



**White River Partnership – LaRosa Partnership  
2007 FINAL REPORT**

**Program Overview**

In 2001, the White River Partnership (WRP) launched a Water Quality Monitoring Program (WQM Program) to better understand potential threats to water quality and public health. For 13 weeks during each summer, WRP staff and volunteers keep tabs at over 20 sites throughout the watershed, including popular swimming holes and locations that have the potential to become contaminated. Every Wednesday morning, volunteers measure turbidity (water clarity) and electrical conductivity, and collect water samples that are tested for *E. coli* bacteria.

Starting in 2006, the WRP formed a new partnership with the State of Vermont’s LaRosa Water Quality Laboratory to conduct additional water quality testing at 10 of the WQM Program sites. All of the selected sites have consistently high *E. coli* counts; are located upstream or downstream of a site with high *E. coli* counts; and/or are a site of concern regarding another type of water pollution, such as turbidity. As part of the LaRosa Partnership, the 10 sites are tested for total suspended solids (TSS), turbidity, total phosphorus, and total nitrogen. Additionally, the sites are tested for *E. coli* as part of the WRP’s quality assurance procedures.

WQM Program volunteers collected samples for the LaRosa Partnership three times during the summer of 2007: on June 27, July 25, and August 29. WRP staff transported the samples to the LaRosa Lab in Waterbury for processing and results are available online within 3 weeks.

**Table 1: 2007 LaRosa Partnership Sampling Sites** – Sites were chosen based on their routinely high *E. coli* counts. Each site is listed below with location information and 2005/2006 *E. coli* results.

<b>Sampling Site</b>	<b>Town</b>	<b>2005 <i>E. coli</i> Geometric Mean*</b>	<b>2006 <i>E. coli</i> Geometric Mean</b>
Adam’s Brook	Randolph	39	105
Ayer’s Brook	Randolph	211	113
Bethel – Above Waste Water Treatment Plant	Bethel	70	37
Bethel – Below Waste Water Treatment Plant	Bethel	160	72
Cilley Bridge	Tunbridge	No Data	116
Chelsea Recreational Park	Chelsea	No Data	98
Dugout Road	South Randolph	243	227
Foxstand	Royalton	152	125
Golf Course Bridge	Randolph	No Data	86
Stock Farm Road	Bethel	No Data	103

\* Note: The geometric mean is an average of all samples taken in a given year that evens out the impact of large variations in the data. The EPA limit for geometric mean is 126 colonies/100 mL sample.

## Test Descriptions

### Nitrogen & Phosphorus

Nitrogen and phosphorus are both major nutrients that affect the productivity of fresh water systems. Deficient amounts of these nutrients can decrease the biological productivity of a system, while excess amounts can cause unwanted blooms of algae and other plants. Excessive plant growth can reduce the attractiveness of a water body for activities such as boating and swimming, and when large amounts of vegetation die in a water body the decomposing organisms can greatly reduce the concentration of oxygen in the water. Common sources of nitrogen and phosphorus “pollution” are agricultural runoff, sewage and leaking septic systems, as well as many other human activities.

The Vermont Water Resources Panel has established water quality standards for nitrogen and phosphorus levels in state waters. In high altitude Class A1 and A2 waters, the limit for nitrogen is 0.20 mg/L. In all other Class A1 and A2 waters, the limit for nitrogen is 2.0 mg/L. For Class B waters, the limit is 5.0 mg/L. For phosphorus, limits have been established for high altitude waters, Lakes Champlain and Memphremagog, and lakes, ponds, or reservoirs with drainage areas less than 40 square miles. These established limits range from 0.010 mg/L to 0.054 mg/L. The Water Resources Panel did not define a standard for rivers.

### Turbidity & Total Suspended Solids

Total suspended solids (TSS) concentrations and turbidity both indicate the amount of solids suspended in the water. However, the TSS test measures an actual weight of material per volume of water, while turbidity measures the amount of light scattered from a sample. TSS can also be used to calculate the total amount of material being moved by a stream. High concentrations of suspended particles can cause increased sedimentation in a stream, which can destroy important habitat areas for fish and other aquatic life. Suspended particles also provide attachment places for other pollutants, such as metals and bacteria. Additionally, high concentrations of suspended particles can impair the vision of predator species, such as trout, and can also attach to the gills of fish.

The Vermont Water Resources Panel has described the water quality standard for total suspended solids as “none in such concentrations or combinations that would prevent the full support of uses.” The Water Resources Panel did not establish a separate water quality standard for turbidity.

