Connecticut River Watch Program

HOCKANUM RIVER WATERSHED
RAPID BIOASSESSMENT SUMMARY REPORT
2009—2011

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Hockanum River Watershed Rapid Bioassessment Summary Report 2009—2011

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In cooperation with Friends of the Hockanum River Linear Park of Vernon, the Hockanum River Watershed Association, and the Connecticut Department of Environmental Protection

INTRODUCTION

During the fall of 2009 and 2011 the Friends of the Hockanum River Linear Park of Vernon coordinated and conducted rapid bioassessments of the Tankerhoosen River with guidance from the Connecticut River Watch Program. The bioassessments were planned in collaboration with other watershed stakeholder groups and the Connecticut Department of Environmental Protection (now the Department of Energy and Environmental Protection, or DEEP). Teams of volunteers, including members of the Hockanum River Watershed Association and the Hockanum River Linear Park Committee of Vernon, a science teacher and students from Rockville High School, students from the University of Connecticut, and members of the community assisted with the bioassessments, consisting of surveys of the benthic macroinvertebrate community following the DEEP protocol: *Rapid Bioassessment in Wadeable Streams and Rivers by Volunteer Monitors*.

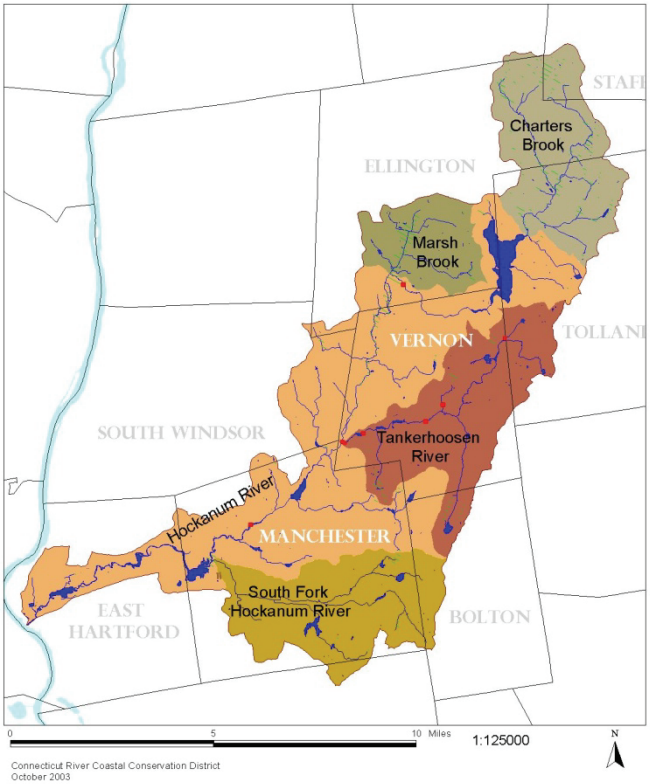
The monitoring activities were part of a community-based effort to assess the health of the Hockanum River begun in 1999. The study began with a physical survey of the Hockanum River, and continued in 2000 with a physical survey of the Tankerhoosen River. In 2002, the first bioassessment of the Hockanum and Tankerhoosen Rivers was conducted, and in subsequent years bioassessments were focused on the Tankerhoosen. It is our hope that this community-based monitoring and assessment effort will continue as a long-term program to help insure the improvement and protection of this valuable resource.

Goals of the monitoring program include: to collect baseline information about the condition of the Hockanum River and its tributaries; to identify areas of the river in need of protection or restoration; and to raise community awareness of the River and the need to restore and protect it. Information collected will be used to identify, plan and prioritize conservation and improvement efforts. The CRWP monitoring program is intended to complement and build upon ongoing efforts to improve conditions in the watershed and raise public awareness of the river.

BACKGROUND

The Hockanum River Watershed

The Hockanum River is a major tributary of the Connecticut River located in north central Connecticut. From its beginnings in Shenipsit Lake in Ellington, the Hockanum flows approximately twenty-five (25) miles to its confluence with the Connecticut River in East Hartford. The River's watershed comprises a seventy-seven (77) square mile area draining large portions of Ellington, Tolland, Vernon and Manchester, and smaller portions of Somers, Stafford, Bolton and East Hartford. While areas of the watershed are undeveloped, the Hockanum flows through an increasingly urbanized landscape as it travels downstream. The River also assimilates waste from three sewage treatment plants.



The Hockanum River is on the state *Impaired Waters List* (Vernon to Mouth), with impairments listed as aquatic life support, contact recreation/bacteria, and inadequate fish passage. Suspected causes of these water quality impairments include agriculture, landfills, highway maintenance and runoff, urban runoff and wet weather discharges. Shenipsit Lake is also included on the list due to flow modification from public water supply diversion.

Despite its water quality problems, the Hockanum River is a well-used recreational resource. An annual spring canoe race brings many enthusiasts to the river. The Hockanum River Linear Park not only protects areas of the river and riparian habitats, but also contains a network of riverside hiking trails. The trails provide casual hikers the opportunity to enjoy the natural beauty of the river, even in some bustling commercial areas. Further, the presence and use of the Linear Trail helps to promote stewardship of the river.

Hockanum River Restoration and Protection Efforts

The Hockanum River has been the focus of a number of local and regional efforts to improve its health. In 1995, the Tolland and Hartford County Soil and Water Conservation Districts (now the North Central Conservation District) initiated a watershed management project with funding from the DEEP through a grant from the US Environmental Protection Agency (EPA) under Section 319 of the Clean Water Act. Activities have focused on identifying and reducing pollution problems associated with storm water runoff, and restoring fish and wildlife habitat.

Five different restoration and stabilization projects in the Hockanum River and tributaries have been funded through the DEEP River Restoration Grant program, one in East Hartford, two in Vernon, and two in Manchester. In addition, in 2004 DEEP conducted intensive water quality monitoring on the river under their TMDL (Total Maximum Daily Load) program.

The Hockanum River Watershed Association (HRWA), North Central Conservation District (NCCD), and the Friends of the Hockanum River Linear Park of Vernon sponsor outreach and education activities such as annual river clean-ups, hikes, and nature walks, and town based Hockanum River Linear Park committees in Manchester, Vernon and Ellington create and maintain a network of trails. In addition, over 80 businesses now participate in the NCCD sponsored Hockanum River Business Partner Program, which encourages local business owners to adopt simple "housekeeping" practices designed to reduce pollutants from entering the Hockanum River.

