46	17.0	23.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-01-12	West .08	7/25/2012	7:20 AM	68.3						19.0	24.5	"Wet" sampling date	
120390-01	19-01-12	West .08	8/8/2012	7:05 AM	59.8	< 0.05	11.3	3.05	101.5	7.52	15.0	25.0	"Dry" sampling date	
	23-01-12	West .08	8/22/2012	8:00 AM	63.1						14.0	22.5	"Dry" sampling date	
120471-01	27-13-12	West .08	9/5/2012	7:30 AM	178.5	0.08	12.7	4.3	135.0	7.36	23.0	23.0	"Wet" sampling date	
120273-02	04-06-12	West 1.42	6/13/2012	8:00 AM	150.0	0.08	10.2	2.5	70.5	7.26	18.0	17.5	"Wet" sampling date	
	08-02-12	West 1.42	6/27/2012	7:40 AM	95.9						20.0	18.0	"Wet" sampling date	
120272-02	11-02-12	West 1.42	7/11/2012	8:15 AM	24.7	0.11	8.98	1.05	98.5	7.49	19.0	20.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-02-12	West 1.42	7/25/2012	8:30 AM	1,046.2						21.0	20.0	"Wet" sampling date	
120390-02	19-02-12	West 1.42	8/8/2012	7:45 AM	69.7	< 0.05	32.3	2.6	99.7	7.49	16.0	20.5	"Dry" sampling date	
	23-02-12	West 1.42	8/22/2012	8:00 AM	30.9						13.5	20.0	"Dry" sampling date	
120471-02	27-14-12	West 1.42	9/5/2012	7:30 AM	38.4	0.08	11	2.9	106.4	7.42	23.5	21.0	"Wet" sampling date	
120273-03	04-07-12	West 6.4	6/13/2012	7:30 AM	115.3	0.07	16.1	3.4	65.3	7.30	18.0	19.0	"Wet" sampling date	reject the test value; RPD = 35.0%
	08-03-12	West 6.4	6/27/2012	7:45 AM	54.8						18.0	18.0	"Wet" sampling date	
120272-03	11-03-12	West 6.4	7/11/2012	7:45 AM	17.1		9.93	1.85	97.4	7.44	13.0	20.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"; NOx tube cap dropped, unable to submit NOx sample to LaRosa
120390-03	19-03-12	West 6.4	8/8/2012	6:40 AM	62.4	< 0.05	13.9	3.4	96.3	7.49	15.0	21.0	"Dry" sampling date	
	23-04-12	West 6.4	8/22/2012	8:45 AM	34.1						14.0	18.0	"Dry" sampling date	
120471-03	27-15-12	West 6.4	9/5/2012	6:32 AM	129.6	0.11	20.5	2.3	100.7	7.43	20.5	20.0	"Wet" sampling date	
120273-04	04-08-12	West 13	6/13/2012	7:35 AM	133.3	0.06	13.6	3.4	70.3	7.14	24.0	17.0	"Wet" sampling date	
	08-04-12	West 13	6/27/2012	8:46 AM	56.3						19.5	15.5	"Wet" sampling date	
120272-04	11-04-12	West 13	7/11/2012	7:30 AM	33.2	0.11	11.7	2.3	98.3	7.30	18.0	20.5	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-03-12	West 13	7/25/2012	7:35 AM	189.1						15.5	21.0	"Wet" sampling date	
120390-04	19-04-12	West 13	8/8/2012	7:50 AM	85.7	0.05	13	4.05	93.4	7.38	16.0		"Dry" sampling date	vol. did not record water temp.