### *E. coli*

*E. coli* is a type of bacteria that lives in the intestines of all warm-blooded animals. A high *E. coli* count reveals that human or animal waste from a variety of sources (leaking septic systems, livestock, etc) is entering the water and could make people sick. *E. coli* levels are determined by measuring the number of bacteria colonies/100 mL of water. Single samples exceeding 235 colonies/100 mL mean that 8 in 1,000 people swimming in that water may have an increased chance of getting sick. This is the single sample maximum allowed by the Environmental

Protection Agency (EPA) for contact recreation. The State of Vermont has adopted a single sample maximum of 77 colonies/100mL sample, the strictest standard in the nation. This means that 0.1 in 1,000 people are at risk of getting sick in the contaminated water. Young children, older folks, and people with suppressed immune systems are more vulnerable to contracting an illness.

*E.coli* counts can fluctuate dramatically depending on how much rain we have had or from the presence of dead carcasses or animal waste in the river. Because of this, the EPA recommends that a geometric mean (an average that evens out large variations in the data) be used instead of a simple average when considering multiple samples taken from the same site over time. At the end of each sampling season, we calculate the geometric mean of *E. coli* at each site for the year. This allows us to identify trends at sites over time. The EPA standard for the geometric mean is 126 colonies/100 mL sample.

### LaRosa Partnership Sampling Results

The sampling done as part of the LaRosa Partnership provides only a snapshot of the phosphorus, nitrogen, turbidity, and TSS levels at the sampling sites. Since samples were taken only three times throughout the entire summer, there is not enough data to draw any conclusions regarding the levels of these parameters. More sampling needs to be done, and on a more frequent basis, in order to understand the effects these parameters are having on the health of the White River watershed.

The results from the three sampling dates are displayed below in Tables 2, 3, and 4.

**Table 2: Results from LaRosa Partnership Sampling on 6/27/07**

Sample Site	June 27, 2007				
	Total Nitrogen (mg/L)	Total Phosphorus (µg/L)	<i>E. coli</i>	Turbidity (NTU)	Total Suspended Solids (mg/L)
Adam's Brook	0.38	8	32	3.78	41.2
Ayer's Brook	0.45		104	0.91	2.38
Bethel - Above Treatment Plant	0.36	10.8	46	0.45	1.12
Bethel - Below Treatment Plant	0.35	6.6	56	0.81	1.78
Cilley Bridge	0.2	7.6	185	0.56	1.28
Chelsea Rec Park	0.23	15.2	75	0.78	1.54
Dugout Road	0.65	22.9	276	1.31	6.53
Foxstand	0.42	9.5	118	0.8	1.69
Golf Course Bridge	0.63	34.6	104	0.52	1.17
Stock Farm Road	0.63	24.7	210	1.3	2.8

**Table 3: Results from LaRosa Partnership Sampling on 7/25/07**

	<b>July 25, 2007</b>				
<b>Sample Site</b>	<b>Total Nitrogen (mg/L)</b>	<b>Total Phosphorus (µg/L)</b>	<b><i>E. coli</i></b>	<b>Turbidity (NTU)</b>	<b>Total Suspended Solids (mg/L)</b>
Adam's Brook	0.39	5.6	9	0.39	2.71
Ayer's Brook	0.45	23.2	102	12.4	22.8
Bethel - Above Treatment Plant	0.28	10.7	30	3.94	7.79
Bethel - Below Treatment Plant	0.32	20.1	147	4.97	12.9
Cilley Bridge	0.23	8	59	0.82	2.14
Chelsea Rec Park	0.23	14.1	86	1.1	2.46
Dugout Road	0.54	43.7	140	9.22	28.1
Foxstand	0.4	22	137	7.48	14.3
Golf Course Bridge	0.48	23.2	113	6.7	12.4
Stock Farm Road					

**Table 4: Results from LaRosa Partnership Sampling on 8/29/07**

	<b>August 29, 2007</b>				
<b>Sample Site</b>	<b>Total Nitrogen (mg/L)</b>	<b>Total Phosphorus (µg/L)</b>	<b><i>E. coli</i></b>	<b>Turbidity (NTU)</b>	<b>Total Suspended Solids (mg/L)</b>
Adam's Brook	0.35	5	2	0.3	1.00
Ayer's Brook	0.49	5.8	214	1.26	2.35
Bethel - Above Treatment Plant	0.34	5	16	0.47	1.88
Bethel - Below Treatment Plant	0.43	9.4	20	0.65	1.00
Cilley Bridge	0.18	5	55	0.34	1.00
Chelsea Rec Park	0.31	60.4	58	0.28	1.00
Dugout Road	0.62	7.7	49	0.62	2.64
Foxstand					
Golf Course Bridge	0.66		105	0.77	1.47
Stock Farm Road	0.67	24.7	50	1.31	2.06

## ***E. coli* Quality Assurance Results**

The *E. coli* results from these additional testing days were used to quality assure the weekly *E. coli* testing done by the WRP. A comparison of the LaRosa results and the WRP's results can be seen below in Table 5. For the most part, the LaRosa results line up fairly well with the WRP's results. On a few occasions, the results varied more significantly. These results are highlighted in red. There are a variety of factors that could have contributed to these variations, including the fact that the samples were analyzed by different people and that the samples could have been processed at different times. On the whole, the results of the quality assurance are positive, reflecting proper sampling and analytical techniques used by the WRP's volunteers and staff.