As an outgrowth of CRWP monitoring activities, in 2005 the Friends of the Hockanum River Linear Park also initiated a *State of the Watershed Assessment for the Tankerhoosen River Watershed*, with the goal of describing the overall health, quality and flow of waters to address the need for watershed assessment and planning. The four-part assessment covers Watershed Baseline Characteristics, Water Quality Data, Plant and Wildlife Diversity Inventories, and Watershed Recreation Areas—Future Viability. A grant from the Long Island Sound Futures Fund helped pay for the second component, which involved collecting and analyzing chemical and biological water quality data at key locations in the watershed.[1] This water quality study was completed by the consulting firm Fuss & O'Neill, which published a report in March 2007, *Tankerhoosen River Watershed Water Quality Monitoring Study*, summarizing the study's objectives, methods, results, conclusions and recommendations. Concerns raised by the study include:

[1] National Fish and Wildlife Foundation Long Island Sound Futures Fund Application for Funds, Friends of the Hockanum River Linear Park of Vernon, Inc., December 2004

- High levels of turbidity, bacteria and phosphorus after wet weather, indicating runoff-related sources
- High levels of nitrogen in both wet and dry weather, indicating runoff-related and chronic sources
- High levels of heavy metals following wet weather in all streams studied, and possible dry weather sources of the heavy metal copper in Gages Brook

In March 2009 the *Tankerhoosen River Watershed Management Plan* was completed as a follow-up to the watershed assessment. The goal of the watershed management plan is to identify recommendations that will help maintain and enhance water quality and ecological health in and along the Tankerhoosen River and its tributaries. In developing the plan, existing information was synthesized, GIS-based desktop analyses were performed, and municipal land use regulations were reviewed. Field surveys of stream corridors and upland areas were also completed to further assess watershed conditions, search for sources and causes of water quality impairments and identify restoration opportunities. The plan includes watershed-wide recommendations, targeted recommendations and site specific recommendations and establishes implementation priorities. Development of the plan, also completed by Fuss & O'Neill, was a collaborative effort led by Friends of the Hockanum River Linear Park, in association with the Town of Vernon, North Central Conservation District, Rivers Alliance of Connecticut, Hockanum River Watershed Association and Belding Wildlife Trust. Funding was provided by the National Fish and Wildlife Foundation, Long Island Sound Futures Fund, Rivers Alliance of Connecticut, and the Town of Vernon.[2]

Since completion of the watershed management plan, a project was undertaken to understand, review, and develop Low Impact Development (LID) regulations and guidelines in the watershed: "Land Use Regulatory Control in the Tankerhoosen Watershed." Implementing LID was a key recommendation in the watershed plan. The project was a collaboration between the Town of Vernon, the North Central Conservation District and the Friends of Hockanum River Linear Park. Consultants Fuss & O'Neill provided four workshops for land use commissioners, a proposed set of regulations, and a draft design manual for the Town. The project was funded by a National Fish and Wildlife Foundation, Long Island Sound Futures Fund grant.

To increase public awareness of the special natural resources in the Tankerhoosen watershed, a website was developed by a citizen volunteer, in collaboration with Friends of the Hockanum River Linear Park (www.tankerhoosen.info). The site contains a wealth of information ranging from simple facts to more detailed technical results of the LID project. A newsletter is also published quarterly.

Additional activities in the watershed include an invasive aquatic plant management program, initiated by the Vernon Conservation Commission following discovery of milfoil and fanwort at the dam in Walker Reservoir East. The program involved hiring a consulting firm to remove the invasive plants, and training a group of volunteers to monitor streams and ponds in the watershed. More information about this effort can be found in the winter 2012 edition of Habitat, the Connecticut Association of Inland Wetland and Conservation Commissions (CACIWC) newsletter.[3]

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[2] *Tankerhoosen River Watershed Management Plan*, Fuss & O'Neill, for Friends of the Hockanum River Linear Park of Vernon., March 2009 (www.ct.gov/dep/lib/dep/water/watershed_management/wm_plans/tankerhoosen/tankwp_final.pdf)

[3] http://caciwc.org/library/habitat/Habitat%2011%20Winter%201-9-12.pdf

Most recently, the State acquired 449 acres in the headwaters region of the Tankerhoosen for open space ($2.9 million). Located near the highway, the property was in threat of development. The work done over the years obtaining natural resource data helped establish the natural resource value of this area of the watershed, and provided justification for this large investment in open space by the state. At the dedication DEEP Commissioner Esty said it was one of the largest and most significant open space preservation projects in CT history.

About the Hockanum River Study

The Connecticut River Watch Program is working in conjunction with watershed stakeholders to assist and support a community-based river monitoring and assessment program in the Hockanum River watershed. This effort is one of the watershed monitoring and assessment programs initiated in 1999 as part of the new expanded basin-wide Connecticut River Watch Program.

The Hockanum River was recommended for monitoring/assessment by the Department of Energy and Environmental Protection (DEEP) ambient monitoring group. The CRWP monitoring program is intended to complement and enhance existing efforts to improve conditions in the watershed and raise public awareness of the river by the HRWA, the Linear Park committees, the North Central Conservation District, and the watershed municipalities. Improvements have been implemented as part of a watershed management project funded by DEEP through a U.S. Environmental Protection Agency §319 nonpoint source grant watershed project. In 1998, CRWP was asked by DEEP and EPA to help develop a volunteer monitoring program in conjunction with the watershed project.

The study began in 1999 with a Stream Walk Survey—a survey of physical characteristics—of the Hockanum River main stem, and continued in 2000 with a similar survey of the Tankerhoosen River, the Hockanum's major tributary. The surveys were conducted with assistance from members of the Hockanum River Watershed Association and the watershed community.

A number of management considerations were raised by the surveys. In the Hockanum, much of the river appeared to be impacted adversely by human development as evidenced by inadequate stream buffers, adjacent residential, commercial and industrial development, non-native invasive plants, yard waste, algae growth, exposed streambank soils, and sedimentation. At the same time, in areas protected by the Hockanum River Linear Park, the river seems to support a diversity of wildlife, as well as provide many opportunities for public access and recreation. In the Tankerhoosen, similar problems were uncovered, though several areas of the river appear to be in relatively good condition, both upstream and downstream. Also, there are very few areas where stream buffers are less than 25 feet and where there are lawns adjacent to the stream. Further, numerous opportunities for recreational access and use were identified in the survey; development and use of new access areas will help to heighten awareness of the river's values and promote stewardship activities. Recommendations included addressing concerns and threats identified by the stream surveys, completing the collection of baseline information by surveying other streams in the watershed, and conducting additional river monitoring activities to assess in-stream health.[4]

