River Bioassessment by Volunteers (RBV)

2012 Program Summary
Annual Report # 14

State of Connecticut
Department of Energy and Environmental Protection
Bureau of Water Protection & Land Reuse

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Cover Photo:
Joe Struble from 3M volunteers on Sodom Brook for the QRWA RBV program. *Photo courtesy of the Quinnipiac River Watershed Association.*

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Volunteers work together to sort an RBV sample from the Salmon River.
Photo courtesy of Jane Brawerman.

Acknowledgements

Mike Beauchene established the RBV program in 1999 and has served as the DEEP Volunteer Monitoring Coordinator ever since. Through more than a decade of Mike's tireless effort, enthusiasm, and creativity, the RBV program has found its place as the heart of DEEP's Volunteer River and Stream Monitoring Program. The RBV program provides local communities with a fun, hands-on way to monitor their local rivers and streams and to contribute valuable data to the DEEP WPLR Monitoring and Assessment Program. Sadly for the RBV Program, in August 2012 Mike accepted a well earned promotion and now serves as a Supervising Fisheries Biologist for the DEEP Inland Fisheries Division. We know that Mike will be greatly missed by the 400+ volunteers that have come to know him as the face of the RBV program, but we wish him well in his new position and thank him for leaving us with such a well established program. *Good luck Mike!*

The local RBV leaders across the state deserve special recognition for ensuring that the RBV program is a success each year. These individuals put countless hours into organizing their programs, coordinating with DEEP staff, recruiting and training volunteers, and more. During the 2012 season, the following individuals served as local RBV program leaders - thank you!!

Ann Astarita (Candlewood Valley Trout Unlimited)
Paula Coughlin (CT Audubon Society at Pomfret)
Ken Couture (Killingly High School Vo-Ag Program)
Ingrid Davis (Pomperaug River Watershed Coalition)
Tom Fahsbender (Washington Montessori School)
Denise Fitch (Friends of the Lake)
Carol Haskins (Pomperaug River Watershed Coalition)
Joe Hovious (Candlewood Valley Trout Unlimited)
Penny Howell (East Lyme Conservation Commission)
Diba Khan-Bureau (Three Rivers Community College)
Ann Letendre (Friends of Hockanum River Linear Park)
Becky Martorelli (Quinnipiac River Watershed Assoc.)
Tom Ouellette (Friends of Hockanum River Linear Park)
Rod Parlee (Bolton Conservation Commission)
Alisa Phillips-Griggs (Farmington River Watershed Assoc.)
Jean Pillo (The Last Green Valley)
Hugh Rawson (Roxbury Conservation Commission)
Sue Reilly (Woodstock Academy)
Judy Rondeau (Niantic River Watershed Committee)
Shannon Rose (E.O. Smith Depot Campus)
Meghan Ruta (Housatonic Valley Association)
Gary Steinman (Roxbury Conservation Commission)
Trudy Swenson (Roxbury Conservation Commission)
Chuck Toal (Colchester Brownie Troop)
Marcia Wilkins (Sierra Club Connecticut)
Pat Young (Salmon River Watershed Partnership)
Diane Herr (Waterford High School)

Finally, the River Bioassessment by Volunteers Program (RBV) would also not be possible without the dedication of the hundreds of volunteers that participate annually – thank you to each of you! We hope to see you again this fall!

Get Involved with RBV Today!

RBV volunteers are trained to sample the macroinvertebrate life of a local stream system in order to help DEEP assess water quality. If this sounds interesting, we would love to have your participation!

Participate as an Individual Volunteer –Join a Local RBV Group in Your Area

Individual volunteers are encouraged to contact a local RBV group in your area. (Please refer to the groups who already participate; see Acknowledgments section.) These organizations would love to have additional hands to assist in their efforts! If you need assistance locating the nearest RBV group in your region, please contact the Volunteer Monitoring Coordinator.

Establish a New RBV Group

If your group or organization consists of 8 or more volunteers over age 16, you can request DEEP staff support to conduct an RBV event in your area. Requests are evaluated on a first-come-first-served basis, with priority given to groups that have an interest in developing a long-term (i.e. multi-year) RBV program, and which are located in areas that are not already being monitored by an existing RBV local group. Contact the Volunteer Monitoring Coordinator to learn more.

Become a Certified Local RBV Trainer

DEEP coordinates several RBV Train-the-Trainer sessions each year. These 1-day sessions are free of charge and led by DEEP staff. All monitoring equipment is provided and no experience is necessary. You must have the physical ability to climb stream banks and walk within a stream to participate.

Upon completion of the RBV Train-the-Trainer session, you will be expected to serve as an RBV team leader for your local group/organization. Team leaders help to organize local RBV events in their area. During the local RBV event you will be responsible for training your fellow group members (as well as any other interested community members) how to carry out the RBV method on one or more stream locations in your area. You will be required to work with DEEP staff prior to the event to select suitable monitoring locations. RBV events must be held between September and November.

Upon successful coordination of two successive DEEP-supervised RBV events, you'll be added to the official list of DEEP Certified Local RBV Trainers. Certified Local RBV Trainers are approved to train new RBV volunteers and to serve as a mentor to new RBV groups in their area, without requiring direct DEEP supervision. As a Certified Local RBV Trainers you are required to attend a refresher course every 3 years and coordinate with the Volunteer Monitoring Coordinator as needed, throughout the year. To obtain a list of upcoming sessions, please contact the Volunteer Monitoring Coordinator.

2013-2014 Volunteer Monitoring Coordinator Contact Information:

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Executive Summary

The *River Bioassessment by Volunteers* program (RBV), formerly *Rapid Bioassessment in Wadeable Streams and Rivers by Volunteer Monitors*, is an aquatic macroinvertebrate collection protocol developed by the Connecticut Department of Energy and Environmental Protection (DEEP) Bureau of Water Protection and Land Reuse (WPLR) Ambient Monitoring Program.

Macroinvertebrates are organisms that are large enough to be seen with the naked eye ('macro') and lack a backbone ('invertebrate'). The RBV Program focuses specifically on riffle-dwelling benthic macroinvertebrates, or those that live within riffle habitat on stream bottoms. Examples of these include insects in their larval or nymph form, crayfish, freshwater snails and clams, and worms.

Aquatic macroinvertebrates are good indicators of stream quality because:

- They are affected by the physical, chemical, and biological conditions of the stream.
- They can't escape pollution and show the effects of short- and long term pollution events.
- They are a critical part of the stream's food web.
- Some are very intolerant of pollution.
- They are relatively easy to sample and identify.

The goal of RBV is to provide volunteer monitoring programs with a quick, efficient, and standardized methodology for the collection of macroinvertebrate community data from wadeable streams. These data can be used to screen for sites with very good water quality, augmenting WPLR monitoring activities. The RBV program also serves as an important environmental education program; volunteers are trained to better understand their local watersheds and to serve as environmental stewards in their communities.

Table 1. Annual RBV Program Statistics

	2010	2011	2012
RBV Vouchers Submitted	119	120	132
Unique Monitoring locations (Appendix A)	106	117	127
Waterbodies Monitored	76	68	96
Fall Vouchers w/ 4+ "Most Wanted" Types	18	24	21
Groups Participating	22	21	22
Individual Participants (Estimated)	400+	400+	400+
Groups Participating for First Time	6	5	4
Returning Groups	16	16	18

All support materials including a more detailed description of the RBV program, the methodology, data sheets, sorting guides, macroinvertebrate field ID cards, and recent annual summary reports are available on the DEEP volunteer monitoring web page (www.ct.gov/deep/rbv).

Additional WPLR annual program reports are available for download from the DEEP website: http://www.ct.gov/deep/cwp/view.asp?a=2719&q=487892&depNav_GID=1654

RBV Program Overview

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Photo courtesy of the Salmon River Watershed Partnership.

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The program includes 33 macroinvertebrate taxa, each with distinct shape, structure, color, or behavior (Table 2). Organisms were selected for inclusion in the RBV program based upon three key criteria:

- The organism must have a statewide distribution
- The organism should provide key information about the river system
- The organism has a unique behavior or morphological characteristic easily identified by new volunteers

Each of the RBV Program macroinvertebrate organism types has been placed into 1 of 3 categories:

- ***'Most Wanted'*** - Macroinvertebrate types typically found in streams characterized by outstanding water quality.
- ***'Moderately Wanted'*** - Macroinvertebrate types typically found in a range of conditions from outstanding to good water quality.
- ***'Least Wanted'*** - Macroinvertebrate types found in all types of water quality conditions, from outstanding to poor.

The name of each of the 3 qualitative categories is intended to characterize water quality and is not intended to imply that those in the least wanted category are harmful or result in nuisance conditions.

In addition, an 'Other' category was added to the RBV program starting in 2005 based on suggestions from RBV participants. Macroinvertebrate types in the 'Other' category represent organisms that can be very common in Connecticut streams and/or are very familiar to participants, but which do not meet the 3 criteria listed above.

Detailed information about each organism can be found on the RBV program Field Identification Panels, which are available for viewing and download from the DEEP web page: www.ct.gov/deep/rbv.

Table 2. The RBV Macroinvertebrate Organisms

Most Wanted	Moderately Wanted	Least Wanted	Other
Drunella	Hydropsychidae	Amphipoda	Crayfish
Isonychia	*Chimarra*	Isopoda	Tipulidae
Epeorus	*Stenonema*	Leech	Elmidae
Peltoperlidae	*Psephenus*	Chironomidae	Baetidae
Perlidae	*Corydalus*	Simuliidae	Athericidae
Glossosoma	*Nigronia*	Freshwater snail	Planaria
Apatania	Odonata	Oligochaeta	Sphaeriidae
Rhyacophila			
Brachycentrus			
Lepidostoma			
Misc. Stoneflies			

The RBV Method

The RBV method was developed based upon the US EPA Rapid Bioassessment Protocols (Barbour et al 1999; Plafkin et al 1989). The RBV method requires that the participants sample the macroinvertebrate community from a stream riffle habitat and produce a voucher collection accompanied by a data sheet. (The RBV datasheet is available for download at http://www.ct.gov/deep/lib/deep/water/volunteer_monitoring/rbvdatasht.pdf.)

The RBV Program is coordinated by the CT DEEP and implemented annually in the fall (September 1-November 30) by local RBV groups. All volunteers attend a training session led by either the DEEP Volunteer Monitoring Coordinator or a DEEP-Certified Local RBV Trainer. The training session provides an overview of the program and introduces the participants to the RBV method. The training typically lasts approximately 3 hours, including a field demonstration component. New volunteers are then paired with one or more experienced volunteers and assigned a nearby monitoring site at which to carry out the RBV method. Typically, teams travel to their site during the same day to carry out the RBV process. The collection and sorting process takes approximately 2-3 hours to complete when conducted streamside at the monitoring site. (The total RBV process, including both training and sampling, takes approximately 5-6 hours.)

Volunteers in Bolton collect an RBV sample from a stream riffle.
Photo courtesy Bolton Conservation Commission

A Certified Local RBV Trainer prepares a voucher collection.
Photo courtesy of the Roxbury Conservation Commission.

At the conclusion of the collection and sorting processes, a voucher collection is produced for each site by placing at least one specimen of each type of macroinvertebrate organism collected into a leak-proof container with a descriptive label and alcohol (either ethyl or isopropyl). The data sheet documents the different organisms present at the site as well. (The data sheet also helps to assist volunteers with distinguishing between different macroinvertebrate organism types during the sorting process.) Both the voucher sample and the data sheet are submitted by the volunteer group to WPLR (via the Volunteer Monitoring Coordinator) for review and inclusion in the annual program report. The contents of the voucher container are verified by DEEP staff trained in macroinvertebrate taxonomic identification and then entered into the DEEP database.

It is important to note that the final data for the sample is based upon the voucher collection and not what has been recorded on the data sheet. If an organism was at the site and listed on the data sheet but not present in the voucher collection, it will not be 'counted' towards the site's final RBV results.

WPLR has several sets of RBV equipment available for short-term loan to Certified Local RBV Trainers. New groups can contact the DEEP Volunteer Monitoring Coordinator to arrange a one-day DEEP-lead training and sampling event; all required monitoring equipment will be provided by the DEEP staff on the day of the training.

RBV Data Utility

The documentation (i.e., voucher collection) of key indicator organisms (e.g., macroinvertebrate organism types) in a section of a stream provides a record of the benthic community present for a collection date and time. **The primary use of RBV data by DEEP is to screen for Connecticut streams that are characterized by high water quality.**

Table 3. Use of RBV Data in State Water Quality Standard Assessments

# 'Most Wanted' Types	Assessment Result
0-3	No Assessment Made
4	Flagged as *likely* fully supporting aquatic life use standard
5+	Automatic 'fully supporting' assessment of aquatic life use standard

The 'Least Wanted' macroinvertebrate organism types are able to thrive in many environmental conditions while the 'Most Wanted' macroinvertebrate organism types thrive only under conditions of low environmental stress. **The absence of the 'Most Wanted' types in any sample does not, however, automatically mean the water quality is low; further information is required before an assessment of water quality conditions can be made.** Therefore, the RBV method is not designed to monitor for impairments or degradation of water quality. Because of this, samples with 3 or fewer types in the 'Most Wanted' category are not used to definitively indicate impairment. Rather, in these situations additional data is required, such as targeted monitoring by DEEP staff, before an assessment determination can be made.

For those samples with 4 or more types of organisms in the 'Most Wanted' category, the location likely fully supports the State Biological Water Quality Criteria for aquatic life. The final decision to list the site as fully supporting, however, will be based upon a comparison of the results to additional available information and WPLR staff's familiarity with the site. Final assessment decisions (i.e. 'fully supporting') are reported by stream segment (Figure 1) in the Integrated Water Quality Report to Congress (www.ct.gov/deep/iwqr).