	23-05-12	West 13	8/22/2012	7:48 AM	79.8						13.0	20.0	"Dry" sampling date	
120471-04	27-16-12	West 13	9/5/2012	8:55 AM	76.3	0.13	9.08	2.7	104.9	7.26	21.0	20.0	"Wet" sampling date	
120273-05	04-09-12	West 16	6/13/2012	7:25 AM	79.4	< 0.05	14.1	3.4	69.8	7.23	17.5	16.5	"Wet" sampling date	
	08-05-12	West 16	6/27/2012	7:05 AM	68.3						18.0	20.0	"Wet" sampling date	
120272-05	11-05-12	West 16	7/11/2012	7:45 AM	40.4	0.07	14	2.7	100.1	7.25	14.0	19.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-04-12	West 16	7/25/2012	7:45 AM	166.4						15.0	21.0	"Wet" sampling date	
120390-05	19-05-12	West 16	8/8/2012	7:10 AM	93.3	< 0.05	14.5	4.8	93.5	7.34	13.0	20.0	"Dry" sampling date	
	23-06-12	West 16	8/22/2012	8:05 AM	50.4						12.0	19.0	"Dry" sampling date	
120471-05	27-17-12	West 16	9/5/2012	7:25 AM	67.6	0.05	9.64	4.15	105.5	7.32	20.0	21.0	"Wet" sampling date	
120273-06	04-10-12	West 36	6/13/2012	8:10 AM	920.8	0.06	23.1	4.2	57.7	7.20	18.0	16.0	"Wet" sampling date	

	08-06-12	West 36	6/27/2012	8:55 AM	344.1						16.0	15.0	"Wet" sampling date	
120272-06	11-06-12	West 36	7/11/2012	8:00 AM	93.3	0.09	8.25	1.15	105.0	7.36	13.5	17.5	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-05-12	West 36	7/25/2012	7:45 AM	686.7						16.0	19.0	"Wet" sampling date	
120390-06	19-06-12	West 36	8/8/2012	7:45 AM	88.4	< 0.05	8.6	1.9	83.6	7.43	12.0	17.5	"Dry" sampling date	
	23-07-12	West 36	8/22/2012	7:20 AM	90.9						9.5	17.0	"Dry" sampling date	
120471-06	27-18-12	West 36	9/5/2012	7:55 AM	117.8	< 0.05	7.89	2.55	115.2	7.52	20.0	20.0	"Wet" sampling date	
120273-07	04-11-12	West 36.1	6/13/2012	7:55 AM	920.8	0.06	23.8	4.15	60.3	7.14	19.0	16.5	"Wet" sampling date	
	08-07-12	West 36.1	6/27/2012	8:50 AM	298.7						16.0	15.0	"Wet" sampling date	
120272-07	11-07-12	West 36.1	7/11/2012	7:50 AM	108.6	0.1	8.28	1.35	102.1	7.30	12.5	17.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-06-12	West 36.1	7/25/2012	7:30 AM	770.1						16.0	18.0	"Wet" sampling date	
120390-07	19-08-12	West 36.1	8/8/2012	7:35 AM	156.5	< 0.05	9.64	2.05	89.8	7.24	12.0	18.0	"Dry" sampling date	
	23-08-12	West 36.1	8/22/2012	7:45 AM	162.4						10.5	16.0	"Dry" sampling date	
120471-07	27-19-12	West 36.1	9/5/2012	7:45 AM	143.9	< 0.05	8.88	3.15	113.8	7.34	20.0	20.0	"Wet" sampling date	
120273-08	04-12-12	West 38.5	6/13/2012	7:42 AM	727.0	0.06	23.6	3.55	47.3	7.05	19.0	15.0	"Wet" sampling date	
	08-08-12	West 38.5	6/27/2012	8:45 AM	272.3						16.0	15.0	"Wet" sampling date	
120272-08	11-08-12	West 38.5	7/11/2012	7:30 AM	86.0	0.11	11.3	2.1	101.9	7.38	13.0	17.5	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-08-12	West 38.5	7/25/2012	7:15 AM	547.5						18.0	17.0	"Wet" sampling date	
120390-08	19-09-12	West 38.5	8/8/2012	7:25 AM	52.1	0.05	11.2	2.55	85.0	7.35	16.5	18.0	"Dry" sampling date	
	23-09-12	West 38.5	8/22/2012	7:35 AM	27.2						9.5	17.0	"Dry" sampling date	
120471-08	27-20-12	West 38.5	9/5/2012	7:30 AM	52.0	< 0.05	10.2	2.9	104.7	7.35	20.0		"Wet" sampling date	volunteer did not record water temp.