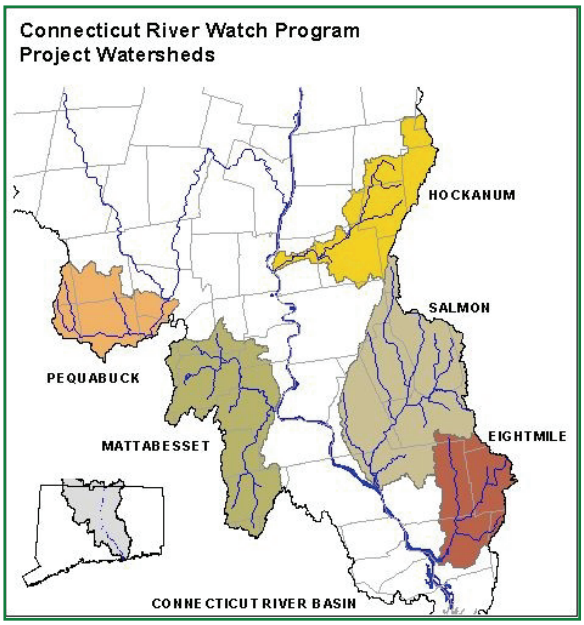
[4] Additional information about the surveys, including data summaries, can be found in the *Hockanum River Stream Walk Summary Report* (May 2000), and *Tankerhoosen River Stream Walk Summary Report* (September 2001), published by the Middlesex County Soil and Water Conservation District (now Connecticut River Coastal Conservation District), available on the District website: conservect.org/ctrivercoastal/riverwatch/publications.htm.

From 2002 through 2008, annual macroinvertebrate assessments were undertaken using the Connecticut DEEP Rapid Bioassessment for Volunteers (RBV) protocol. The studies were planned and conducted with assistance from the Vernon Linear Park Committee and the Hockanum River Watershed Association. The Tankerhoosen River was the focus of the assessments. In 2002 Hockanum River sites were also included, and in 2003-2008, a site on Gages Brook, a small tributary of the Tankerhoosen, was included. Results of the studies revealed general upstream-downstream declines in the percent contribution of sensitive organisms at the sites, pointing toward a possible decline in water quality. Recommendations included conducting an annual Rapid Bioassessment. [5]

The Connecticut River Watch Program

The Connecticut River Watch Program (CRWP) is a volunteer water quality monitoring, protection and improvement program for the Connecticut River and tributaries. CRWP is sponsored by the Connecticut River Coastal Conservation District, and was initiated in 1992 in cooperation with River Watch Network (now River Network). The program is designed to meet two major objectives: build awareness about river resources and water quality, and collect scientifically credible data to use to identify and address water quality problems. CRWP has become a model program, with wide support from local communities and state and federal environmental officials. Funding has come in part from the Connecticut DEEP through US EPA grants under Section 319 of the Clean Water Act, and from private contributions.

From 1992-1998 monitoring activities focused on the lower Connecticut River main stem and the Mattabesset/Coginchaug tributary basin. The program generated an extensive water quality database, and raised local awareness of river resources and water quality. CRWP information was used by municipalities to investigate potential pollution sources, by the state for planning purposes, and in developing a comprehensive management plan for the Mattabesset watershed.



In 1999, CRWP was expanded into new watersheds within the Connecticut River basin. A regional support service, the program initiates, supports and coordinates community-based river monitoring, assessment and improvement programs in regional watersheds throughout the basin. CRWP continues to work with local communities to collect information about water quality and stream health, and support its use in river/watershed protection and improvement efforts. Project areas include the Mattabesset/ Coginchaug, Eightmile, Salmon, Hockanum and Farmington River watersheds.

[5] Additional information about the rapid bioassessments, including data summaries, can be found in the *Hockanum River Rapid Bioassessment Summary Report*, published by the Middlesex County Soil and Water Conservation District in December 2002 (now the Connecticut River Coastal Conservation District), and additional summary reports published by the Connecticut River Coastal Conservation District in May 2004, March 2005, December 2006, October 2007 and July 2008, also available on the District website.

PROJECT SUMMARY

Goals

The Hockanum River Rapid Bioassessment was undertaken as part of an ongoing community-based effort to document the health of the Hockanum River watershed. With leadership from the Friends of the Hockanum Linear Park of Vernon, rapid bioassessments were planned for 2009, as well as 2010[6] and 2011, again focused on the Tankerhoosen River.

The overall goals include:

- Develop a baseline of information about the condition of the Hockanum River and tributaries, and monitor changes over time
- Identify areas of concern and potential pollution problems that can be used to plan conservation and improvement efforts
- Raise public interest in and knowledge of the Hockanum River, both about the resources it has to offer and the problems it faces
- Develop public awareness of water quality issues and human impacts on our rivers
- Build on the existing local constituency for the Hockanum River and expand the base of active volunteers
- Form the basis for more complex water quality monitoring activities that can be pursued in future years according to needs, level of interest, ability to commit time, and the availability of resources

Study Design and Methodology

The DEEP's Rapid Bioassessment in Wadeable Streams and Rivers by Volunteer Monitors (RBV) is a benthic macroinvertebrate assessment protocol designed specifically for volunteer programs. Benthic macroinvertebrates are bottom dwelling aquatic organisms that can be seen with the unaided eye, such as stonefly, mayfly and caddisfly nymphs. They are good indicators of water quality for several reasons: many are sensitive to pollution, the composition of the community is a good reflection of long-term water quality (since they live there year-round), they cannot easily escape pollution, and they are relatively easy to collect. In addition, there are many established methods for using macroinvertebrate data to assess water quality and stream health. Benthic macroinvertebrates are collected from shallow riffle areas by disturbing the stream bottom and catching the dislodged organisms in a net. DEEP uses the riffle-dwelling benthic macroinvertebrate community as the primary indicator of biological integrity of freshwater streams.

The RBV protocol is designed to help identify streams with pollution sensitive benthic macroinvertebrate communities. It is not a definitive assessment procedure; data are used primarily for screening purposes, to identify streams with either very high or very poor water quality. There are twenty-six organisms included in the RBV protocol (see list, Attachment A). They are easily identified due to their distinct shape, structure, color, or behavior. Each also provides key ecological information about the stream environment. RBV organisms are categorized in one of three groups:

- *Most Wanted* – The most sensitive to pollution, requiring a narrow range of environmental conditions. When abundant they are a sign of a non-impaired stream;

[6] The 2010 bioassessment was cancelled due to drought conditions experienced in the summer, which would have compromised results.

- *Moderately Wanted* – Less sensitive to pollution and found in a variety of water quality conditions. When abundant, more information is needed about upstream conditions to infer water quality;
- *Least Wanted* – Least sensitive to pollution and tolerant of the widest range of conditions. When they make up the majority of a sample, they indicate some level of water quality impairment.

RBVs are generally scheduled to take place in the fall, during October and November, to document the condition of the macroinvertebrate community following the summer, a "high stress" time for streams due to lower flows and higher water temperatures.