Volunteers with the Friends of Hockanum River Linear Park work to determine the number of 'Most Wanted' organisms in their sample. *Photo courtesy of Jane Brawerman.*

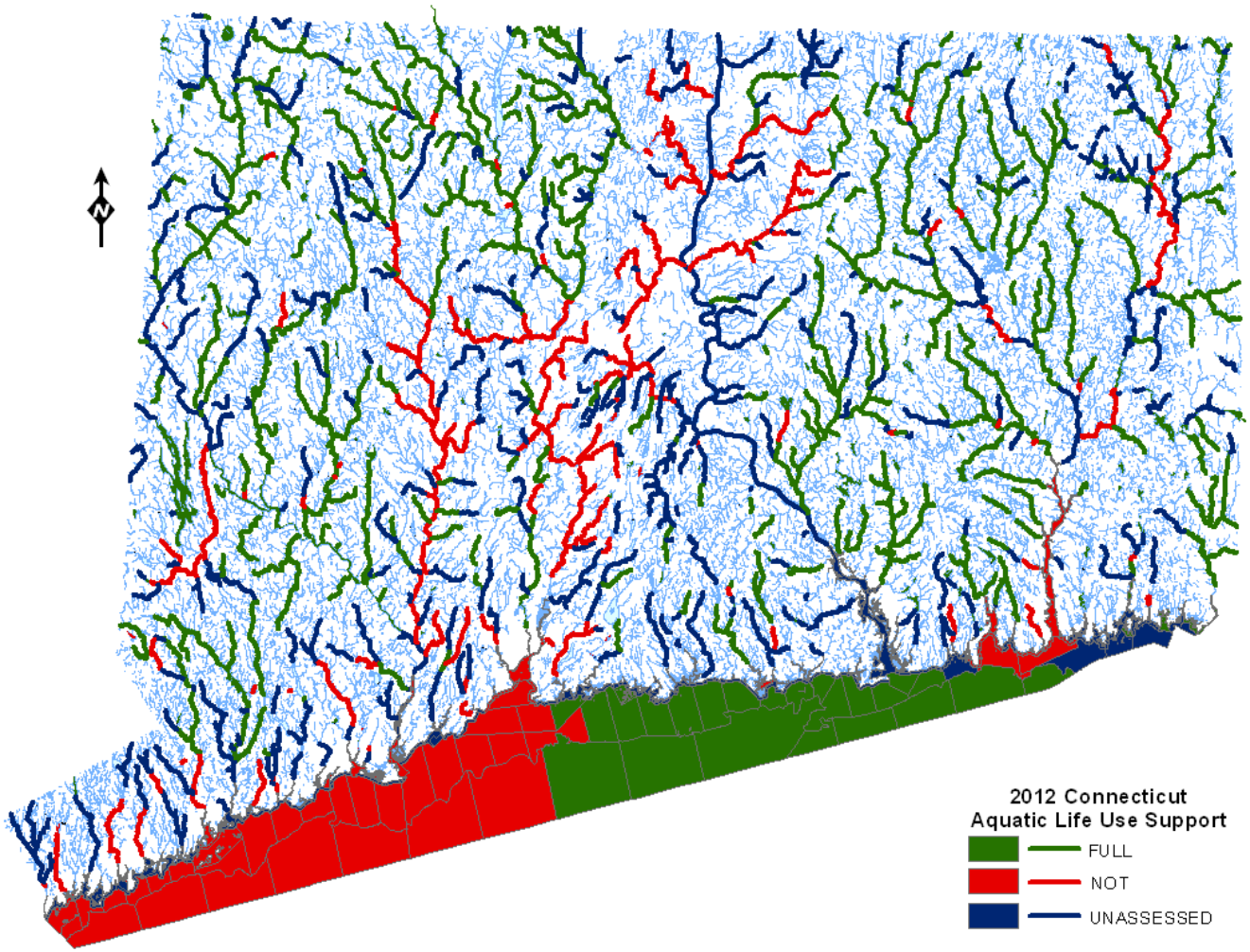

Figure 1. 2012 Integrated Water Quality Report to Congress (IWQR) Aquatic Life Use Support Assessments. The aquatic life use support assessments reported in the 2012 IWQR. Green lines represent stream segments supporting aquatic life goals while red segments represent those determined to be not supporting aquatic life goals.

A review of all macroinvertebrate data collected by WPLR between 1999 and 2011 as part of it routine monitoring and assessment program demonstrates the success of this methodology (Figure 2).

At each site in the 1999-2011 WPLR dataset a complete macroinvertebrate sample of 200 or more organisms was collected and identified to the lowest possible taxa. These data were used to support assessments for the biennial IWQRs compiled during this timeframe. This review of more than 1,000 samples confirmed that all sites at which five or more of the 'Most Wanted' RBV organism types were present had been assessed as fully supporting aquatic life use support goals for State Water Quality Standards. Only a small handful of sites (n=7) with 4 or more of the 'Most Wanted' macroinvertebrate organism types failed to meet water quality standards for aquatic life use. However, in all of these cases, the sites were large river systems and would not meet the site criteria required to be suitable for monitoring with the RBV program.

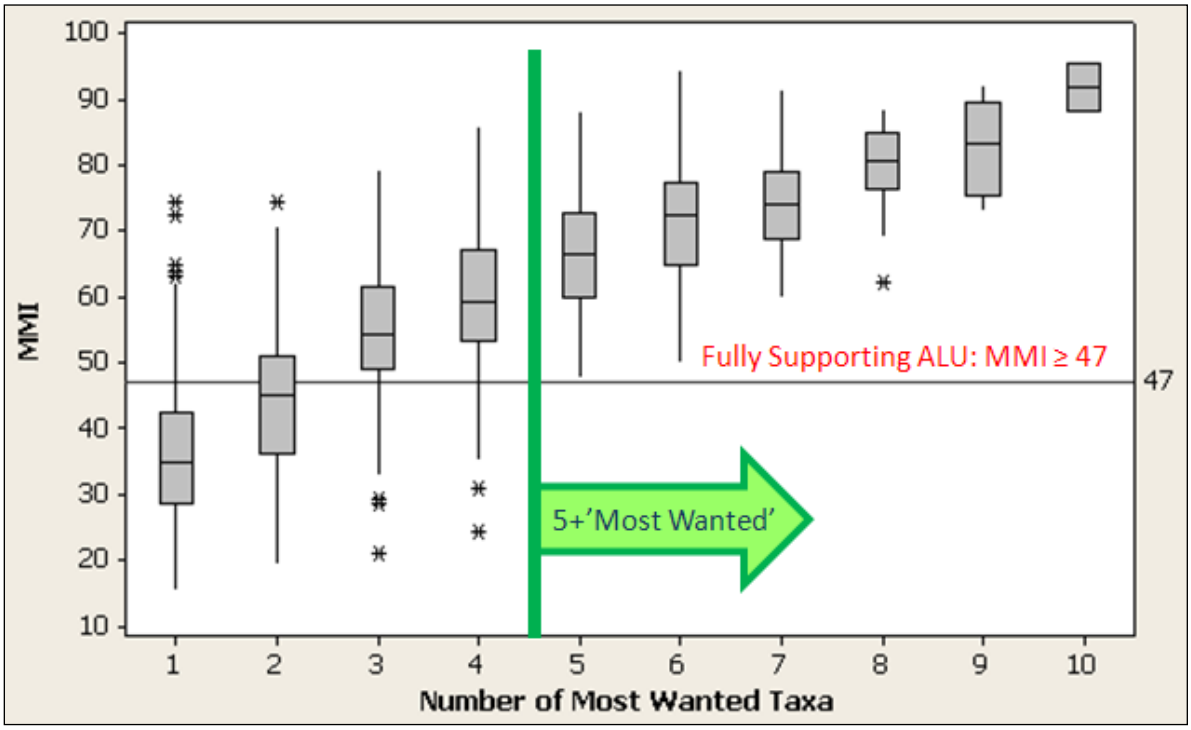

Figure 2. A 1999-2011 review of all available WPLR macroinvertebrate data records (n=1152) demonstrates support for the RBV methodology. All sites with 5 or more most wanted taxa has macroinvertebrate multimetric index (MMI) scores above the threshold to be considered a fully supporting stream.

During the most recent IWQR (2012), RBV data was used to support the assessment of 29 river and stream segments (12% of all segments assessed), comprising over 175 miles of streams and rivers (17% of all stream and river miles assessed). The value of the RBV Program is evident from these figures.

Table 4. Use of RBV Data in Connecticut Integrated Water Quality Reports (2004-2012)

	Reporting Cycle				
	2004	2006	2008	2010	2012
Total # Segments Assessed	309	319	264	242	244
Vol Data Primary	24 (8%)	48 (15%)	47 (18%)	16 (7%)	16 (7%)
Vol Data Supporting	27 (9%)	22 (7%)	10 (4%)	12 (5%)	13 (5%)
Total Vol Contribution	51 (17%)	70 (22%)	57 (22%)	28 (12%)	29 (12%)
Total # Miles Assessed	1242.9	1310.6	993.4	1034.5	1034.7
Vol Data Primary	81.5 (7%)	171.3 (13%)	176.06 (18%)	80.9 (8%)	80.9 (8%)
Vol Data Supporting	89.4 (7%)	88.9 (7%)	47.62 (5%)	94.7 (9%)	94.6 (9%)
Total Vol Contribution	170.9 (14%)	260.2 (20%)	223.7 (23%)	175.7 (17%)	175.6 (17%)

2012 Program Results

2012 marked the 14th year volunteer monitoring groups collected and submitted vouchers to DEEP under the RBV program (Figure 3).

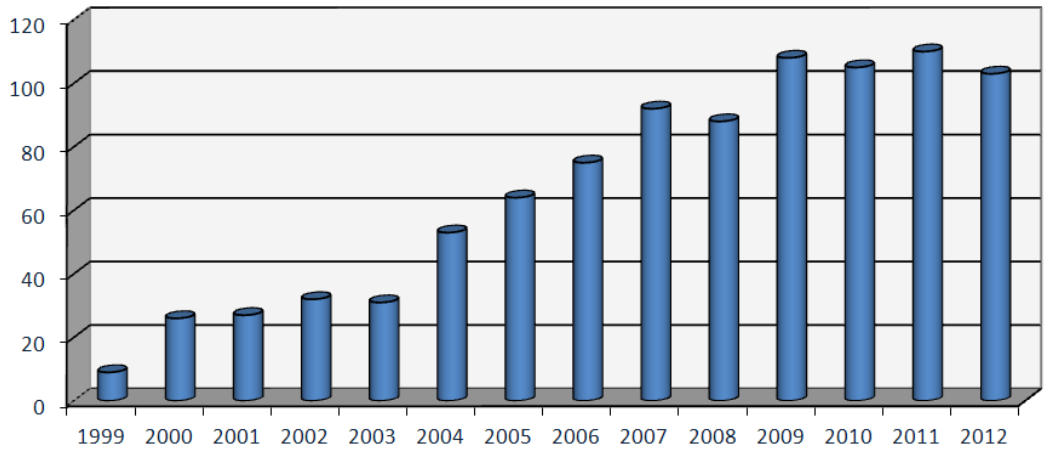

Figure 3. Number of Fall RBV Vouchers* Submitted Annually

**Additional RBV vouchers were submitted between 2005-2012, however these vouchers were not collected within the required September-November timeframe and are therefore not considered 'valid' for use for assessment purposes.*

An estimated 400+ volunteers representing twenty-two (22) volunteer monitoring groups participated in the 2012 program. **Together, volunteers collected 132 vouchers (99 fall, 30 spring/summer, 3 winter) from 127 locations on 96 different waterbodies during 2012** (Table 5; Figures 4 & 5; Appendix A). **The distribution of most wanted types in the samples was 0 to 6 (Figure 6; Table 6).**

Table 5. 10-Year RBV Program Summary Statistics

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total # Vouchers	32	31	54	85	98	98	106	121	119	125	132
# Fall Vouchers	32	31	53	64	75	92	88	108	105	110	99
# Unique Sites	32	31	54	68	80	92	96	113	106	117	127
# Waterbodies	20	26	43	49	59	66	58	76	76	68	96
# Towns	16	20	30	35	40	52	42	51	41	44	56
# Groups	9	14	20	19	19	26	20	22	22	21	22
#Volunteers	120	110	232	215	250	325	350	400	400+	400+	400+

Twenty-one (21) of the fall 2012 voucher samples had 4 or more types in the 'Most Wanted' category (Table 7). Those sites for which a voucher containing four or more 'Most Wanted' macroinvertebrate organism types was submitted, will most likely be listed as 'fully supporting' State Biological Water Quality Criteria for aquatic life use. DEEP staff will review these sites before making a final determination.

Twenty-four (24) fall 2012 voucher samples contained three most wanted types present in the voucher sample (Table 8). Although these sites do not meet the '4 or More' criteria to be considered for listing as fully supporting State Biological Water Quality Criteria for aquatic life use, water quality at these sites is likely good. **It is important that program participants understand that the absence of key indicator organisms (i.e., 'Most Wanted' types) in a voucher does not necessarily mean the water quality is low; samples with 3 or fewer types in the 'Most Wanted' category do not automatically indicate impairment. These sites may actually even be characterized by very good water quality**. In these situations further investigation is required, such as additional monitoring by DEEP staff, before an assessment determination can be made. No assessment was made for 2012 RBV sites for which a voucher was submitted that contained 3 or fewer 'Most Wanted' macroinvertebrate types.

No assessment was made for 2012 RBV vouchers that were collected before September 1, 2012 or after November 30, 2012 (Figure 5) as these vouchers were not collected in accordance with the program's QAPP (CT DEP 2008; Appendix B).