120273-20	04-20-12	Whetstone .2	6/13/2012	7:53 AM	1,986.3	0.18	35.7	9.95	131.5	7.69	18.0	15.0	"Wet" sampling date	
120272-20	11-21-12	Whetstone .2	7/11/2012	7:50 AM	325.5	0.42	9.39	0.6	251.7	7.48	20.0	16.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
120390-20	19-21-12	Whetstone .2	8/8/2012	6:30 AM	686.7	0.33	7.66	1.1	245.2	7.56	14.5	16.5	"Dry" sampling date	
120471-20	27-32-12	Whetstone .2	9/5/2012	7:36 AM	2,419.6	0.34	24.7	13	247.4	7.50	22.0	18.0	"Wet" sampling date	
120585-02	32-02-12	Whetstone .2	10/3/2012	7:57 AM	93.3	see below	11.7	1.4	191.8		15.0	14.0	"Wet" sampling date	Not able to do pH analysis within appropriate timeframe
120472-02		Whetstone .2	10/3/2012	7:57 AM		0.17							"Wet" sampling date	Same water samples as above - TP & NOX orders were processed separately by LaRosa lab, hence the separate LaRosa Lab # 's
120273-21	04-21-12	Whetstone 6.4	6/13/2012	5:20 AM	344.8	0.11	29.2	15	80.4	7.45	16.5	14.5	"Wet" sampling date	
	08-23-12	Whetstone 6.4	6/27/2012	10:00 AM	64.4						19.5	15.0	"Wet" sampling date	Site not orig. sched. For this day; LC collected this to provide a Lab DUP for the run
120272-21	11-22-12	Whetstone 6.4	7/11/2012	6:00 AM	32.7	0.16	8.59	0.5	107.2	7.38	13.5	15.5	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
120390-21	19-22-12	Whetstone 6.4	8/8/2012	6:50 AM	52.0	0.13	7.16	0.83	111.4	7.44	11.5	13.5	"Dry" sampling date	
	23-31-12	Whetstone 6.4	8/22/2012	11:21 AM	28.5						22.5	15.5	"Dry" sampling date	Site not orig. sched. for this day; LC collected this to provide a Field DUP for the run
120471-21	27-33-12	Whetstone 6.4	9/5/2012	6:05 AM	290.9	0.14	17.2	2.7	111.5	7.42	20.5	17.5	"Wet" sampling date	
120585-03	32-03-12	Whetstone 6.4	10/3/2012	6:55 AM	17.3	see below	8.08	0.93	105.2		16.0	12.5	"Wet" sampling date	Not able to do pH analysis within appropriate timeframe
120472-03		Whetstone 6.4	10/3/2012	6:55 AM		< 0.05							"Wet" sampling date	Same water samples as above - TP & NOX orders were processed separately by LaRosa lab, hence the separate LaRosa Lab # 's
120273-22	04-22-12	Whetstone 9.6	6/13/2012	5:40 AM	61.3	0.1	37	9.85	58.9	7.23	15.6	14.5	"Wet" sampling date	

120272-22	11-23-12	Whetstone 9.6	7/11/2012	6:15 AM	15.8	0.26	10.6	0.9	110.7	7.40	13.5	15.5	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
120390-22	19-23-12	Whetstone 9.6	8/8/2012	7:05 AM	5.2	0.23	16.5	0.98	122.8	7.35	14.0	16.0	"Dry" sampling date	RPD 20.2%; sample value NOT rejected
	23-32-12	Whetstone 9.6	8/22/2012	11:29 AM	3.1						22.5	16.5	"Dry" sampling date	Site not orig. sched. for this day; LC collected this to provide a Field DUP for the run
120471-22	27-34-12	Whetstone 9.6	9/5/2012	5:50 AM	280.9	0.23	18.6	4.85	117.9	7.48	19.5	17.5	"Wet" sampling date	
120585-04	32-05-12	Whetstone 9.6	10/3/2012	7:05 AM	12.1	see below	13.8	2.35	91.4		14.0	13.0	"Wet" sampling date	Not able to do pH analysis within appropriate timeframe
120472-04		Whetstone 9.6	10/3/2012	7:05 AM		< 0.05							"Wet" sampling date	Same water samples as above - TP & NOX orders were processed separately by LaRosa lab, hence the separate LaRosa Lab # 's
120273-11	04-14-12	Williams 7.0	6/13/2012	7:45 AM	1,046.2	0.1	34.4	13	65.7	7.18	17.0	15.0	"Wet" sampling date	
	08-10-12	Williams 7.0	6/27/2012	7:04 AM	>2419.6						15.0	15.0	"Wet" sampling date	
120272-11	11-12-12	Williams 7.0	7/11/2012	7:07 AM	155.3	0.78	20.2	1.05	155.6	7.24	12.0	16.5	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-10-12	Williams 7.0	7/25/2012	7:11 AM	686.7						13.5	18.0	"Wet" sampling date	
120390-11	19-12-12	Williams 7.0	8/8/2012	7:10 AM	206.4	0.54	10.5	2.6	152.5	7.42	13.0	18.0	"Dry" sampling date	