Volunteers receive training in the RBV protocol in an indoor training session prior to conducting the assessment. Sampling and analysis equipment and supplies, as well as reference materials to aid in identification of organisms, are provided by the DEEP. Benthic macroinvertebrates are collected using a large flat-bottom net 12" high X 18" wide with a mesh size no large than a #30 sieve (0.59 mm). Volunteers collect three replicate samples, each consisting of two one square meter collections or "kicks", sort and identify the organisms in the field, and document relative abundance of key organisms on official field data sheets for the RBV protocol (see Attachment B). Volunteers also keep a representative voucher collection consisting of at least one of each type of organism found, preserved in 91% isopropyl alcohol. The voucher collection is returned to the DEEP along with the data sheets.[7]

Five sites were to be included in the 2009 and 2011 studies (see site map, Attachment C). Sites were selected to provide an in-depth upstream-downstream assessment of the Tankerhoosen River, as well as an assessment of the Tankerhoosen tributary Gages Brook. As indicated in the table below, several of the sites are also DEEP monitoring sites.

Table 1. Tankerhoosen River RBV Sites (listed upstream to downstream by river)

Site #	River	Location	Rationale
HR7d	Gages Brook	Behind the Tolland Agricultural Center, at the footbridge on the walking trail	Impacts of Interstate 84 and upstream development in the Tolland Industrial Park
HR7b	Tankerhoosen R.	Bolton Road in Vernon (downstream)	Upstream site; control site for watershed
HR7a (DEP)	Tankerhoosen R.	Tunnel Road in Vernon (upstream)	Mid-stream site; downstream of agriculture
HR7c	Tankerhoosen R.	Downstream of Dobsonville Pond in Vernon	Impacts of pond
HR7 (DEP)	Tankerhoosen R.	Golfland, near confluence with Hockanum R. (100 meters upstream)	Downstream site; integrator site for nonpoint sources

[7] DEP website: http://www.ct.gov/dep/cwp/view.asp?a=2719&q=325608&depNav_GID=1654

Volunteer Recruitment, Training and Participation

Volunteer recruitment, training and coordination were handled locally by the Friends of the Hockanum River Linear Park of Vernon, with assistance from Jane Seymour of the CT DEEP and CRWP staff. Eighteen (18) people attended the October 11, 2009 training session, and twenty-two (22) people attended the October 1, 2011 training session, both held at the Tolland County Agricultural Center (TAC) in Vernon. The agenda included an introduction to local Hockanum River protection and improvement efforts; an introduction to the Connecticut River Watch Program and the Hockanum River Study; and a training presentation on the DEEP RBV protocol.

After the training, volunteers were grouped into five teams, each with an experienced team leader, and assigned a specific river site. Each team was provided with sampling and analysis equipment and supplies: a kicknet, gloves, white plastic trays, forceps, hand lenses, ice cube trays (for sorting), field identification cards, a data sheet, and a vial filled with 91% isopropyl alcohol for the voucher collection.

Teams proceeded to their sites to complete their fieldwork. They first identified three different locations in the riffle where samples would be collected, then completed their collections. Samples were then sorted and the organisms identified. Relative abundance of each RBV organism was recorded on the RBV data sheet, and at least one of each type of organism found was placed in the vial filled with alcohol for the voucher collection.

SURVEY RESULTS

RBV data sheets were reviewed and voucher collections examined by the DEEP Volunteer Monitoring Coordinator. A list of organisms included in the voucher collection was generated for each sample site, and an overall assessment of the health of the river was made based on the data collected.[8] Rapid bioassessment results are summarized in a table format (Attachment D). The table includes information about RBV organisms, as well as additional organisms in the voucher collections.

2009 Results

Overall, the 2009 Tankerhoosen RBV data show good representation from the *moderately wanted* category (3-6 per site), with more limited representation from the *most wanted* (1-4 per site) and *least wanted* (0-3 per site) categories, as seen in Table 2 (page 11). Organisms in all categories but *least wanted* were represented at all sites. The best representation of *most wanted* organisms was found at the Tankerhoosen Bolton Road site (4), which also compares most favorably with the reference conditions in terms of representation from each category. At the Gages Brook and Tunnel Road sites, three *most wanted* organisms were found, and at the Dobsonville Pond and Golfland Tankerhoosen sites, only one *most wanted* organism was found.

The most commonly collected RBV organisms (found in at least three of the five sites) were:

- Perlidae (Panel 5 – Common Stonefly – Most);
- *Ryacophila* (Panel 7 – Michelin-man Caddisfly – Most);
- Hydropsychidae (Panel 9 – Common Netspinner Caddisfly - Moderate);
- *Chimarra* (Panel 10 – Fingernet Caddisfly – Moderate);
- *Stenonema* (Panel 11 – Flat-head Mayfly – Moderate);
- *Nigronia* (Panel 13 – Fishfly Larva – Moderate);
- Odonata (Panel 14 – Dragonfly, Damselfly Nymphs – Moderate).

Higher representation of organisms in the *most wanted* category—the most sensitive to pollution—is an indicator of better water quality, though in general, streams with representation from all RBV categories indicate good water quality.[9] Based on the numbers of *most wanted* organisms found at the sites, one can infer that the Gages Brook, Bolton Road and Tunnel Road sites have excellent water quality, and the Dobsonville Pond and Golfland sites have very good water quality. It is important to note, however, that only organisms preserved in the voucher collection can be confirmed as present at the site.

[8] According to the RBV protocol, only organisms in the voucher collection can be confirmed as present at the site and are considered in the assessment.

[9] Written communication from Mike Beauchene, CT DEP, November 2002.

Table 2. 2009—Occurrence of different types of organisms in each RBV category by site, compared with a high quality reference site. Sites with 1-3 organisms in the *most wanted* category—the most sensitive to pollution—are considered by DEP to have very good water quality; sites with 3-4 *most wanted* organisms are considered to have excellent water quality; and sites with 5 or more organisms in the *most wanted* category are considered to have exceptional water quality.[10]

Site #	River	Location	Most	Moderate	Least	Total #
HR7d	Gages Brook	Behind the TAC, at the footbridge	25% (3)	50% (6)	25% (3)	12
HR7b	Tankerhoosen R.	Bolton Road in Vernon	40% (4)	50% (5)	10% (1)	10
HR7a	Tankerhoosen R.	Tunnel Road in Vernon	43% (3)	57% (4)	0%	7
HR7c	Tankerhoosen R.	Downstream of Dobsonville Pond In Vernon	25% (1)	75% (3)	0%	4
HR7	Tankerhoosen R.	Golfland, near confluence with Hockanum R.	20% (1)	80% (4)	0%	5
NA	REFERENCE [11]	Compilation of high quality sites	47% (7)	40% (6)	13% (2)	15

Included in the voucher collections were six additional (non-RBV) organisms. One has a tolerance value of 1, *most wanted* in RBV terms, and the remaining have tolerance values of 3 or 4, *moderately wanted* in RBV terms. Diversity (the number of different types of organisms found, including RBV and non-RBV), as shown in Table 3, varies between a high of fifteen (15) at the Gages Brook site, and a low of seven (6) at the Tankerhoosen sites downstream of Dobsonville Pond, and at Golfland.[12]

Differences between the results at the five sites are not likely significant, with the possible exception of the greater number of *most wanted* organisms at the Tankerhoosen Bolton Road site, and the general downstream decline in numbers of these sensitive organisms as well as overall diversity. However, these differences in results may be due to sampling and observation techniques, as well as the level of care taken in ensuring that all types of organisms identified were included in the voucher collection; future rapid bioassessments will help determine whether they reflect actual differences in the benthic macroinvertebrate communities.