A volunteer works to sort and identify an RBV sample. *Photo courtesy of the Farmington River Watershed Association.*

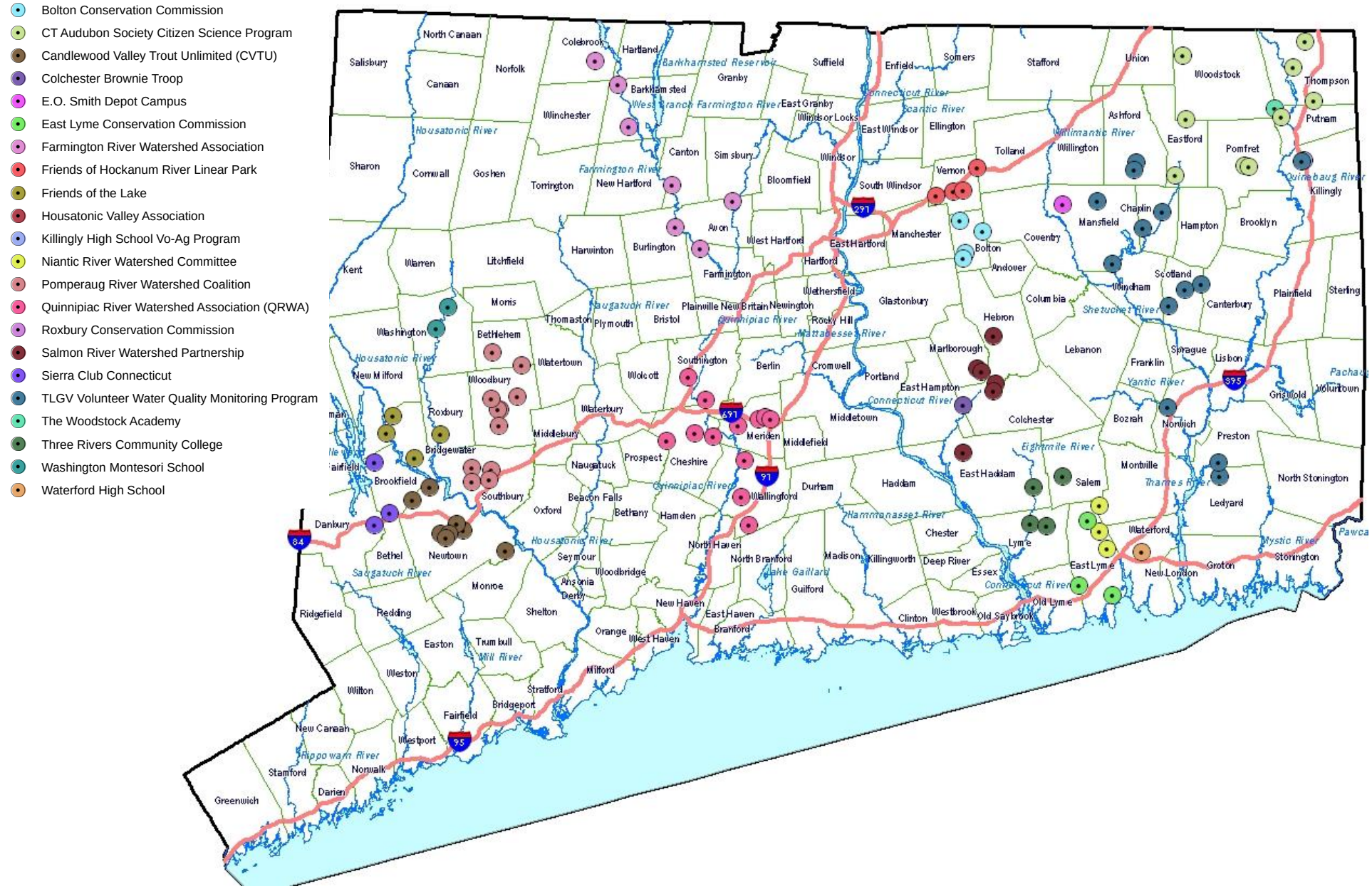

Figure 4. 2012 Fall RBV Monitoring Locations . The 99 locations where a RBV voucher was collected during the 2012 RBV period (September-November 2012) and the entity responsible for each. A description of each of the locations can be found in Appendix A.

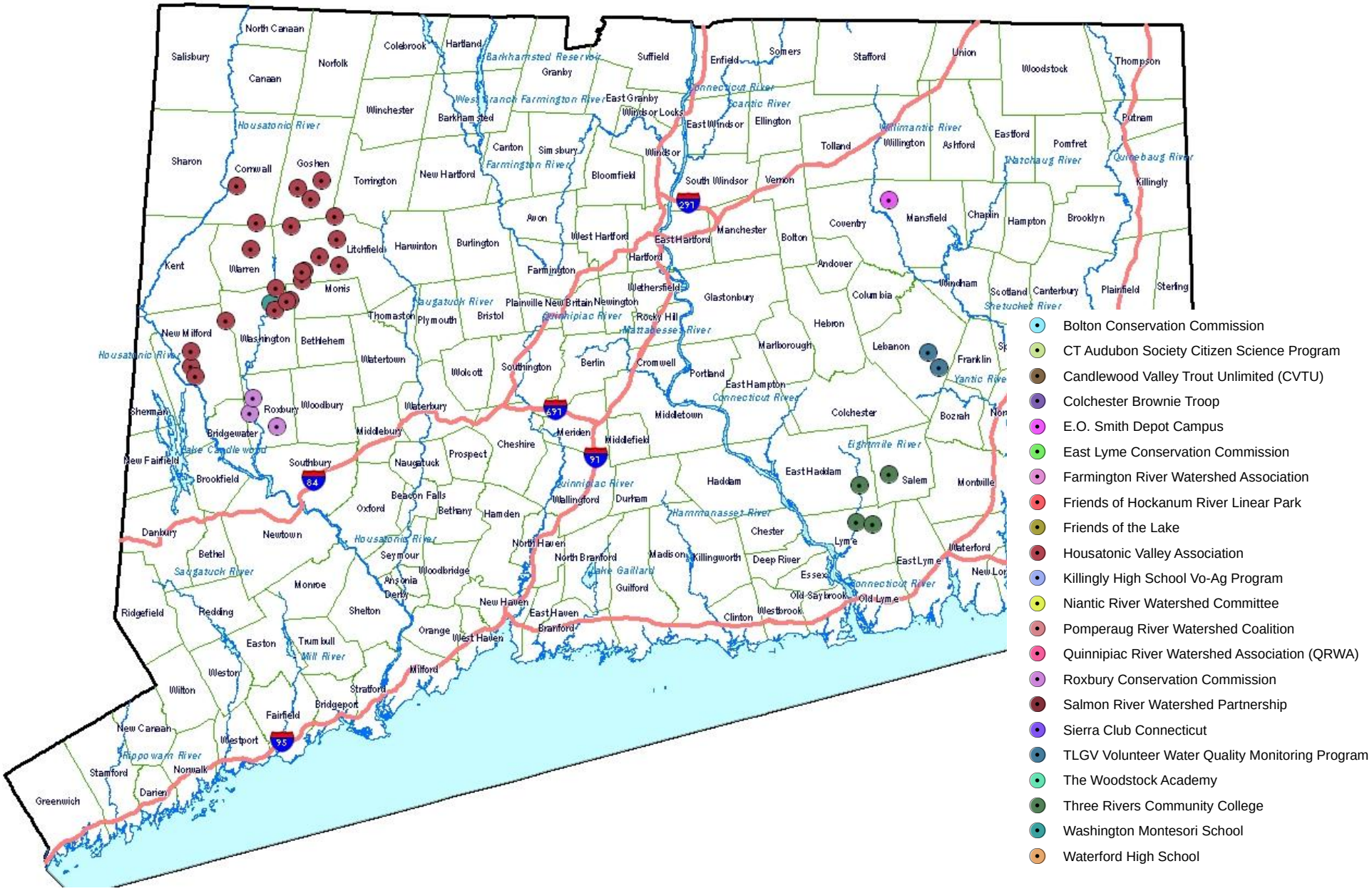

Figure 5. 2012 Non-Fall Monitoring Locations. The 33 locations for which a spring, summer or winter voucher was submitted. These locations were sampled outside of the official September-November RBV monitoring window; the results will not be used for official assessments. A description of each of the locations can be found in Appendix A.

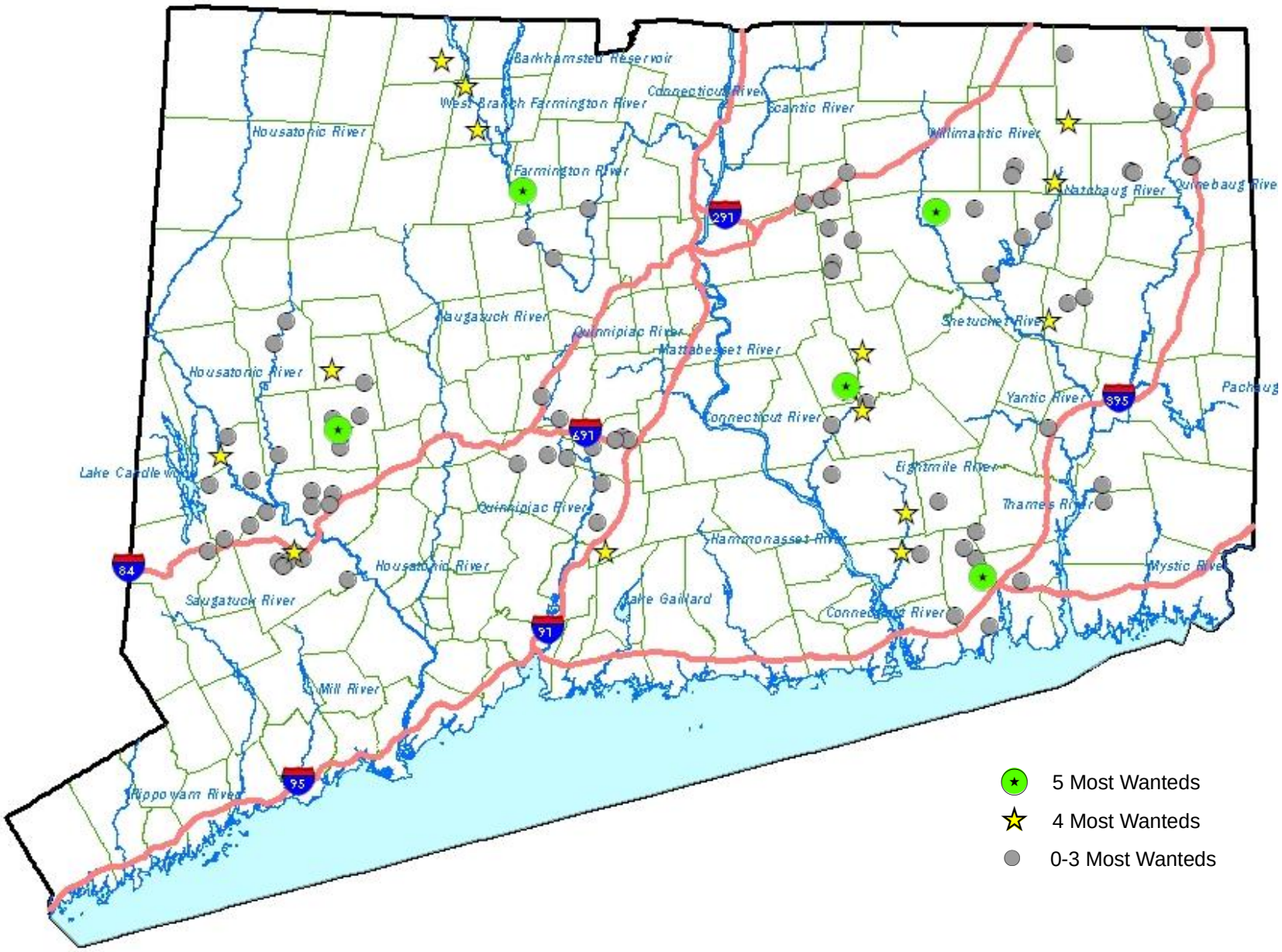

Figure 6. 2012 RBV Results Map. The number of most wanted types present in voucher samples submitted to WPLR collected in fall 2012. Fall samples with 5 or more 'Most Wanted' types indicate full support of aquatic life support goals; samples with 4 'Most Wanted' types are likely to be assessed as fully supporting aquatic life support goals.

Table 6. 2012 RBV Program Results: All Results. The organisms present in each of the 132 voucher collections submitted to WPLR during 2012. The samples are sorted alphabetically by stream name and then descending by the greatest number of most wanted types present in a voucher. The panel number corresponds to the RBV datasheet, identification cards, and sorting guide. Of the 132 samples collected, only those with 4 or more total most wanted from a fall (i.e. September-November) sample date (blue background) will be used to indicate full support of aquatic life use goals. Fall sites with four or more 'Most Wanted' types are in bold.

Stream/River	Site#	Town	Date	1	2	3	4	5A	5B	5C	6A	6B	7	8A	8B	Total Most	9	X0	XX	X2	X3A	X3B	X4	Total Moderate	X5A	X5B	X5C	X5D	X5E	X5F	X5G	Total Least	Other
Bantam River	1048	Litchfield	7/25/2012		x			x					x			3		x	x	x		x	x	5								0	1
Bantam River	1174	Litchfield	7/25/2012		x	x		x								3	x	x	x					3								0	1
Bantam River	6741	Torrington	7/18/2012		x			x			x		x			4	x	x	x			x	x	5	x			x				2	1
Bantam River	6742	Washington	7/20/2012		x	x		x					x	x		5	x		x	x			x	4				x			x	2	2
BANTAM RIVER, tributary	5700	Morris	7/27/2012					x		x	x					3	x		x			x	x	4								0	0
BANTAM RIVER, tributary to	6743	Washington	7/27/2012		x	x		x		x	x		x	x		7	x		x			x		3								0	1
Beaver Brook	**1125**	**Scotland**	**10/26/2012**		**x**			**x**			**x**			**x**		4	**x**	**x**	**x**	**x**		**x**	**x**	**6**								**0**	**2**
Blackledge River	1248	Bolton	11/10/2012					x								1			x			x		2								0	2
Blackledge River	**12**	**Marlborough**	**10/20/2012**		**x**			**x**		**x**	**x**				**1**	5	**x**	**x**	**x**	**x**		**x**	**x**	**6**						**x**	**x**	**2**	**2**
Bolton Pond Brook	2486	Bolton	11/10/2012									x				1	x		x					2							x	1	1
Broad Brook	6744	Meriden	10/27/2012													0	x	x	x			x	x	5	x					x		2	1
Bunnell Brook	2266	Burlington	10/28/2012					x			x					2	x	x	x				x	4				x		x		2	1
Burnhams Brook	1239	East Haddam	4/28/2012				x	x		x			x			4	x		x			x		3								0	2
Burnhams Brook	**1239**	**East Haddam**	**10/20/2012**				**x**	**x**		**x**		**x**				4	**x**	**x**	**x**	**x**		**x**	**x**	**6**				**x**				**1**	**6**
BUTTERNUT BROOK	5104	Litchfield	7/27/2012		x								x			2	x	x	x					3								0	1
Cedar Pond Brook	1435	Lyme	10/20/2012					x				x		x		3	x	x	x	x		x	x	6				x				1	2
Cedar Pond Brook	1435	Lyme	4/28/2012	x		x		x		x			x			5	x	x	x	x		x	x	6								0	4
Cedar Swamp Brook	1660	Mansfield	12/3/2012					x		x			x			3		x	x			x		3					x			1	1
Cedar Swamp Brook	**1660**	**Mansfield**	**10/5/2012**			**x**		**x**		**x**	**x**		**x**			5		**x**	**x**			**x**	**x**	**4**								**0**	**0**
Cherry Brook	**1513**	**Canton**	**10/13/2012**		**x**	**x**		**x**		**x**	**x**					5	**x**	**x**	**x**	**x**				**4**					**x**		**x**	**2**	**0**
Clapboard Oak Brook	**6693**	**Bridgewater**	**9/16/2012**		**x**		**x**	**x**					**x**			4	**x**	**x**	**x**	**x**		**x**	**x**	**6**					**x**	**x**		**2**	**3**
Cranberry Meadow Brook	6768	East Lyme	9/29/2012					x								1				x		x	x	3				x				1	1
Cranberry Meadow Brook	5153	East Lyme	9/29/2012				x	x								2			x			x	x	3								0	1
Deep Brook	1993	Newtown	9/22/2012		x											1	x	x	x	x		x		5							x	1	1
Deep Brook	2473	Newtown	9/22/2012		x											1	x	x	x	x		x	x	6		x						1	3
Deep Brook	47	Newtown	9/22/2012		x			x								2	x	x	x	x				4							x	1	1