**Table 5:** Comparison of WRP and LaRosa *E. coli* Results. Results highlighted in red indicate those which varied more significantly.

<b>Site</b>	<b>WRP Results 6/27</b>	<b>LaRosa Results 6/27</b>	<b>WRP Results 7/25</b>	<b>LaRosa Results 7/25</b>	<b>WRP Results 8/29</b>	<b>LaRosa Results 8/29</b>
Adam's Brook	28.5	32	5.2	9	4.1	2
Ayer's Brook	93.2	104	101.2	102	191.8	214
Bethel - Above Treatment Plant	35.0	46	25.9	30	29.9	16
Bethel - Below Treatment Plant	70.3	56	<b>78</b>	<b>147</b>	30.5	20
Cilley Bridge	<b>113.7</b>	<b>185</b>	<b>117.8</b>	<b>59</b>	33.6	55
Chelsea Rec Park	80.1	75	61.3	86	60.1	58
Dugout Road	<b>209.8</b>	<b>276</b>	125	140	63.1	49
Foxstand	93.3	118	124.6	137		
Golf Course Bridge	96.0	104	131.7	113	98.4	105
Stock Farm Road	231.0	210			36.9	50

## **Conclusions**

The LaRosa Partnership provides an excellent opportunity for the WRP to enhance the WQM Program and to gain a better understanding of the health of the White River watershed. The WRP plans to continue the partnership in future years and to explore sampling more frequently. Many thanks to the WRP's volunteer monitors who have helped make this partnership possible: Don Faulkner, Wanda Knudsen, Kathy Leonard, Tom MacNair, Lynn McNamara, Mary Pavone, and Debbie Price!

Appendix A

**LaRosa Partnership Results – Summer 2006**

**Table 1: Results from LaRosa Partnership Sampling on 6/28/06**

	<b>June 28, 2006</b>			
<b>Sample Site</b>	<b>Total Nitrogen (mg/L)</b>	<b>Total Phosphorus (µg/L)</b>	<b><i>E. coli</i></b>	<b>Turbidity (NTU)</b>
Adam's Brook	0.67	40		1.88
Ayer's Brook	0.53	60		12.80
Bethel - Above Treatment Plant	0.25	10		22.80
Bethel - Below Treatment Plant	0.32	79		18.50
Cilley Bridge	0.24	20		0.98
Chelsea Rec Park	0.27	21		1.17
Dugout Road	0.48	95		11.50
Foxstand	0.35	87		19.20
Golf Course Bridge	0.40	21		3.82
Stock Farm Road	0.34	115		27.20

**Table 2: Results from LaRosa Partnership Sampling on 7/26/06**

	<b>July 26, 2006</b>			
<b>Sample Site</b>	<b>Total Nitrogen (mg/L)</b>	<b>Total Phosphorus (µg/L)</b>	<b><i>E. coli</i></b>	<b>Turbidity (NTU)</b>
Adam's Brook		14.2	461	0.74
Ayer's Brook		16.4	179	2.74
Bethel - Above Treatment Plant		5	29	0.96
Bethel - Below Treatment Plant		7	49	0.71
Cilley Bridge		14.6	101	0.75
Chelsea Rec Park		21.4	147	
Dugout Road		29	291	1.83
Foxstand		12	126	2.13
Golf Course Bridge		14	73	0.88
Stock Farm Road		17.3	55	1.89

**Table 3: Results from LaRosa Partnership Sampling on 8/30/06**

<b>Sample Site</b>	<b>August 30, 2006</b>			
	<b>Total Nitrogen (mg/L)</b>	<b>Total Phosphorus (µg/L)</b>	<b><i>E. coli</i></b>	<b>Turbidity (NTU)</b>
Adam's Brook	0.55	10		0.42
Ayer's Brook	0.49	10		1.21
Bethel - Above Treatment Plant	0.32	7		10.40
Bethel - Below Treatment Plant	0.37	9		18.50
Cilley Bridge	0.21	183		0.54
Chelsea Rec Park	0.21	13		0.69
Dugout Road	0.64	163		0.12
Foxstand	0.38	8		19.20
Golf Course Bridge				
Stock Farm Road	0.55	22		0.96