Table 3. 2009—Occurrence of different types of RBV and non-RBV organisms by site, with total diversity for each site (listed upstream to downstream by river)

Site #	River	Location	RBV #	Non RBV #	Total #
HR7d	Gages Brook	Behind the TAC, at the footbridge	12	3	15
HR7b	Tankerhoosen R.	Bolton Road in Vernon	10	1	11
HR7a	Tankerhoosen R.	Tunnel Road in Vernon	7	2	9
HR7c	Tankerhoosen R.	Downstream of Dobsonville Pond in Vernon	4	2	6
HR7	Tankerhoosen R.	Golfland, near confluence with Hockanum R.	5	1	6

[10] Data interpretation information from RBV Field Data Sheet

[11] Reference statistics compiled and provided by Mike Beauchene, CT DEP, based on DEP data from high quality streams around the state, including the Natchaug River, Eightmile River, Sandy Brook, Salmon River, Saugatuck River, Green Fall River and Whitford Brook. Median percentages are reported here.

[12] In general terms, the greater the number, the healthier the community.

Overall, the 2009 Hockanum RBV results compare favorably with similar volunteer bioassessments done around the state in 2009, with three sites at or above average with respect to *most wanted* organisms (3 or more), and two sites below average (<3). As shown in the 2009 RBV summary report, *Rapid Bioassessment in Wadeable Streams and Rivers By Volunteer Monitors-Annual Summary Report #11 2009*, numbers of *most wanted* organisms range from 0-7, with 50% greater than or equal to 3, and 50% less than 3. 4 or more *most wanted* organisms were found in 32 of the 108 fall voucher collections (30%); 3 *most wanted* organisms were found at 22 sites (20%); 2 *most wanted* organisms were found at 19 sites (18%); 1 *most wanted* organism was found at 21 sites (19%); and 0 *most wanted* organisms were found at 14 sites (13%). Again, the Bolton Road site has the distinction of being in the "four or more" group, and with 4 *most wanted* organisms is one of 20 sites assessed in the state having four of the highly sensitive organisms.

According to the report, the DEEP monitoring staff is confident that sites with four or more *most wanted* organisms are in full support of the state water quality standard for aquatic life. However, sites with fewer than 4 *most wanted* organisms do not definitively indicate impairment or degradation. In these cases, the DEP conducts additional assessment to verify species present, determine possible impacts of upstream land use characteristics, and evaluate the possibility of errors in conducting the RBV.

Though it is of interest to compare RBV results from around the state, it is important to qualify these comparisons due to the inherent variability between volunteer groups and their application of the RBV protocol. There are many places in the procedure where level of experience, effort and attention to detail could affect results—while sampling, picking organisms from the tray, sorting and identifying, and transferring organisms to the vials for preservation. Weather conditions can also affect results.

Furthermore, while the presence of 4 or more *most wanted* organisms indicates a reference quality stream according to the DEEP, the fact that fewer than 4 are found does not necessarily mean that the stream does not also have reference conditions, just that the additional *most wanted* organisms were not documented by volunteers using the RBV protocol. It is important to bear in mind that the RBV protocol is intended to be a screening tool, not a definitive assessment method.

2011 Results

Overall, the 2011 Tankerhoosen RBV data show good representation from the *moderately wanted* category (2-5 per site), with more limited representation from the *most wanted* (1-3 per site) and *least wanted* (0-1 per site) categories, as seen in Table 4. Organisms in all categories but *least wanted* were represented at all sites. The best representation of *most wanted* organisms was found at the Tankerhoosen Bolton Road site (3). At the Tunnel Road site, two *most wanted* organisms were found, and at the Gages Brook, and Dobsonville Pond and Golfland Tankerhoosen sites, only one *most wanted* organism was found.

The most commonly collected RBV organisms (found in at least three of the five sites) were:

- Perlidae (Panel 5 – Common Stonefly – Most);
- Hydropsychidae (Panel 9 – Common Netspinner Caddisfly - Moderate);
- *Chimarra* (Panel 10 – Fingernet Caddisfly – Moderate);
- *Psephenus* (Panel 12 – Flat-head Mayfly – Moderate);
- *Nigronia* (Panel 13 – Fishfly Larva – Moderate);

Table 4. 2011—Occurrence of different types of organisms in each RBV category by site, compared with a high quality reference site. Sites with 1-3 organisms in the *most wanted* category—the most sensitive to pollution—are considered by DEP to have very good water quality; sites with 3-4 *most wanted* organisms are considered to have excellent water quality; and sites with 5 or more organisms in the *most wanted* category are considered to have exceptional water quality.[13]

Site #	River	Location	Most	Moderate	Least	Total #
HR7d	Gages Brook	Behind the TAC, at the footbridge	16% (1)	67% (4)	16% (1)	6
HR7b	Tankerhoosen R.	Bolton Road in Vernon	43% (3)	57% (4)	0%	7
HR7a	Tankerhoosen R.	Tunnel Road in Vernon	29% (2)	71% (5)	0%	7
HR7c	Tankerhoosen R.	Downstream of Dobsonville Pond In Vernon	25% (1)	50% (2)	25% (1)	4
HR7	Tankerhoosen R.	Golfland, near confluence with Hockanum R.	20% (1)	60% (3)	20% (1)	5
NA	REFERENCE [14]	Compilation of high quality sites	47% (7)	40% (6)	13% (2)	15

Again, higher representation of organisms in the *most wanted* category—the most sensitive to pollution—is an indicator of better water quality, though in general, streams with representation from all RBV categories indicate good water quality.[15] Based on the numbers of *most wanted* organisms found at the sites (1-3), one can infer that all sites have very good water quality. It is important to note, however, that only organisms preserved in the voucher collection can be confirmed as present at the site.