Stream/River	Site#	Town	Date	1	2	3	4	5A	5B	5C	6A	6B	7	8A	8B	Total Most	9	X0	XX	X2	X3A	X3B	X4	Total Moderate	X5A	X5B	X5C	X5D	X5E	X5F	X5G	Total Least	Other
Deep Brook	1992	Newtown	9/20/2012		x			x					x			3	x	x	x	x		x	x	6	x						x	2	2
Dickinson Creek	6587	Colchester	10/21/2012					x			x					2	x					x	x	3								0	0
East Aspetuck River	6745	Washington	8/13/2012					x								1	x	x	x					3							x	1	0
East Aspetuck River	6746	New Milford	8/13/2012		x			x					x			3	x			x			x	3								0	1
East Spring Brook	5932	Bethlehem	9/15/2012		x			x								2	x	x		x		x	x	5			x					1	2
Eightmile River	6769	Southington	10/27/2012					x		x			x			3	x	x	x			x		4								0	1
Eightmile River Tributary	**1238**	**Lyme**	**10/20/2012**				**x**	**x**		**x**	**x**					4	**x**	**x**	**x**			**x**	**x**	**5**		**x**					**x**	**2**	**4**
Eightmile River Tributary	1238	Lyme	4/28/2012			x	x	x		x			x			5	x	x	x				x	4								0	2
Fawn Brook	**2781**	**Hebron**	**10/27/2012**					**x**		**x**	**x**				**1**	4	**x**	**x**	**x**	**x**		**x**	**x**	**6**							**x**	**1**	**1**
Fawn Brook	**6770**	**Marlborough**	**10/20/2012**		**x**			**x**		**x**	**x**					4		**x**		**x**	**x**		**x**	**4**				**x**			**x**	**2**	**5**
FENN BROOK	5215	Roxbury	6/16/2012		x		x	x			x		x			5	x						x	2				x	x		x	3	1
Fenton River	1680	Mansfield	10/17/2012		x			x			x					3	x	x	x	x		x	x	6							x	1	1
Fivemile River	2462	Killingly	10/12/2012		x			x								2		x			x			2								0	1
Fivemile River	6771	Killingly	10/25/2012		x			x								2	x	x	x	x	x		x	6						x	x	2	0
Fourmile River	5933	East Lyme	9/22/2012					x						x		2	x	x				x	x	4								0	0
FOX BROOK	5235	Goshen	7/25/2012		x			x		x						3	x	x	x	x		x		5								0	2
French Brook	1534	Bolton	11/10/2012					x								1	x	x	x			x		4				x		x		2	0
French River	6747	Thompson	9/29/2012		x											1	x	x	x	x	x		x	6	x					x		2	0
Furnace Brook	1076	Cornwall	7/19/2012		x			x		x	x		x			5	x	x	x	x		x	x	6				x				1	2
Gages Brook	1240	Tolland	10/13/2012					x			x		x			3	x		x	x		x	x	5	x					x	x	3	4
Halfway River	2762	Newtown	9/22/2012					x	x							2	x	x	x	x		x		5							x	1	2
Harbor Brook	1112	Meriden	10/27/2012													0	x	x	x	x				4	x							1	0
Harbor Brook	1114	Meriden	10/3/2012													0		x	x	x		x	x	5	x						x	2	0
Harris Brook	1237	Salem	10/20/2012		x			x		x						3	x	x	x		x	x	x	6								0	3
Harris Brook	1237	Salem	4/28/2012	x	x			x					x			4	x	x	x			x	x	5				x				1	1
Hewitt Brook (Poquetanuck Brook)	6773	Preston	11/12/2012							x						1		x				x	x	3	x	x						2	1
HILL BROOK	5299	Litchfield	7/27/2012		x	x		x					x			4	x	x		x		x		4								0	1
Honeypot Brook	1106	Cheshire	10/13/2012													0	x	x	x				x	4	x	x		x				3	0
Jacks Brook	6330	Roxbury	6/16/2012	x	x			x					x			4	x	x	x			x	x	5								0	0
Jeremy River	2370	Colchester	11/30/2012		x			x		x						3	x	x	x		x	x	x	6				x				1	3
Joe Clark Brook	1169	Ledyard	10/24/2012					x								1	x	x	x	x			x	5		x					x	3	2
Jordan Brook	1308	Waterford	10/4/2012										x			1	x					x	x	3								0	1
Latimer Brook	2520	Montville	10/3/2012		x			x						x		3	x	x	x			x	x	5						x		1	1
Latimer Brook	**6774**	**East Lyme**	**10/19/2012**					**x**			**x**	**x**	**x**	**x**		5	**x**	**x**	**x**			**x**	**x**	**5**	**x**							**1**	**1**

Stream/River	Site#	Town	Date	1	2	3	4	5A	5B	5C	6A	6B	7	8A	8B	Total Most	9	X0	XX	X2	X3A	X3B	X4	Total Moderate	X5A	X5B	X5C	X5D	X5E	X5F	X5G	Total Least	Other
Lebanon Brook	2272	Woodstock	10/26/2012					X					X			2	X	X	X	X		X	X	6								0	0
Limekiln Brook	6775	Brookfield	10/27/2012													0			X				X	2	X		X				X	3	2
Little River	151	Woodstock	10/24/2012		X			X								2	X	X		X	X	X		5								0	0
Little River	5369	Scotland	9/29/2012		X			X								2	X	X	X	X	X	X	X	7					X	X		2	3
Little River	2269	Putnam	9/15/2012		X	X		X								3	X	X		X	X	X	X	6				X		X	X	3	1
LONG BRANCH BROOK	6776	Thompson	9/26/2012					X			X					2	X		X	X		X	X	5	X						X	2	0
Marshepaug River	2240	Litchfield	8/2/2012		X								X			2	X	X	X				X	4								0	1
Marshepaug River	6748	Goshen	8/2/2012					X					X			2	X	X	X					3							X	1	1
Mashamoquet Brook	1541	Pomfret	10/6/2012		X											1				X		X		2								0	0
Mashamoquet Brook	1164	Pomfret	10/6/2012					X			X			X		3	X	X	X	X		X	X	6								0	1
Meetinghouse Brook	6749	Wallingford	10/13/2012								X					1	X	X	X					3							X	1	2
Merrick Brook	6750	Scotland	11/26/2012					X				X			1	3	X	X	X			X	X	5								0	1
MERRYALL BROOK	6751	New Milford	8/14/2012		X			X		X						3		X	X		X			3	X							1	2
Misery Brook	1808	Southington	10/13/2012													0	X		X	X		X		4	X		X			X		3	2
Moodus River	6752	East Haddam	11/10/2012							X	X					2	X	X	X		X	X	X	6	X						X	2	2
Morgan Brook	**2273**	**Barkhamsted**	**10/13/2012**		**X**			**X**	**X**		**X**					4	**X**	**X**	**X**	**X**			**X**	**5**								**0**	**2**
Mount Hope River	2791	Ashford	9/8/2012		X			X					X			3	X	X	X	X	X		X	6							X	1	1
Mount Hope River	6753	Ashford	10/3/2012		X			X				X				3	X	X	X	X		X	X	6				X			X	2	2
Muddy River	**1806**	**Wallingford**	**10/13/2012**		**X**			**X**			**X**	**X**				4	**X**	**X**	**X**	**X**		**X**	**X**	**6**	**X**					**X**		**2**	**0**
Natchaug River	189	Chaplin	9/3/2012		X	X		X								3	X		X	X	X	X	X	6							X	1	3
Natchaug River	**1319**	**Eastford**	**10/13/2012**					**X**			**X**		**X**	**X**		4	**X**		**X**	**X**	**X**		**X**	**5**				**X**				**1**	**3**
Nod Brook	1243	Avon	10/14/2012		X						X					2	X	X	X	X			X	5								0	1
Nonewaug (Nonnewaug) River	770	Woodbury	9/15/2012		X			X			X					3	X	X	X	X		X		5			X					X	2	5
Nonewaug (Nonnewaug) River	**230**	**Woodbury**	**10/9/2012**		**X**	**X**		**X**							**1**	4	**X**	**X**		**X**				**3**	**X**						**X**	**2**	**1**
PATTAGANSETT RIVER	6754	East Lyme (Niantic)	9/22/2012											X		1	X	X	X	X			X	5	X	X			X		X	4	3
Pease Brook	6755	Lebanon	12/8/2012							X	X					2	X		X					2				X		X	X	3	2
Pease Brook	6162	Lebanon	12/15/2012		X			X		X	X	X	X			6	X	X	X	X		X		5				X				1	4
Pine Brook	**2779**	**Colchester**	**11/25/2012**				**X**	**X**		**X**					**1**	4			**X**				**X**	**2**				**X**				**1**	**3**
Pomperaug River	1313	Southbury	9/15/2012					X								1	X	X	X	X		X		5	X						X	2	2
Pomperaug River	5936	Southbury	9/15/2012					X								1	X	X		X		X	X	5	X		X				X	3	1
Pomperaug River	934	Southbury	9/15/2012					X			X					2	X	X	X	X		X		5	X			X			X	3	0
Pomperaug River	1990	Woodbury	9/15/2012		X			X			X					3	X	X	X	X		X	X	6	X						X	2	5
Pond Brook	1523	Newtown	9/22/2012		X			X			X					3	X		X	X		X		4								0	1
Pond Brook	2766	Newtown	9/22/2012		X			X					X			3	X	X	X	X		X		5	X						X	2	2

Stream/River	Site#	Town	Date	1	2	3	4	5A	5B	5C	6A	6B	7	8A	8B	Total Most	9	X0	XX	X2	X3A	X3B	X4	Total Moderate	X5A	X5B	X5C	X5D	X5E	X5F	X5G	Total Least	Other
Pootatuck River	281	Newtown	9/22/2012		x			x	x							3	x	x				x		3	x						x	2	2
Pootatuck River	**1198**	**Newtown**	**9/22/2012**					**x**	**x**		**x**		**x**			**4**	**x**	**x**		**x**		**x**	**x**	**5**								**0**	**1**
Quinnatisset Brook	6756	Thompson	9/28/2012					x								1	x		x	x		x	x	5				x				1	0
Railroad Brook	6230	Bolton	11/10/2012													0	x	x	x				x	4			x	x				2	1
Roaring Brook	6757	Farmington	10/12/2012		x			x								2	x	x	x	x			x	5	x							1	3
Sanders Hill Brook	6758	Warren	8/3/2012		x			x								2	x	x						2				x				1	3
Sandy Brook	**743**	**Colebrook**	**10/20/2012**		**x**	**x**				**x**			**x**			**4**	**x**		**x**					**2**							**x**	**1**	**0**
Sandy Brook	**1796**	**Barkhamsted**	**10/13/2012**		**x**			**x**		**x**			**x**			**4**	**x**	**x**		**x**				**3**							**x**	**1**	**1**
Sawmill Brook	6759	Mansfield	9/17/2012		x			x								2	x	x	x	x				4			x	x			x	3	2
Shepaug River	325	Roxbury	6/16/2012		x			x			x					3	x	x	x	x				4				x				1	0
Shepaug River	596	Washington	7/18/2012		x			x		x						3	x	x	x		x		x	5							x	1	0
Shepaug River	596	Washington	9/24/2012		x			x						x		3	x		x		x	x	x	5				x				1	1
Shepaug River	2474	Washington	9/25/2012		x			x						x		3	x		x	x	x	x		5								0	0
Shepaug River	6760	Roxbury	9/16/2012		x			x							1	3	x	x		x	x			4								0	3
Shepaug River	1839	Washington	7/24/2012		x	x		x					x			4	x	x	x	x	x		x	6								0	2
Sodom Brook	6586	Meriden	10/27/2012													0	x	x	x				x	4	x	x				x	x	4	2
Spoonshop Brook	1116	Meriden	10/3/2012								x			x		2	x	x	x			x	x	5	x		x				x	3	1
Sprain Brook	2772	Woodbury	9/15/2012		x	x										2	x	x	x			x		4							x	1	3
Still Brook	6761	Litchfield	7/27/2012		x			x		x						3			x	x		x	x	4								0	2
Still River	6711	Danbury	9/8/2012													0	x	x	x					3	x			x			x	3	3
Still River	**1658**	**Woodstock**	**10/26/2012**		**x**			**x**			**x**		**x**			**4**	**x**	**x**	**x**	**x**		**x**	**x**	**6**								**0**	**0**
Still River, tributary to	6762	Brookfield	10/27/2012							x						1	x					x	x	3			x				x	2	2
Stonehouse Brook	2331	Chaplin	11/12/2012		x			x		x						3	x	x	x	x		x	x	6								0	2
Tankerhoosen River	1121	Vernon	10/13/2012					x								1	x	x						2				x	x		x	3	1
Tankerhoosen River	345	Vernon	10/13/2012					x	x							2	x	x	x	x		x	x	6							x	1	1
Tankerhoosen River	1120	Vernon	10/13/2012					x	x							2	x	x	x	x		x	x	6						x	x	2	3
Tenmile River	6585	Cheshire	10/13/2012		x								x			2	x		x				x	3							x	1	0
Town Farm Brook	1951	New Milford	9/16/2012					x			x					2	x							1		x		x			x	3	4
Transylvania Brook	597	Southbury	9/15/2012													0		x					x	2							x	1	0
W. Branch Shepaug River	6767	Cornwall	8/3/2012					x		x			x			3		x	x				x	3				x			x	2	2
Weekeepeemee Brook	**1468**	**Woodbury**	**10/9/2012**		**x**			**x**			**x**	**x**		**x**		**5**	**x**	**x**	**x**	**x**			**x**	**5**			**x**		**x**	**x**	**x**	**4**	**5**
West Aspetuck River	363	New Milford	8/14/2012		x			x								2	x	x		x		x	x	5								0	1
West Branch Bantam River	1171	Goshen	7/27/2012										x			1	x		x					2								0	0
West Branch Bantam River	6763	Litchfield	7/25/2012		x			x			x			x		4	x	x	x	x		x	x	6								0	2