	23-11-12	Williams 7.0	8/22/2012	8:13 AM	117.8						14.5	17.0	"Dry" sampling date	
120471-11	27-23-12	Williams 7.0	9/5/2012	7:15 AM	201.4	0.78	9.86	2.75	176.5	7.43	20.0	18.0	"Wet" sampling date	
120273-12	04-15-12	Williams 8.7	6/13/2012	7:00 AM	1,986.3	0.08	43.4	14	64.4	7.18	20.0	15.0	"Wet" sampling date	
	08-11-12	Williams 8.7	6/27/2012	7:15 AM	248.9						15.0	15.0	"Wet" sampling date	
120272-12	11-13-12	Williams 8.7	7/11/2012	7:00 AM	275.5	0.8	14.9	1.05	161.2	7.22	14.0	16.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-11-12	Williams 8.7	7/25/2012	7:00 AM	325.5						15.0	18.0	"Wet" sampling date	
120390-12	19-13-12	Williams 8.7	8/8/2012	6:50 AM	116.9	0.53	10.7	2.7	156.4	7.37	21.0	19.0	"Dry" sampling date	
	23-12-12	Williams 8.7	8/22/2012	6:45 AM	224.7						12.0	16.0	"Dry" sampling date	
120471-12	27-24-12	Williams 8.7	9/5/2012	6:30 AM	461.1	0.72	53.7	4.05	181.1	7.25	22.0	19.0	"Wet" sampling date	
120273-13	04-16-12	Williams 10.3	6/13/2012	8:02 AM	1,553.1	0.05	28.9	9.85	61.1	7.18	16.5	15.5	"Wet" sampling date	
	08-12-12	Williams 10.3	6/27/2012	8:00 AM	>2419.6						16.5	15.0	"Wet" sampling date	
120272-13	11-14-12	Williams 10.3	7/11/2012	8:05 AM	125.9	0.24	8.47	1	145.3	7.25	13.5	17.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-12-12	Williams 10.3	7/25/2012	7:10 AM	224.7						15.5	17.5	"Wet" sampling date	
120390-13	19-14-12	Williams 10.3	8/8/2012	**8:35 AM**	116.2	0.13	8.2	3.4	144.2	7.43	14.5	16.0	"Dry" sampling date	**Sample time should be 08:35 AM**
	23-13-12	Williams 10.3	8/22/2012	7:20 AM	290.9						13.0	16.0	"Dry" sampling date	
120471-13	27-25-12	Williams 10.3	9/5/2012	8:00 AM	360.9	0.16	10.3	2.7	162.7	7.58	20.5	17.5	"Wet" sampling date	
	08-13-12	Williams 10.7	6/27/2012	6:45 AM	328.2						15.0	15.0	"Wet" sampling date	
120272-14	11-15-12	Williams 10.7	7/11/2012	6:25 AM	129.6	0.22	6.96	0.95	146.7	7.20	10.5	17.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-13-12	Williams 10.7	7/25/2012	6:40 AM	248.1						13.5	17.5	"Wet" sampling date	rejected the test value; RPD = 60.7%
120390-14	19-15-12	Williams 10.7	8/8/2012	5:45 AM	228.2	0.12	8.36	4.45	145.0	7.30	16.0	18.0	"Dry" sampling date	
	23-14-12	Williams 10.7	8/22/2012	7:32 AM	290.9						12.0	16.0	"Dry" sampling date	
120471-14	27-26-12	Williams 10.7	9/5/2012	7:22 AM	517.2	0.16	8.68	2.3	163.8	7.43	22.5	18.5	"Wet" sampling date	
	08-14-12	Williams 10.8	6/27/2012	7:27 AM	214.2						13.5	15.0	"Wet" sampling date	
120272-15	11-16-12	Williams 10.8	7/11/2012	7:00 AM	209.8	0.28	8.66	1.2	138.5	6.97	11.0	17.5	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-14-12	Williams 10.8	7/25/2012	6:52 AM	488.4						13.0	18.0	"Wet" sampling date	

120390-15	19-16-12	Williams 10.8	8/8/2012	6:01 AM	224.7	0.27	7.65	1.85	143.2	7.18	13.0	19.0	"Dry" sampling date	
	23-15-12	Williams 10.8	8/22/2012	7:42 AM	461.1						10.0	16.0	"Dry" sampling date	
120471-15	27-27-12	Williams 10.8	9/5/2012	7:20 AM	1,299.7	0.33	10.9	2.95	159.9	7.23	22.5	17.5	"Wet" sampling date	
	08-15-12	MBrWilliams .02	6/27/2012	7:00 AM	517.2						15.0	15.0	"Wet" sampling date	
120272-16	11-17-12	MBrWilliams .02	7/11/2012	6:45 AM	325.5	0.19	7.35	0.85	150.5	7.26	18.5	17.0	"Dry" sampling date	Need to get CRWC "Wet? = Y" corrected to "Wet? = N"
	15-15-12	MBrWilliams .02	7/25/2012	6:50 AM	298.7						13.0	17.0	"Wet" sampling date	
120390-16	19-17-12	MBrWilliams .02	8/8/2012	5:52 AM	160.7	0.09	8.55	6	151.9	7.49	13.0	18.0	"Dry" sampling date	
	23-16-12	MBrWilliams .02	8/22/2012	7:37 AM	228.2						11.0	16.0	"Dry" sampling date	
120471-16	27-28-12	MBrWilliams .02	9/5/2012	7:30 AM	124.6	0.09	7.38	2.05	165.2	7.66	20.5	17.5	"Wet" sampling date	