Included in the voucher collections were six additional (non-RBV) organisms. One has a tolerance value of 2, *most wanted* in RBV terms, and the remaining have tolerance values of 3 or 4, *moderately*

[13] Data interpretation information from RBV Field Data Sheet

[14] Reference statistics compiled and provided by Mike Beauchene, CT DEP, based on DEP data from high quality streams around the state, including the Natchaug River, Eightmile River, Sandy Brook, Salmon River, Saugatuck River, Green Fall River and Whitford Brook. Median percentages are reported here.

[15] Written communication from Mike Beauchene, CT DEP, November 2002.

wanted in RBV terms. Diversity (the number of different types of organisms found, including RBV and non-RBV), as shown in Table 5, varies between a high of nine (9) at the Golfland Tankerhoosen site, and a low of seven (5) at the Tankerhoosen site downstream of Dobsonville Pond. [16]

Differences between the results at the five sites are not likely significant, with the possible exception of the greater number of *most wanted* organisms at the Tankerhoosen Bolton Road site, and the general downstream decline in numbers of these sensitive organisms as well as overall diversity. However, these differences in results may be due to sampling and observation techniques, as well as the level of care taken in ensuring that all types of organisms identified were included in the voucher collection; future rapid bioassessments will help determine whether they reflect actual differences in the benthic macroinvertebrate communities.

Table 5. 2011—Occurrence of different types of RBV and non-RBV organisms by site, with total diversity for each site (listed upstream to downstream by river)

Site #	River	Location	RBV #	Non RBV #	Total #
HR7d	Gages Brook	Behind the TAC, at the footbridge	6	2	8
HR7b	Tankerhoosen R.	Bolton Road in Vernon	7	1	8
HR7a	Tankerhoosen R.	Tunnel Road in Vernon	7	0	7
HR7c	Tankerhoosen R.	Downstream of Dobsonville Pond in Vernon	4	1	5
HR7	Tankerhoosen R.	Golfland, near confluence with Hockanum R.	5	4	9

Overall, the 2011 Hockanum RBV results compare favorably with similar volunteer bioassessments done around the state in 2011, with one site above average with respect to *most wanted* organisms (3 or more), and four sites average (<3). As shown in the 2011 RBV summary report, *Rapid Bioassessment in Wadeable Streams and Rivers By Volunteer Monitors-Annual Summary Report #13 2011*, numbers of *most wanted* organisms range from 0-6, with 39% greater than or equal to 3, and 61% less than 3. 4 or more *most wanted* organisms were found in 24 of the 110 fall voucher collections (22%); 3 *most wanted* organisms were found at 19 sites (17%); 2 *most wanted* organisms were found at 26 sites (24%); 1 *most wanted* organism was found at 31 sites (28%); and 0 *most wanted* organisms were found at 10 sites (9%).

According to the report, the DEEP monitoring staff is confident that sites with four or more *most wanted* organisms are in full support of the state water quality standard for aquatic life. However, sites with fewer than 4 *most wanted* organisms do not definitively indicate impairment or degradation. In these cases, the DEP conducts additional assessment to verify species present, determine possible impacts of upstream land use characteristics, and evaluate the possibility of errors in conducting the RBV.[17]

Again, though it is of interest to compare RBV results from around the state, it is important to qualify these comparisons due to the inherent variability between volunteer groups and their application of the RBV protocol. There are many places in the procedure where level of experience, effort and attention to detail could affect results—while sampling, picking organisms from the tray, sorting and

[16] In general terms, the greater the number, the healthier the community.
[17] http://www.ct.gov/dep/lib/dep/water/volunteer_monitoring/2011_rbv_report.pdf

identifying, and transferring organisms to the vials for preservation. Weather conditions can also affect results.

Furthermore, while the presence of 4 or more *most wanted* organisms indicates a reference quality stream according to the DEEP, the fact that fewer than 4 are found does not necessarily mean that the stream does not also have reference conditions, just that the additional *most wanted* organisms were not documented by volunteers using the RBV protocol. It is important to bear in mind that the RBV protocol is intended to be a screening tool, not a definitive assessment method.

As seen in Tables 4 and 5 (page 16), when comparing results from 2002—2011, numbers of *most wanted* organisms at most sites are somewhat steady overall, with a few year to year ups and downs. One anomaly is the marked decline in *most wanted* organisms at the Gages Brook site in 2011. On the other hand, a general decline can be seen in RBV and total organisms. While these changes may be significant, they may also be due, in part, to differences in sampling, observation and preservation techniques, perhaps related to the make-up of teams and level of experience of team members. Future assessments will help determine whether these are in fact real trends.

Table 6. Comparison of 2002—2011 *Most Wanted* RBV organisms by site (listed upstream to downstream)

Site #	River	Location	Most Wanted RBV #								
			'02	'03	'04	'05[1]	'06	'07	'08	'09	'11
HR7d	Gages Brook	Behind the TAC at the footbridge	NA	6	3	1	2	NA	3	3	1
HR7b	Tankerhoosen R.	Bolton Road in Vernon	6	4	1	2	4	4	2	4	3
HR7a	Tankerhoosen R.	Tunnel Road in Vernon	8	5	3	2	2	3	5	3	2
HR7c	Tankerhoosen R.	Below Dobsonville Pond	2	NA	NA	0	1	1	1	1	1
HR7	Tankerhoosen R.	Golfland, near Hockanum R confluence	2	4	1	1	1	1	2	1	1

Table 7. Comparison of 2002—2011 RBV and non-RBV organisms by site, with total diversity for each site (listed upstream to downstream)

Site #	River	Location	RBV #									Non-RBV #									Total #								
			'02	'03	'04	'05	'06	'07	'08	'09	'11	'02	'03	'04	'05	'06	'07	'08	'09	'11	'02	'03	'04	'05	'06	'07	'08	'09	'11
HR7d	Gages Brook	Behind the TAC, at the footbridge	NA	12	7	5	10	NA	7	12	6	NA	3	2	1	5	NA	3	3	2	NA	15	6	9	15	NA	10	15	8
HR7b	Tankerhoosen River	Bolton Road in Vernon	12	10	7	9	10	13	5	10	7	0	2	2	5	1	3	2	1	1	12	12	9	14	11	16	7	11	8
HR7a	Tankerhoosen River	Tunnel Road in Vernon	17	12	5	4	8	10	10	7	7	2	5	3	3	1	1	1	2	0	19	17	8	7	9	11	11	9	7
HR7c	Tankerhoosen River	Below Dobsonville Pond	10	NA	NA	4	7	7	7	4	4	1	NA	NA	1	2	0	0	2	1	11	NA	NA	5	9	7	7	6	5
HR7	Tankerhoosen River	Golfland, near confluence with Hockanum R.	13	13	8	7	6	6	8	5	5	3	3	3	2	0	4	1	1	4	16	16	11	9	6	10	9	6	9

[1] Extreme weather in fall 2005 was the likely cause of the decrease in *most wanted* organisms (see the 2005 report at www.conservect.org/ctrivercoastal/riverwatch/PDFs/Hockanum_RBV_summary_report_05.pdf for more information).