Stream/River	Site#	Town	Date	1	2	3	4	5A	5B	5C	6A	6B	7	8A	8B	Total Most	9	X0	XX	X2	X3A	X3B	X4	Total Moderate	X5A	X5B	X5C	X5D	X5E	X5F	X5G	Total Least	Other
WEWAKA BROOK	6764	Bridgewater	9/16/2012		x			x			x					3	x	x	x	x		x	x	6								0	4
Wharton Brook	1113	Wallingford	10/27/2012													0	x	x					x	3	x						x	2	2
Wood Creek	**5944**	**Bethlehem**	**9/15/2012**		**x**		**x**	**x**		**x**						**4**	**x**		**x**	**x**		**x**		**4**					**x**		**x**	**2**	**4**
Yantic River	622	Norwich	9/15/2012					x								1	x	x	x	x	x			5					x	x	x	3	0

Table 7. 2012 RBV Program Results: 4+ Most Wanted Types Present. Thirty-five (35) of the 2012 RBV voucher samples contained 4 or more "Most Wanted" types. Twenty-one (21) were collected in the fall and 14 in the spring or winter. The data are sorted alphabetically by decreasing total most wanted types, then stream name, and then collection date. *Blue Italic font indicates a spring or winter voucher; these results are not used for assessment purposes.*

Group/Organization	Stream/River	Station ID	Date	Town	# Most Wanted
Housatonic Valley Association	*BANTAM RIVER, tributary to*	*6743*	*7/27/2012*	*Washington*	*7*
The Last Green Valley	*Pease Brook*	*6162*	*12/15/2012*	*Lebanon*	*6*
Housatonic Valley Association	*Bantam River*	*6742*	*7/20/2012*	*Washington*	*5*
Salmon River Watershed Partnership	Blackledge River	12	10/20/2012	Marlborough	5
Three Rivers Community Technical College	*Cedar Pond Brook*	*1435*	*4/28/2012*	*Lyme*	*5*
E.O. Smith Depot Campus	Cedar Swamp Brook	1660	10/5/2012	Mansfield	5
Farmington River Watershed Association	Cherry Brook	1513	10/13/2012	Canton	5
Three Rivers Community Technical College	*Eightmile River, tributary to (PV brook)*	*1238*	*4/28/2012*	*Lyme*	*5*
Roxbury Conservation Commission	*FENN BROOK*	*5215*	*6/16/2012*	*Roxbury*	*5*
Housatonic Valley Association	*Furnace Brook*	*1076*	*7/19/2012*	*Cornwall*	*5*
Niantic River Watershed Committee	Latimer Brook	6774	10/19/2012	East Lyme	5
Pomperaug River Watershed Coalition	Weekeepeemee Brook	1468	10/9/2012	Woodbury	5
Housatonic Valley Association	*Bantam River*	*6741*	*7/18/2012*	*Torrington*	*4*
The Last Green Valley	Beaver Brook	1125	10/26/2012	Scotland	4
Three Rivers Community Technical College	*Burnhams Brook*	*1239*	*4/28/2012*	*East Haddam*	*4*
Three Rivers Community Technical College	Burnhams Brook	1239	10/20/2012	East Haddam	4
Friends of the Lake	Clapboard Oak Brook	6693	9/16/2012	Bridgewater	4
Three Rivers Community Technical College	Eightmile River, tributary to (PV brook)	1238	10/20/2012	Lyme	4
Colchester Brownie Troop	Fawn Brook	6770	10/20/2012	Marlborough	4
Salmon River Watershed Partnership	Fawn Brook	2781	10/27/2012	Hebron	4
Three Rivers Community Technical College	*Harris Brook*	*1237*	*4/28/2012*	*Salem*	*4*
Housatonic Valley Association	*HILL BROOK*	*5299*	*7/27/2012*	*Litchfield*	*4*
Roxbury Conservation Commission	*Jacks Brook*	*6330*	*6/16/2012*	*Roxbury*	*4*
Farmington River Watershed Association	Morgan Brook	2273	10/13/2012	Barkhamsted	4
Quinnipiac River Watershed Association	Muddy River	1806	10/13/2012	Wallingford	4
CT Audubon Society-Citizen Science Program	Natchaug River	1319	10/13/2012	Eastford	4
Pomperaug River Watershed Coalition	Nonewaug (Nonnewaug) River	230	10/9/2012	Woodbury	4
Salmon River Watershed Partnership	Pine Brook	2779	11/25/2012	Colchester	4

Table 7 (continued)

Group/Organization	Stream/River	Station ID	Date	Town	# Most Wanted
Trout Unlimited-Candlewood Valley Chapter	Pootatuck River	1198	9/22/2012	Newtown	4
Farmington River Watershed Association	Sandy Brook	1796	10/13/2012	Barkhamsted	4
Farmington River Watershed Association	Sandy Brook	743	10/20/2012	Colebrook	4
Housatonic Valley Association	*Shepaug River*	*1839*	*7/24/2012*	*Washington*	*4*
CT Audubon Society-Citizen Science Program	Still River	1658	10/26/2012	Woodstock	4
Housatonic Valley Association	*West Branch Bantam River*	*6763*	*7/25/2012*	*Litchfield*	*4*
Pomperaug River Watershed Coalition	Wood Creek	5944	9/15/2012	Bethlehem	4

Table 8. 2012 RBV Program Results: 3 Most Wanted Types Present. Thirty-five (35) of the 2012 RBV voucher samples contained 3 "Most Wanted" types. Twenty-four (24) were collected in the fall and 11 in the spring or winter. The data are sorted alphabetically by decreasing total most wanted types, then stream name, and then collection date. *Blue Italic font indicates a spring or winter sample.*

Group/Organization	Stream/River	Station ID	Date	Town	# Most Wanteds
Housatonic Valley Association	*Bantam River*	*1048*	*7/25/2012*	*Litchfield*	*3*
Housatonic Valley Association	*Bantam River*	*1174*	*7/25/2012*	*Litchfield*	*3*
Housatonic Valley Association	*BANTAM RIVER, tributary to*	*5700*	*7/27/2012*	*Morris*	*3*
Three Rivers Community Technical College	Cedar Pond Brook	1435	10/20/2012	Lyme	3
E.O. Smith Depot Campus	*Cedar Swamp Brook*	*1660*	*12/3/2012*	*Mansfield*	*3*
Trout Unlimited-Candlewood Valley Chapter	Deep Brook	1992	9/20/2012	Newtown	3
Housatonic Valley Association	*East Aspetuck River*	*6746*	*8/13/2012*	*New Milford*	*3*
Quinnipiac River Watershed Association	Eightmile River	6769	10/27/2012	Southington	3
The Last Green Valley	Fenton River	1680	10/17/2012	Mansfield	3
Housatonic Valley Association	*FOX BROOK*	*5235*	*7/25/2012*	*Goshen*	*3*
Friends of Hockanum River Linear Park	Gages Brook	1240	10/13/2012	Tolland	3
Three Rivers Community Technical College	Harris Brook	1237	10/20/2012	Salem	3
Salmon River Watershed Partnership	Jeremy River	2370	11/30/2012	Colchester	3
Niantic River Watershed Committee	Latimer Brook	2520	10/3/2012	Montville	3
CT Audubon Society-Citizen Science Program	Little River	2269	9/15/2012	Putnam	3
CT Audubon Society-Citizen Science Program	Mashamoquet Brook	1164	10/6/2012	Pomfret	3
The Last Green Valley	Merrick Brook	6750	11/26/2012	Scotland	3
Housatonic Valley Association	*MERRYALL BROOK*	*6751*	*8/14/2012*	*New Milford*	*3*
The Last Green Valley	Mount Hope River	2791	9/8/2012	Ashford	3
The Last Green Valley	Mount Hope River	6753	10/3/2012	Ashford	3
The Last Green Valley	Natchaug River	189	9/3/2012	Chaplin	3
Pomperaug River Watershed Coalition	Nonewaug (Nonnewaug) River	770	9/15/2012	Woodbury	3
Pomperaug River Watershed Coalition	Pomperaug River	1990	9/15/2012	Woodbury	3
Trout Unlimited-Candlewood Valley Chapter	Pond Brook	1523	9/22/2012	Newtown	3
Trout Unlimited-Candlewood Valley Chapter	Pond Brook	2766	9/22/2012	Newtown	3
Trout Unlimited-Candlewood Valley Chapter	Pootatuck River	281	9/22/2012	Newtown	3
Roxbury Conservation Commission	*Shepaug River*	*325*	*6/16/2012*	*Roxbury*	*3*
Washington Montessori School	*Shepaug River*	*596*	*7/18/2012*	*Washington*	*3*

Table 8 (continued)

Group/Organization	Stream/River	Station ID	Date	Town	# Most Wanteds
Friends of the Lake	Shepaug River	6760	9/16/2012	Roxbury	3
Washington Montessori School	Shepaug River	596	9/24/2012	Washington	3
Washington Montessori School	Shepaug River	2474	9/25/2012	Washington	3
Housatonic Valley Association	*Still Brook*	*6761*	*7/27/2012*	*Litchfield*	*3*
The Last Green Valley	Stonehouse Brook	2331	11/12/2012	Chaplin	3
Housatonic Valley Association	*WEST BRANCH SHEPAUG RIVER*	*6767*	*8/3/2012*	*Cornwall*	*3*
Friends of the Lake	WEWAKA BROOK	6764	9/16/2012	Bridgewater	3

RBV Limitations & Strategies to Reduce Error

The RBV method was developed to be a simple, non-technical, and educational method for use by volunteer groups interested in evaluating the water quality of a local resource while concurrently generating useful information for DEEP.

The RBV program is not dependent upon accurate taxonomic identification by the participant; rather all official taxonomic identifications are performed by trained DEEP staff during review of the voucher collection. This eliminates the potential for a false positive to occur as a site cannot be listed as 'fully supporting' aquatic life use goals unless four or more 'most wanted' types are present in the voucher and confirmed by DEEP staff. Consequently, a false identification by the volunteer (e.g., on the datasheet) will not detract from the quality of the program's results.

Although taxonomic identification by volunteers is not required, successful implementation of the RBV method is however, dependent upon the volunteer's ability to: 1) adequately collect a macroinvertebrate sample from suitable stream riffle habitat, 2) sufficiently sort the organisms in the sample to document all of the different types present, and 3) prepare and submit to DEEP a complete voucher for each site monitored.

All three stages of the process – collection, sorting, and voucher preparation – are equally critical to ensuring successful implementation of the RBV program. Errors made will tend to underestimate the macroinvertebrate community present and may result in a missed opportunity to document sites with above average water quality. Any variable that reduces the quality or completeness of any step in the RBV method (e.g., site selection, incomplete collection, high stream flow, inclement weather conditions, nuisance insects, rushed time constraints, or rotted/desiccated voucher specimens) may ultimately reduce the number of different macroinvertebrate organism types found at the site.

1) Adequate Collection

If volunteers attempt to implement the RBV method in a location that is not characterized by suitable habitat, the program will not generate meaningful results. Volunteers are often interested in studying a stream that is nearby their residence or place of employment, however, these sites may not be appropriate RBV locations. **Streams that are known to be degraded and/or do not have clearly defined riffle habitat are not suitable for study using the RBV method.** Many urban streams do not have the in-stream habitat necessary to support the macroinvertebrate organisms upon which the RBV program is dependent.

The RBV program is intended to sample streams characterized by riffle habitat such as the one shown above. *DEEP photo.*

Suitable sites for the RBV program include streams that are:

- wadeable (i.e., less than knee-deep),
- perennial (i.e. flow year-round except under extreme drought conditions),
- characterized by riffle habitat (shallow, fast flowing, rocky areas),
- are not immediately downstream of a discharge, and
- are accessible to volunteers (i.e. publicly accessible or private permission has been granted to local organization).

Preferred sites are those that meet the required criteria and are also suspected by DEEP or the local community to be characterized by high water quality, and for which sufficient data is currently lacking to support a water quality standard assessment.

The RBV program is intended to be applied on those rivers and streams that are believed to be characterized by above average water quality. **RBV cannot document degradation or impairments to a water body, but rather can only confirm the presence of high water quality.** To avoid sampling unsuitable locations, volunteers should always consult with the DEEP Volunteer Monitoring Coordinator before implementing the RBV method in a new location.

The presence of suitable habitat alone will not guarantee an adequate collection however. **Volunteers performing the sample collection must be trained by DEEP staff or a Certified Local RBV Trainer in order to ensure proper collection technique is employed.** A failure to employ proper collection technique may result in a loss of macroinvertebrate organisms from the sample either by loss during collection or failure to sample all microhabitats (i.e. within the sediment, rock surfaces, etc.) during collection.

Photo courtesy of the Roxbury Conservation Commission.

Lastly, collection should be conducted not only in suitable habitat, but also under suitable conditions. **Unusually high or low flow conditions can negatively affect collection efforts.** Inclement weather conditions can also negatively affect collection such as by causing volunteers to rush through the process. (Rushing the collection process is likely to reduce the number of organisms found in the sample.)

To help reduce error related to collection efforts, it is critical that local group coordinators work with DEEP staff to review potential monitoring locations and ensure proper technique is employed throughout the collection process.

2) Sufficient Sorting

During the sorting process, the volunteer picks through the entire sample, including looking over any leaf packs, rocks, and small woody debris in the sample, in order to remove all macroinvertebrates present. As macroinvertebrates are found in the sample, they are separated out into ice cube trays and grouped into common types. Unique physical characteristics and behaviors associated with the organisms can help distinguish the types apart from one another. The goal of this stage of the RBV process is to identify as many different *types* of macroinvertebrates present as possible.

A properly collected sample can result in a poor voucher collection if the sorting process is not sufficiently completed. Error can occur if the volunteer does not spend an adequate amount of time looking through the sample for all possible macroinvertebrate organism types present, in particular those that might be small, slow moving or still, contained within a case, and/or generally better camouflaged. **Many of the 'Most Wanted' types are small, delicate organisms that may be easily overlooked by a novice volunteer.** Experience has indicated that pairing experienced volunteers, who are likely to be more familiar with these more difficultly found types and distinguishing between similar types, with new volunteers can help improve sorting success.

To assist volunteers with sorting, DEEP has created field cards outlining the key features and behaviors of each RBV organism to help with the sorting process. (The RBV Field Identification Cards are available for download at www.ct.gov/deep/lib/deep/water/volunteer_monitoring/rbvcards.pdf). The development of additional support materials (e.g. reference collections of organisms, photographs, and identification training sessions) are also being explored.

3) Proper Voucher Preparation

The final step in the RBV method requires that volunteers prepare and submit to DEEP a voucher collection of organisms for each site monitored. At the conclusion of the RBV process, volunteers place one of each macroinvertebrate organism type present into a leak-proof container with isopropyl alcohol and a label documenting when, where, and by who the voucher was collected.

To insure that each organism present at a site is documented, it is critical that at least one of each different type of organism is placed in the voucher container. A common mistake is for volunteers to check off a macroinvertebrate organism type on the datasheet and then fail to place a representative sample of that type into the voucher. The final list of macroinvertebrate organisms found at a site is based on WPLR staff review of the submitted voucher collection. If the organism is not in the voucher but recorded on the volunteer's datasheet, it will not be counted as present – the organism must be in the voucher to 'count'!

Voucher container selection is also important. **Ideal voucher containers are small, see-through/clear, smoothed-sided, glass or plastic containers, with tight-sealing plastic or rubber lids.** The specimens in the voucher must remain submersed in alcohol until review. Certain popular voucher containers, particularly glass jars with metal lids such as baby food jars, are prone to leaking and result in vouchers that cannot be processed by DEEP due to desiccation. (Desiccation can prevent proper identification of the macroinvertebrate type.) Other container types, such as sports bottles with grooved sides, make it very difficult to remove the macroinvertebrates for inspection and verification by DEEP staff.

Improper labeling of a voucher container can also negate the entire RBV process. DEEP cannot review vouchers that do not contain a label or that are incompletely labeled. **Voucher labels must always**

include: 1) the name of the stream from which the sample was collected, 2) the town in which the monitoring site is located, 3) a map description or GPS location of the site, 4) the date and time that the sample was collected, and 5) the name of the collectors. Vouchers that are not labeled or that are incompletely labeled must unfortunately be discarded and will not be included in that year's RBV results.

References

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Appendix A: 2012 RBV Sample Locations

The following provides a description of the location where an RBV sample was collected during 2012. Locations are sorted alphabetically by the collecting group and then by stream name.

Organization	Station	Stream/River Name	Basin	Official Location Description	Town	Lat.	Long.
Bolton Conservation Commission	1248	Blackledge River	4707	500 downstream Deming Road	Bolton	41.7518	-72.4454
Bolton Conservation Commission	2486	Bolton Pond Brook	3108	at Mark Anthony Lane	Bolton	41.7784	-72.4167
Bolton Conservation Commission	1534	French Brook	4707	at French Road	Bolton	41.7442	-72.4485
Bolton Conservation Commission	6230	Railroad Brook	4503	at RR trail crossing In Freja Park DS Bolton Notch Pond	Bolton	41.7922	-72.4530
Colchester Brownie Troop	6587	Dickinson Creek	4708	100 Meters downstream airline trail	Colchester	41.5631	-72.4495
Colchester Brownie Troop	6770	Fawn Brook	4706	At mouth	Marlborough	41.6046	-72.4188
CT Audubon Society	6747	French River	3300	Upstream Main Street/Rt 12 bridge	Thompson	41.9792	-71.9005
CT Audubon Society	2272	Lebanon Brook	3705	upstream Route 198	Woodstock	41.9945	-72.0836
CT Audubon Society	2269	Little River	3708	at Recreation Park Road	Putnam	41.9182	-71.9205
CT Audubon Society	6776	Long Branch Brook	3300	Downstream Wagner/Wagher Road	Thompson	42.0110	-71.8797
CT Audubon Society	1164	Mashamoquet Brook	3710	500 meters downstream Route 44 in State Park	Pomfret	41.8579	-71.9812
CT Audubon Society	1541	Mashamoquet Brook	3710	end paved section of road in state park	Pomfret	41.8561	-71.9758
CT Audubon Society	1319	Natchaug River	3200	at Route 198 entrance to Natchaug SF	Eastford	41.8458	-72.0976
CT Audubon Society	6756	Quinnatisset Brook	3300	Upstream County Home Road (at Country Club)	Thompson	41.9368	-71.8658
CT Audubon Society	1658	Still River	3202	adjacent to Route 198 downstream of upper crossing	Woodstock	41.9158	-72.0774
E.O. Smith Depot Campus	1660	Cedar Swamp Brook	3100	upstream confluence with Nelson Brook	Mansfield	41.8110	-72.2841
E.O. Smith Depot Campus	1660	Cedar Swamp Brook	3100	upstream confluence with Nelson Brook	Mansfield	41.8110	-72.2841
East Lyme Conservation Commission	6768	Cranberry Meadow Brook	2202	Downstream Grassy Hill Road	East Lyme	41.4185	-72.2457
East Lyme Conservation Commission	5933	Fourmile River	2207	at spring rock road	East Lyme	41.3390	-72.2592
East Lyme Conservation Commission	6754	Pattagansett River	2205	Downstream Brook Road	East Lyme	41.3260	-72.2054
Farmington River Watershed Association	2266	Bunnell Brook	4311	between Punch Brook confluence and Route 179	Burlington	41.7833	-72.9247
Farmington River Watershed Association	1513	Cherry Brook	4309	upstream Route 44	Canton	41.8365	-72.9295
Farmington River Watershed Association	2273	Morgan Brook	4305	upstream Route 318	Barkhamsted	41.9086	-73.0007
Farmington River Watershed Association	1243	Nod Brook	4317	Downstream Route 10	Avon	41.8158	-72.8294
Farmington River Watershed Association	6757	Roaring Brook	4312	Upstream Farmington Avenue (DS Cottage Street)	Farmington	41.7574	-72.8818
Farmington River Watershed Association	743	Sandy Brook	4304	250m upstream second bridge crossing on Sandy Brk Rd	Colebrook	41.9904	-73.0580

Farmington River Watershed Association	1796	Sandy Brook	4304	upstream Route 20	Barkhamsted	41.9600	-73.0200
Friends of Hockanum River Linear Park	1240	Gages Brook	4503	at footbridge on Tolland Agricultural Center Property	Tolland	41.8571	-72.4248
Friends of Hockanum River Linear Park	345	Tankerhoosen River	4503	upstream Tunnel Road	Vernon	41.8272	-72.4640
Friends of Hockanum River Linear Park	1120	Tankerhoosen River	4503	Downstream Bolton Road	Vernon	41.8294	-72.4482
Friends of Hockanum River Linear Park	1121	Tankerhoosen River	4503	upstream Small pond (below Dobsonville pond)	Vernon	41.8232	-72.4934
Friends of the Lake	6693	Clapboard Oak Brook	6000	upstream of Tappen Road near mouth	Bridgewater	41.5259	-73.3982
Friends of the Lake	6760	Shepaug River	6700	300m Downstream Jack's Brook confluence	Roxbury	41.5262	-73.3101
Friends of the Lake	1951	Town Farm Brook	6000	Downstream Clatter Valley Road	New Milford	41.5477	-73.3889
Friends of the Lake	6764	Wewaka Brook	6000	Downstream Wewaka Brook Rd	Bridgewater	41.4962	-73.3515
Housatonic Valley Association	1048	Bantam River	6705	Downstream Route 63	Litchfield	41.7305	-73.1868
Housatonic Valley Association	1174	Bantam River	6705	US of treatment Plant	Litchfield	41.7235	-73.2441
Housatonic Valley Association	6741	Bantam River	6705	50m Downstream Weed Road	Torrington	41.7915	-73.1943
Housatonic Valley Association	6742	Bantam River	6705	Upstream Romford Road	Washington	41.6761	-73.2920
Housatonic Valley Association	5700	Bantam River Tributary	6705	75 M US Smokey Hollow Rd	Morris	41.6883	-73.2656
Housatonic Valley Association	6743	Bantam River Tributary	6705	50m Upstream West Morris Rd	Washington	41.6861	-73.2721
Housatonic Valley Association	5104	Butternut Brook	6704	DS of Ripley Rd	Litchfield	41.7419	-73.2192
Housatonic Valley Association	6745	East Aspetuck River	6502	50m Upstream Rte 202	Washington	41.6626	-73.3711
Housatonic Valley Association	6746	East Aspetuck River	6502	50m Upstream Wells Road	New Milford	41.5928	-73.4211
Housatonic Valley Association	5235	Fox Brook	6705	US Rte 4	Goshen	41.8356	-73.2155
Housatonic Valley Association	1076	Furnace Brook	6010	at Picnic table pool adjacent to Route 4	Cornwall	41.8274	-73.3553
Housatonic Valley Association	5299	Hill Brook	6705	US West Morris Rd	Litchfield	41.7125	-73.2472
Housatonic Valley Association	2240	Marshepaug River	6701	adjacent to Shearshop Road	Litchfield	41.7794	-73.2663
Housatonic Valley Association	6748	Marshepaug River	6701	Upstream Sharon Tpk/Route 4	Goshen	41.8259	-73.2547
Housatonic Valley Association	6751	Merryall Brook	6501	50m Upstream Aspetuck Ridge Rd	New Milford	41.6242	-73.4290
Housatonic Valley Association	6758	Sanders Hill Brook	6702	Upstream Hardscrabble Road	Warren	41.7505	-73.3308
Housatonic Valley Association	1839	Shepaug River	6700	500m downstream Rte 202 adjacent to dirt road	Washington	41.7019	-73.2904
Housatonic Valley Association	6761	Still Brook	6705	Upstream Route 202/Bantam Rd	Litchfield	41.7233	-73.2469
Housatonic Valley Association	363	West Aspetuck River	6500	Upstream Aspetuck Ridge Road (near Sand Rd.)	New Milford	41.6046	-73.4290
Housatonic Valley Association	1171	West Branch Bantam River	6703	At Bentley Rd	Goshen	41.8124	-73.2342
Housatonic Valley Association	6763	West Branch Bantam River	6703	Upstream Norfolk Road near Brook Hill Rd	Litchfield	41.7636	-73.1907
Housatonic Valley Association	6767	West Branch Shepaug River	6702	Downstream Flat Rocks Road	Cornwall	41.7825	-73.3220
Killingly High School Vo-Ag Program	2462	Fivemile River	3400	at Route 12 and Huntley Road on town property	Killingly	41.8638	-71.8834
Niantic River Watershed Committee	5153	Cranberry Meadow Brook	2202	50 M DS of rte 161	East Lyme	41.4081	-72.2289