CONCLUSIONS/RECOMMENDATIONS

This year's bioassessment results show some anomalies compared with previous years, in particular with respect to the decline in *most wanted* organisms overall in 2011, especially at the Gages Brook site. The general upstream-downsteam decline in quality in the Tankerhoosen River (evidenced by declines in diversity and numbers of *most wanted* organisms) is also not quite as pronounced in 2011 as it was in 2009. This is due to the decline in numbers of *most wanted* organisms and overall diversity at the upstream Tankerhoosen sites. While it is of concern that numbers have declined at some sites, ongoing annual bioassessments will help determine whether these changes reflect actual changes in water quality, are simply anomalies, or are the result of year-to-year variability in volunteer teams.

Bioassessment results, coupled with water quality concerns and threats to the rivers' health identified in the stream walk surveys conducted in 1999 and 2000, in the *Tankerhoosen River Watershed Water Quality Monitoring Study* completed in 2007, and most recently as part of field assessments conducted in 2008 in developing the *Tankerhoosen River Watershed Management Plan*, all corroborate the need for river improvement and protection. Continued monitoring will help assess real changes in water quality and stream health over time, and document improvements resulting from ongoing management and restoration activities.

As a follow-up to this year's monitoring effort in the Hockanum River watershed, general recommendations include:

- Conduct a Rapid Biological Assessment on an annual basis;
- Continue to collect baseline information by conducting surveys of physical characteristics of watershed streams not yet assessed;
- Conduct additional river monitoring activities, including benthic macroinvertebrate surveys at new sites, and analysis of water samples for chemical, physical and biological indicators of water quality;
- Monitor river segments periodically to assess conditions and identify water quality concerns. This could be accomplished through a stream adoption program whereby volunteers make periodic visual observations, and document and report concerns;
- Last but not least, continue to address the recommendations in the *Tankerhoosen River Watershed Management Plan*.

For assistance and further information, please contact:

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c/o Ann Letendre
29 Gottier Drive
Vernon, CT 06066
860.875.4623

North Central Conservation District
Tolland Agricultural Center- 24 Hyde Avenue
Vernon, CT 06066
860.875.3881

Connecticut River Watch Program
Connecticut River Coastal Conservation District
deKoven House – 27 Washington Street
Middletown, CT 06457
860.346.3282

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Armaan Dode (09)
Pauline Drapeau (09)
Lindsey Dura (11)
Sonoko Fagans (09)
Raina Foley (09)
Ginny Gingras (09 &11)
KarraMarie Hoar (09)
Deb Hockenberry (09)
GloryAnna Hockenberry (09)
Kyle Kneeland (09)
Katie Kuponunos (09)
Ann Letendre (09 & 11)
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Jacklyn Lowe (11)
Sarah Lueckel (09 & 11)
Tom Ouellette (09 & 11)
Angela Pegolo 11)
Sarah Pike (09)
John Roe (11)
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Kiara Ruesta (11)
Mark Satter (11)
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Attachments

A – RBV Organism List

B – RBV Field Data Sheet

C – Site Map

D – 2009 Data Summary

E – 2011 Data Summary

Attachment A – RBV Organism List

Rapid Bioassessment for Volunteers – Organism List

RBV Panel #	Genus	Family	Order	Common Name	RBV Category	Tolerance Value
1	*Drunella*	Ephemerellidae	Ephemeroptera	Body-Builder Mayfly	MOST	0
2	*Isonychia*	Isonychidae	Ephemeroptera	Minnow Mayfly		2
3	*Epeorus*	Heptageniidae	Ephemeroptera	Flat-headed Mayfly		0
4		Peltoperlidae	Plecoptera	Roach-like Stonefly		0
5		Perlidae	Plecoptera	Common Stonefly		1
5	*Pteronarcys*	Pteronarcyidae	Plecoptera	Giant Stonefly		0
5		Miscellaneous	Plecoptera	Stonefly		1
6	*Apatania*	Limnephilidae	Trichoptera	Cornucopia Case Maker		0
6	*Glossosoma*	Glossomatidae	Trichoptera	Mini-stone Case Maker		0
7	*Rhyacophila*	Rhyacolphilidae	Trichoptera	Michelin-Man Caddisfly		0
8	*Brachycentrus*	Brachycentridae	Trichoptera	Mid-size Plant Case Builder		1
8	*Lepidostoma*	Lepidostomatidae	Trichoptera	Mid-size Plant Case Builder		1
9		Hydropsychidae	Trichoptera	Common Netspinner	MODERATE	4
10	*Chimarra*	Philopotamidae	Trichoptera	Fingernet Caddisfly		3
11	*Stenonema*	Heptageniidae	Ephemeroptera	Flat-headed Mayfly		4
12	*Psephenus*	Psephenidae	Coleoptera	Water Penny Beetle Larva		4
13	*Corydalus*	Corydalidae	Megaloptera	Dobsonfly Larva		6
13	*Nigronia*	Corydalidae	Megaloptera	Fishfly Larva		4
14		Aeshnidae Gomphidae Coenagrionidae	Odonata	Dragonfly, Damselfly Nymphs		3
15		Amphipod	Amphipoda	Scud	LEAST	8
15			Oligochaeta	Aquatic Earth Worm		9
15		Isopod	Isopoda	Sowbug		8
15		Simulidae	Diptera	Black Fly Larva		6
15			Hirudinea	Leech		8
15		Chironomidae	Diptera	Midge Fly Larva		6
15			Gastropoda	Snail		7

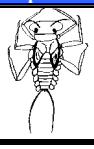
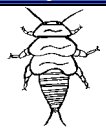
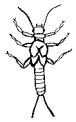
Attachment B – RBV Field Data Sheet

RAPID BIOASSESSMENT IN WADEABLE STREAMS AND RIVERS BY VOLUNTEER MONITORS
FIELD DATA SHEET
SUBMIT DATA TO: MIKE BEAUCHENE (mike.Beauchene@po.state.ct.us)

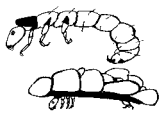
PHONE (860) 424-4185

WATERBODY NAME:		COLLECTION DATE:	COLLECTION TIME:
LOCATION DESCRIPTION:		COLLECTORS NAMES:	
TOWN:	NOTES/COMMENTS:		

MOST

	1 Body builder mayfly Drunella	2 Minnow mayfly Isonychia	3 2-tailed flat head mayfly Epeorus	4 Roach-like stonefly Peltoperlidae	5A Common stonefly Perlidae	5 B Giant stonefly Pteronarcys	5 C Misc Stonefly
							