Niantic River Watershed Committee	2520	Latimer Brook	2202	between Route 85 and Beckwith Road	Montville	41.4375	-72.2253
Niantic River Watershed Committee	6774	Latimer Brook	2202	50m Upstream Colony Road	East Lyme	41.3840	-72.2143
Pomperaug River Watershed Coalition	5932	East Spring Brook	6801	at Nonewaug Road and Porter Hill road	Bethlehem	41.6121	-73.1761
Pomperaug River Watershed Coalition	230	Nonewaug River	6802	Downstream Route 47 (Washington Road)	Woodbury	41.5575	-73.2122
Pomperaug River Watershed Coalition	770	Nonewaug River	6802	upstream Minortown road adjacent to Mill Road	Woodbury	41.5728	-73.1844
Pomperaug River Watershed Coalition	934	Pomperaug River	6800	upstream Poverty Road	Southbury	41.4812	-73.2252
Pomperaug River Watershed Coalition	1313	Pomperaug River	6800	adjacent Bent-Of-River Audubon Center	Southbury	41.4672	-73.2580
Pomperaug River Watershed Coalition	1990	Pomperaug River	6800	at town park (the Hollow) off Rte 317	Woodbury	41.5365	-73.2136
Pomperaug River Watershed Coalition	5936	Pomperaug River	6800	at Flood Bridge Road	Southbury	41.4690	-73.2298
Pomperaug River Watershed Coalition	2772	Sprain Brook	6803	downstream Route 47 adjacent to Papermill Road	Woodbury	41.5696	-73.2259
Pomperaug River Watershed Coalition	597	Transylvania Brook	6806	25 meters downstream Whale Road	Southbury	41.4826	-73.2595
Pomperaug River Watershed Coalition	1468	Weekeepeemee Brook	6804	Downstream Jacks Bridge Road at USGS gage	Woodbury	41.5575	-73.2155
Pomperaug River Watershed Coalition	5944	Wood Creek	6804	at Route 132	Bethlehem	41.6275	-73.2257
Quinnipiac River Watershed Association	6744	Broad Brook	5204	Downstream Broad Brook Reservoir	Meriden	41.5246	-72.8601
Quinnipiac River Watershed Association	6769	Eightmile River	5201	Downstream West Center Street	Southington	41.5972	-72.9020
Quinnipiac River Watershed Association	1112	Harbor Brook	5206	upstream upper footbridge in Brookside Park	Meriden	41.5456	-72.7854
Quinnipiac River Watershed Association	1114	Harbor Brook	5206	Downstream Westfield street at Baldwin Pond Outlet	Meriden	41.5486	-72.7750
Quinnipiac River Watershed Association	1106	Honeypot Brook	5200	downstream Creamery Road	Cheshire	41.5286	-72.8904
Quinnipiac River Watershed Association	6749	Meetinghouse Brook	5200	Upstream Route 5 (at BJs Wholesale Club)	Wallingford	41.4955	-72.8083
Quinnipiac River Watershed Association	1808	Misery Brook	5203	at South End Road crossing (house # 475-482)	Southington	41.5699	-72.8733
Quinnipiac River Watershed Association	1806	Muddy River	5208	Downstream route 150 (woodhouse ave) in town park	Wallingford	41.4151	-72.8012
Quinnipiac River Watershed Association	6586	Sodom Brook	5205	at end of Carl Street	Meriden	41.5371	-72.8207
Quinnipiac River Watershed Association	1116	Spoonshop Brook	5206	between bee and baldwin streets at carrol park	Meriden	41.5457	-72.7655
Quinnipiac River Watershed Association	6585	Tenmile River	5202	at Notch Road	Cheshire	41.5183	-72.9377
Quinnipiac River Watershed Association	1113	Wharton Brook	5207	upstream footbridge in Doolittle Park	Wallingford	41.4491	-72.8145
Roxbury Conservation Commission	5215	Fenn Brook	6700	US Rte 67	Roxbury	41.5669	-73.3255
Roxbury Conservation Commission	6330	Jacks Brook	6706	in Tierney Preserve off of Squire Lane	Roxbury	41.5300	-73.2893
Roxbury Conservation Commission	325	Shepaug River	6700	downstream 100 meters Wellers Bridge Road	Roxbury	41.5489	-73.3308
Salmon River Watershed Partnership	12	Blackledge River	4707	upstream Confluence with Lyman Brook	Marlborough	41.6084	-72.4263
Salmon River Watershed Partnership	2781	Fawn Brook	4706	Downstream Route 66	Hebron	41.6483	-72.3993
Salmon River Watershed Partnership	2370	Jeremy River	4705	150 ft downstream of Rt 2 Exit 16 (RT 149) Commuter Parking Lot	Colchester	41.5894	-72.3948
Salmon River Watershed Partnership	6752	Moodus River	4710	at Red Mill Lane, DS of old bridge	East Haddam	41.5043	-72.4493
Salmon River Watershed Partnership	2779	Pine Brook	4705	at mouth Colchester Fish and Game club property	Colchester	41.5802	-72.4005

Sierra Club CT	6775	Limekiln Brook	6600	Downstream Quarry Road	Brookfield	41.4905	-73.4174
Sierra Club CT	6711	Still River	6600	Upstream of greenway pedestrian bridge at Pitney Bowes	Danbury	41.4131	-73.4179
Sierra Club CT	6762	Still River, tributary to	6600	Behind Monika Lane Condos	Brookfield	41.4274	-73.3932
The Last Green Valley	1125	Beaver Brook	3802	upstream Gager Hill Road	Scotland	41.6841	-72.1092
The Last Green Valley	1680	Fenton River	3207	at Gurleyville Road crossing	Mansfield	41.8147	-72.2254
The Last Green Valley	6771	Fivemile River	3400	Downstream I-395 (at Frito Lay facility)	Killingly	41.8621	-71.8872
The Last Green Valley	6773	Hewitt (Poquetanuck) Brook	3003	at Rose Hill WMA on Lincoln Park Rd	Preston	41.4903	-72.0293
The Last Green Valley	1169	Joe Clark Brook	3003	At Route 117	Ledyard	41.4719	-72.0275
The Last Green Valley	5369	Little River	3805	100 m DS of Downing Brook confluence	Scotland	41.7111	-72.0553
The Last Green Valley	6750	Merrick Brook	3803	Upstream Brook Road	Scotland	41.7043	-72.0818
The Last Green Valley	2791	Mount Hope River	3206	250 feet downstream Route 44	Ashford	41.8633	-72.1612
The Last Green Valley	6753	Mount Hope River	3206	at Ashford Memorial Park	Ashford	41.8533	-72.1656
The Last Green Valley	189	Natchaug River	3200	Downstream North Bear Hill Road	Chaplin	41.8008	-72.1182
The Last Green Valley	6162	Pease Brook	3905	upstream Goshen Hill road and Smith Road intersection	Lebanon	41.6231	-72.2205
The Last Green Valley	6755	Pease Brook	3905	Downstream Waterman Road Bridge	Lebanon	41.6051	-72.2021
The Last Green Valley	6759	Sawmill Brook	3208	Upstream Eastbrook Mall	Mansfield	41.7368	-72.2010
The Last Green Valley	2331	Stonehouse Brook	3204	off old trail downstream Palmer Road	Chaplin	41.7812	-72.1509
The Last Green Valley	622	Yantic River	3900	upstream West Town Street	Norwich	41.5583	-72.1120
Three Rivers Community College	1239	Burnhams Brook	4800	at Mouth	East Haddam	41.4603	-72.3343
Three Rivers Community College	1239	Burnhams Brook	4800	at Mouth	East Haddam	41.4603	-72.3343
Three Rivers Community College	1435	Cedar Pond Brook	4803	US of route 156 near 134 Beaver Brook road	Lyme	41.4119	-72.3128
Three Rivers Community College	1435	Cedar Pond Brook	4803	US of route 156 near 134 Beaver Brook road	Lyme	41.4119	-72.3128
Three Rivers Community College	1238	Eightmile River Tributary	4800	at trail crossing off MacIntosh Road	Lyme	41.4155	-72.3396
Three Rivers Community College	1238	Eightmile River Tributary	4800	at trail crossing off MacIntosh Road	Lyme	41.4155	-72.3396
Three Rivers Community College	1237	Harris Brook	4801	at Mouth	Salem	41.4733	-72.2851
Three Rivers Community College	1237	Harris Brook	4801	at Mouth	Salem	41.4733	-72.2851
TU Candlewood Valley Chapter	47	Deep Brook	6019	upstream mouth near Pootatuck River	Newtown	41.4131	-73.2823
TU Candlewood Valley Chapter	1992	Deep Brook	6019	at Baldwin Road	Newtown	41.4029	-73.3079
TU Candlewood Valley Chapter	1993	Deep Brook	6019	Downstream Wasserman Way	Newtown	41.4023	-73.2947
TU Candlewood Valley Chapter	2473	Deep Brook	6019	upstream Bushy Hill Road in Dickenson park	Newtown	41.3976	-73.3006
TU Candlewood Valley Chapter	2762	Halfway River	6022	at Jordan Hill Road	Newtown	41.3811	-73.2010
TU Candlewood Valley Chapter	1523	Pond Brook	6018	at Bridge at State Boat Launch	Newtown	41.4597	-73.3275
TU Candlewood Valley Chapter	2766	Pond Brook	6018	300 m downstream Pond Brook Rd and Obtuse Rd	Newtown	41.4433	-73.3545

TU Candlewood Valley Chapter	281	Pootatuck River	6020	Downstream Wasserman Way	Newtown	41.4064	-73.2720
TU Candlewood Valley Chapter	1198	Pootatuck River	6020	adjacent Tom's Brook Confluence	Newtown	41.4149	-73.2827
Washington Montessori School	596	Shepaug River	6700	Upstream Whittlesey Road	Washington	41.6836	-73.3019
Washington Montessori School	596	Shepaug River	6700	Upstream Whittlesey Road	Washington	41.6836	-73.3019
Washington Montessori School	2474	Shepaug River	6700	upstream route 47	Washington	41.6568	-73.3180
Waterford High School	1308	Jordan Brook	2201	Downstream cross road adjacent to Route 85	Waterford	41.3800	-72.1558
Woodstock Academy	151	Little River	3708	Downstream 150 meters Peake Brook Road	Woodstock	41.9280	-71.9315

Appendix B:
2008-2013 RBV Program Quality Assurance Project Plan (QAPP)

QUALITY ASSURANCE PROJECT PLAN

1. Title and Approval Page

Rapid Bioassessment In Wadeable Streams and Rivers By Volunteer Monitors

(Project name)

Connecticut Department of Environmental Protection Bureau of Water Management Planning and Standards Division

(Responsible Agency)

March 3, 2008

(Date)

Bureau QA/QC Officer Signature _____

Signature/Date

Mr. Lee Dunbar
Assistant Director
Planning and Standards Division
Connecticut Department of Environmental Protection
Bureau of Water Protection and Land Reuse

Project Manager Signature _____

Signature/Date

Mr. Ernest Pizzuto
Project Manager Monitoring & Assessment
Planning and Standards Division
Connecticut Department of Environmental Protection
Bureau of Water Protection and Land Reuse

USEPA Project Officer Signature _____

Signature/Date

Mr. Larry MacMillan
EPA Project Officer
Connecticut State Team
United States Environmental Protection Agency

USEPA QA Officer Signature _____

Signature/date

Mr. Arthur Clark
Quality Assurance Officer
United States Environmental Protection Agency

Prepared by

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Planning and Standards Division
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Bureau of Water Protection and Land Reuse
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2. Table of Contents

3. Distribution List

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United States Environmental Protection Agency

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Quality Management Lead
CT DEP, Bureau of Water Protection and Land Reuse

Mr. Ernest Pizzuto
Project Manager Monitoring & Assessment
CT DEP, Bureau of Water Protection and Land Reuse

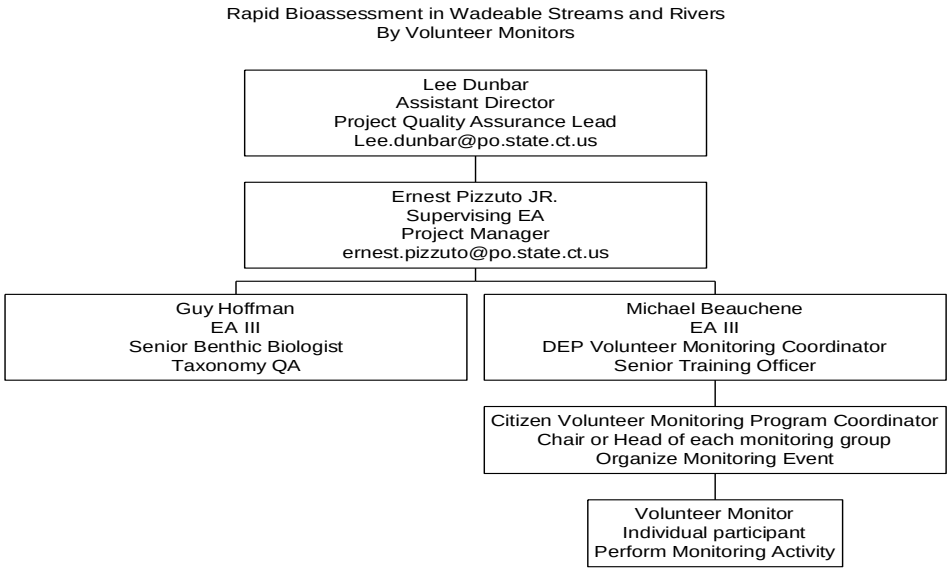
Mr. Michael Beauchene
Monitoring & Assessment
CT DEP, Bureau of Water Protection and Land Reuse

Mr. Guy Hoffman
Monitoring & Assessment
CT DEP, Bureau of Water Protection and Land Reuse

Chairperson/Lead Contact
Each Volunteer Monitoring Group
Participating in this Program

4. Project Organization

4.1 Organizational Chart



4.2 Communication Pathways

The CT DEP maintains a web page with materials relating to background, data collection methodology, field data sheets, and annual summary reports (http://www.ct.gov/dep/cwp/view.asp?a=2719&q=325606&depNav_GID=1654). The DEP volunteer monitoring coordinator maintains a list of electronic and physical addresses for all citizen volunteer monitoring program coordinators. The citizen volunteer monitoring coordinator maintains contact information for each volunteer monitor under his/her supervision. All communications are handled electronically via e-mail whenever possible. The heart of the above communication pathway is between the DEP volunteer monitoring coordinator and the Citizen Volunteer Monitoring Program Coordinator. These 2 people are responsible for facilitating, organizing, and reporting all information regarding, the training day, methodology, data use and assessment, and data reporting. Communication flows up through the DEP via the DEP coordinator and down to individual volunteer monitors via the citizen volunteer monitoring program coordinator.

4.2.1 Modifications to the Approved QAPP

Any real-time changes to sampling effort or location will be made by the citizen volunteer monitoring program coordinator with consultation from the DEP volunteer monitoring coordinator. If such changes are necessary they are to be made in such a manner as to not jeopardize the validity and comparability of the macroinvertebrate community data. If a change is made, the change will be documented and distributed via the above pathway.

4.3 Personnel Responsibilities and Qualifications

Name	Project Related Role	Qualifications
Lee Dunbar	Project QA/QC Lead	5 years as Assistant Director of Planning and Standards Division. Over 25 years involved with water quality management.

Ernest Pizzuto Jr.	Project Manger (Monitoring) Data review and assessment	Over 30 years involved with surface water quality and biological monitoring. Supervising EA for monitoring section 7 years.
Michael Beauchene	Workshop Facilitator/Field Survey Crew Leader/Data Management/QA-QC officer	Over 15 years involved with river/stream sampling. Developed RBV protocol of which this QAPP is written for. Developed Access database to store water quality and biological data.
Guy Hoffman	Benthic Expert and Taxonomy QA	Over 25 years involved with surface water quality and biological monitoring. Lead Biologist for the DEP Ambient Benthic Monitoring Program.
Citizen Volunteer Monitoring Program Coordinator	Organize training day, identify site locations, liaison with DEP volunteer monitoring coordinator/Sample Collection QA	Active interest in water quality monitoring or watershed management, restoration, or preservation. Current serving as the chair of an organized volunteer monitoring group. Have previously attended and participated in the RBV training.
Volunteer Monitor	Field Data Collection	Active interest in water quality monitoring or watershed management, restoration, or preservation.

4.4 Special Training Requirements/Certification

Training Logistical Arrangements

The DEP BWM volunteer monitoring coordinator conducts all training sessions. Presentations are standardized and presented in Microsoft Power Point format (Appendix A and B). Volunteer monitoring program coordinators schedule a one-day training session with the DEP BWM volunteer monitoring coordinator. The session consists of morning presentations followed by afternoon field sample collection.

Description of Training and Trainer Qualifications

DEP BWM volunteer monitoring coordinator, Michael Beauchene, directs training. Mike Beauchene developed all program materials and methodology with peer review from Ernest Pizzuto and Guy Hoffman.

Project Function	Course or Description	Trained by	Training Date	Trainees	Certs/Records
Data collection	Rapid Bioassessment in Wadeable Streams and Rivers by Volunteer Monitors	Michael Beauchene	Every Fall immediately prior to sampling	All Volunteer Monitors in Attendance	DEP Volunteer Monitoring Coordinator

5. Project Planning/Problem Definition

5.1 Project Planning Meetings

Project planning meetings are held when a citizen volunteer monitoring coordinator contacts the DEP volunteer monitoring coordinator requesting to set up a training day for their specific group. At the meeting the logistics for training and sample collection locations are discussed. Follow up meetings are held until are of the issues regarding the training are resolved and both parties are satisfied with the logistics.

5.2 Problem Definition/Site History and Background

During the early to mid 1990's volunteer monitoring using macroinvertebrates was very popular. Most groups implemented the family-level bioassessment method. Unfortunately the extensive time commitment required to complete the process at a single site caused many groups to

abandon or reduce their monitoring activity. The DEP volunteer monitoring coordinator, developed this protocol to reduce volunteer attrition while concurrently maintaining useful data for both DEP and the volunteer.
Beginning in 1999, the DEP volunteer monitoring coordinator developed Rapid Bioassessment in Wadeable Streams and Rivers (RBV). This method uses a select group of macroinvertebrates collected from riffle segments of wadeable streams and rivers to screen for either very high or very low water quality. As part of the programs' materials, a document describing the rationale and history of the RBV method was developed. This document is found on the web page at (http://www.ct.gov/dep/lib/dep/water/volunteer_monitoring/rbvpt1.pdf) and is presented as Appendix C. This method was developed to reverse the trend discussed above. The DEP values volunteer monitoring data when collected with and according to established methods. However, the amount of data and number of groups willing to commit to the task were steadily decreasing. The program has been ongoing since each fall since 1999 and seems to have stabilized the volunteer monitoring effort in Connecticut.

6. Project Description and Schedule

6.1 Project Overview

The RBV program has been implemented each fall since 1999. At each RBV day, participants are trained prior to sample collection by the DEP volunteer monitoring coordinator. The participants collect riffle-dwelling benthic macroinvertebrates from approximately 1 square meter of substrate. The entire contents of the sample are sorted by type. A representative specimen from each type is placed in a labeled glass vial with alcohol and submitted to the DEP volunteer monitoring coordinator.

A complete description of the program is attached as Appendix C.

6.2 Project Schedule

The following table provides a schedule of the project activities for a typical fall collection season. The schedule is based on a calendar year. Initial planning activities occur during the summer prior to sampling (year A) and data assessment occurs following data entry and validation but prior to initial planning activities for the next low flow sampling (year B).

Task	**Date**
Scoping Meeting/Selection of Waterbodies	Summer of year A
Definition of segments	Summer/Fall of year A
Training and benthic community sampling	September-November of year A
Data entry/validation	November-December of year A
Data Evaluation/Assessment	January-March of year B
Data Reporting	April of year B

7. Project Quality Objectives

7.1 Project Quality Objectives

Groups who participate in RBV will be provided with a list of macroinvertebrates. Each organism on the list has distinct shape, structure, color, or behavior and provides key ecological information about the stream environment (Appendix D). Following the standard procedures, volunteers collect benthic

macroinvertebrates in the fall and determine the relative abundance (none, few, some or many) of each macroinvertebrate on the list. The final product will be a completed data sheet and a representative voucher collection. The datasheet can then be submitted to DEP via phone, mail, fax, or email and the voucher collection at a later date. The entire process occurs at the stream site and can be completed by 2-3 monitors within 2 hours.

The most meaningful information for the DEP will come from those groups who are able to complete the RBV process at multiple sites (**during a single day in the fall**) along a reach of river not routinely monitored by DEP. By evaluating the relative abundance of the benthic community at each site and establishing baseline information, subtle changes can be detected, provided the process is performed correctly.

7.2 Measurement Performance Criteria

Precision & Accuracy/Bias

This method of collecting macroinvertebrates does not support measurable precision nor accuracy/bias calculations. Volunteers are required to place a representative organism of each type collected at the station in to a vial with alcohol. All organism identifications are verified by the DEP volunteer monitoring coordinator and mis-identifications reconciled when the voucher sample is submitted to DEP.

Data Representativeness

Sampling segments are limited to riffle habitats within wadeable sections of streams and rivers. Volunteers are required to perform a traveling kick at six different locations at the sampling station. The organisms from each of the 6 kick stops are composited into a single sample for the station. Data collected in this fashion provide documentation of organisms present at a station at the date and time of collection.

C. Comparability

Macroinvertebrates community data are collected per the protocol methodology in wadeable riffle sections of a stream. Each sample will consist of 6 kick stops composited into a single sample. The DEP volunteer monitoring coordinator rotates through each group of collectors at least once during the collection process on each of the RBV days to insure the participants follow the protocol correctly.

Completeness

It is expected that a vial of voucher organisms will be assembled and preserved in alcohol from each of the stations selected for monitoring.

8. Sampling Process Design

8.1 Sampling Design Rationale

This method covered by this QAPP allows citizens to collect and submit meaningful aquatic macroinvertebrate information to the DEP, Bureau of Water Management, Ambient Monitoring Program. Data collected using this method will be used to help identify streams with pollution sensitive benthic communities. Rapid Bioassessment for volunteers is not a definitive assessment

procedure, but rather a screening tool intended to broadly characterize sites within 3 categories of environmental quality; very good, marginal, or very poor. Established DEP assessment methods may be needed to determine actual community structure.

Sample Design Logistics

Category	**Type of sample**	**Number of samples**	**Sampling Frequency**	*Sampling Period*
Macroinvertebrate community	Traveling Kick	100	Annually	Sept. to Dec.

9. Sampling Procedures and Requirements

9.1 Sampling Procedure

Follows methodology detailed in Appendix E. (http://www.ct.gov/dep/lib/dep/water/volunteer_monitoring/rbvpt2.pdf).

9.2 Sampling SOP Modifications

None

9.3 Cleaning and Decontamination of Equipment

All equipment is rinsed with stream water following sampling. Additional cleaning occurs with a scrub brush and hose at the field headquarters after sampling is complete and prior to storing the gear.

Field Equipment Calibration

No equipment requiring calibration is used in this project.

9.4 Field Equipment Maintenance, Testing and Inspection Requirements

Equipment type	**Inspection Frequency**	**Type of Inspection**
Kick Net	Pre and post sampling	Net and handle condition
Sorting trays	Pre and post sampling	Cleanliness
Identification support materials	Pre and post sampling	Condition and Presence
Voucher Collection materials (Vials, alcohol, labels, pencils)	Pre sampling	Present and usable

9.5 Inspection and Acceptance Requirements for Supplies/Sample Containers

All equipment must be in condition to be able to collect and retain macroinvertebrates without loss through holes, rips, tears, etc. Adequate preservation materials must be on site.

10. Sample Handling, Tracking and Chain of Custody Procedures

The volunteer participant transfers the original field data sheet and the voucher collection at end of sampling day to the Citizen volunteer monitoring coordinator and then to the DEP volunteer monitoring coordinator. The field data sheet and label in the vial are review for completeness and accuracy while the collector is present.

At least one of each organism that is identified as one of the "targeted" types on the data sheet and at least one of each type of organism either not on the datasheet or that was not able to be definitively identified in the field are placed in the voucher collection vial and submitted to the DEP volunteer monitoring coordinator as soon as sampling is completed. Since the sampling method is intended not to be lethal to most of the organisms, they are released to the stream immediately following identification.

The DEP volunteer monitoring coordinator logs each sample into a Microsoft Access database upon return to DEP lab.

10. 1 Documentation and Records

10.1.1 Field Notes

Field Data sheets (http://www.ct.gov/dep/lib/dep/water/volunteer_monitoring/rbvdatasht.pdf) track field collection information. Field data sheets are printed on waterproof paper. Location data is collected using hand-held GPS and/or ArcView Map interpolation by the DEP volunteer monitoring coordinator. A copy of the field data sheet is attached as Appendix D.

10.1.2 Field Documentation Management System

Field documentation is described in section 10 above.

10.2 Sample Handling and Tracking System

Sample handling and tracking is described in section 10 above.

10.3 Sample Custody

Sample custody is described in section 10 above.

11. Field Analytical Requirements

There are no field analytical methods involved with this project

12. Fixed Laboratory Analytical Method Requirements

There are no laboratory analytical methods involved with this project.

13. Quality Control Requirements

13.1 Sampling Quality Control

Volunteer monitors are supervised by either the DEP volunteer monitoring coordinator or an experienced participant (greater than 2 sampling seasons). The DEP volunteer monitoring coordinator on site confirms all macroinvertebrate voucher sample identification.

13.2 Analytical Quality Control

There are no analytical quality controls.

14. Data Acquisition Requirements

Completed field sheets and the voucher collection are submitted to the DEP volunteer coordinator at the conclusion of the sampling. The DEP volunteer monitoring coordinator enters all specimens into a Microsoft Access Database.

15. Documentation, Records, and Data Management

15.1 Project Documentation and Records

Sample collection records	Field Analysis Records	Fixed Laboratory Records	Data Assessment Records
Field Notes	Field Data Sheet	Voucher Collection	Volunteer Monitoring Database

15.2 Field Analysis Data Package Deliverables

A photocopy of the completed field datasheet and the voucher collection from each sample collection location.

15.3 Fixed Laboratory Data Package Deliverables
Curated Voucher Collection.

15.4 Data Reporting Formats
Data are recorded on waterproof paper. A standard data sheet is used to estimate relative abundance of each type of organism identified at the station. The data recorder places few, some, or many for each organism identified. Any errors are reconciled by a single line through the error and initialed by the data recorder. The DEP volunteer monitoring coordinator reviews each data sheet immediately following completion of the protocol.

15.5 Data Handling and Management
Data Recording
Data are recorded are described in section 15.4.

Data Transformation/Data Reduction
The data is neither transformed nor reduced.

Data analysis and Data Assessment
Rapid Bioassessment for volunteers is not a definitive assessment procedure, but rather a screening tool intended to identify high quality streams. Established DEP assessment methods may be needed to determine actual community structure.

Macroinvertebrate community lists are used via best professional judgement that is equivalent to RBP I (Plafkin 1989). Assessments are used to define level of support for Aquatic Life Water Quality Standard (CT DEP 1997). The most useful data are those samples containing four or more representative types in the pollution sensitive group (Most Wanted). When these organisms are present in a voucher sample, it can be inferred with some degree of confidence that the water quality standards for aquatic life use are fully supporting. Currently, there is no calibrated multi-metric approach appropriate for this data set. Sites with data suggesting impairment are scheduled for follow-up monitoring by DEP staff.

15.6 Data Tracking and Control
The volunteer monitoring database was developed and is maintained by BWM staff. The database resides on a Novell Computer Network. The CT DEP Information and Technology Department maintain this network. The network is backed up nightly, weekly, monthly, and annually on computer tapes. With this back up system the database can be restored following catastrophic loss or the corruption. Ultimately these data will be uploaded to STORET.

The database is password protected and maintained by Mike Beauchene. Only he and the monitoring supervisor know the password. The monitoring supervisor keeps a hard copy of the password.

16. Assessment and Response Actions
16.1 Planned Assessments
The macroinvertebrate data is compiled in to an annual summary report. This report serves to document the types of organisms collected at each sampling location for the corresponding field season. As the number of samples from a particular station increase with time, longer-term evaluation can occur.

16.2 Assessment Findings and Corrective Action Responses

Any deficiencies identified during field sampling visits are documented on the field data sheet and forward to the DEP volunteer monitoring coordinator and the citizen volunteer monitoring coordinator as described in section 4.2 Communication pathways. Segments with data indicating low macroinvertebrate diversity and that are located on previously unassessed DEP segments will be recommended for a more though investigation. These recommendations will come from the DEP volunteer monitoring coordinator to the DEP project manager.

16.3 Additional QAPP non-conformances

The monitoring staff and the field crew supervisor discuss and reach consensus regarding any field sampling deviations. Corrective actions are decided and based upon the intended use of the data. If it is determined that conditions will jeopardize the usability of the data sampling is suspended until the issue can be resolved according the communication pathways described in section 4.2. Most deviations involve stream flow, habitat, or accessibility issues.

17. QA Management Reports

Photocopies of the field data sheets are provided to the DEP volunteer monitoring coordinator from the volunteer monitoring group. These datasheets are kept on file at the DEP. Because the DEP volunteer monitoring coordinator is present during sampling, any QA issues are handled in a timely manner so not to jeopardize the sample results. The DEP volunteer coordinator provides a verbal report of the days sampling to the volunteer participants during and at the completion of the sampling. Any potential water quality issues discovered during the RBV sampling are documented through interdepartmental memos as soon as it is practical.

18.Verification and Validation Requirements

Data will be verified and validated primarily by evaluating the contents of the voucher collection against the hard copy data sheet.

19. Verification and Validation Procedures

At least one of each organism that is identified as one of the "targeted" types on the data sheet and at least one of each type of organism either not on the datasheet or that was not able to be definitively identified in the field are placed in the voucher collection vial at the time of collection. At a later date at the DEP laboratory each organism in the voucher collection is identified and confirmed against the datasheet. Because this methodology is not intended to be a comprehensive list of riffle-dwelling benthic macroinvertebrates, it is expected that organisms not listed as part of the protocol will be in the voucher vial. All organisms in the vial are verified and recorded in the database.

20. Data Usability/Reconciliation with DQO's

Data are reviewed according to *Diagram 6 Preliminary Data Review Decision Tree* in the QAPP guidance (EPA 1999). Assessments are used to define level of support for Aquatic Life Water Quality Standard (CT DEP 1997).

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