Locs 1&2							
Locs 3&4							
Locs 5&6							

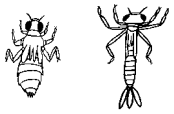
MOST

	6A Saddle-Case caddis Glossosoma	6 B Cornucopia Case caddis Apatania	7 Michelin Man caddis Rhyacophila	8A Mid-size plant case caddis Brachycentrus	8 B Lepidostoma
					
Locs 1&2					
Locs 3&4					
Locs 5&6					

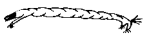
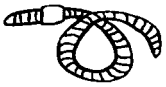
DATA INTERPRETATION

# OF TYPES OF THE "MOST"	WATER QUALITY
5 OR MORE	EXCEPTIONAL
3 TO 4	EXCELLENT
1 TO 3	VERY GOOD
0	MORE INFO NEEDED TO ASSESS

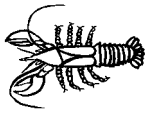
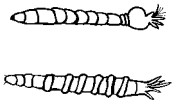
MODERATE

	9 Common net-spinner Hydropsychidae	10 Fingernet Caddis Chimarra	11 Flat Head mayfly Stenonema	12 Water Penny Psephenus	13 A Dobsonfly Corydalus	13 B Fishfly Nigronia	14 Dragonfly & Damselfly Odonata
							
Locs 1&2							
Locs 3&4							
Locs 5&6							

LEAST

	15 A Amphipod	15 B Isopod	15 C Leech	15 D Midge	15 E Black fly	15 F Snail	15 G Worm
							
Locs 1&2							
Locs 3&4							
Locs 5&6							

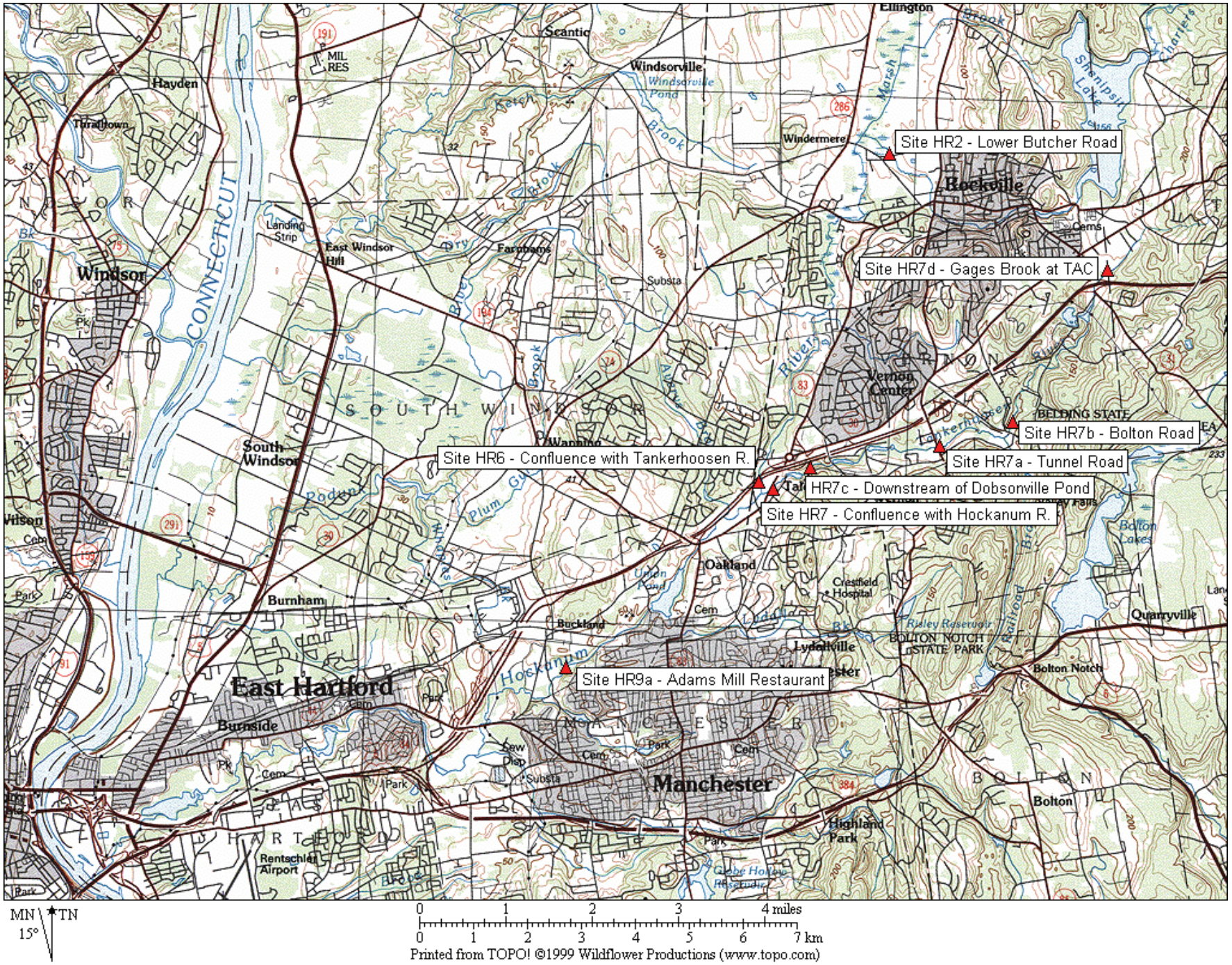
OTHERS

	OTHER COMMONLY COLLECTED RIFFLE-DWELLING MACROINVERTEBRATES						
	Crayfish	Crane fly larvae	Riffle Beetle adult/larva	Small minnow mayfly	Water snipe fly	Planaria	Fingernail clam/ mussel
							
Present							

ALL RBV MATERIALS ARE AVAILABLE AT: http://dep.state.ct.us/wtr/volunmon/volopp.htm

PLEASE NOTE: BE SURE TO INCLUDE AT LEAST 1 OR 2 OF EACH ORGANISM IN YOUR VOUCHER COLLECTION!! INCLUDE A SPECIMEN FROM EVERY TYPE YOU THINK IS A DIFFERENT, EVEN IF IT IS NOT PICTURED ON THIS DATASHEET. **IF AN ORGANISM IS NOT INCLUDED IN THE VOUCHER COLLECTION IT WILL NOT BE INCLUDED IN THE FINAL DATA ASSESSMENT!!**

Attachment C – Site Map



Attachment D – Hockanum River Rapid Bioassessment – Summary of Organism Data from 10/10/09

RBV Panel #	Genus	Family	Order/Class	Common name	RBV Category	Tolerance Value	Gages Bk	Tankerhoosen River			
							TAC footbridge	Bolton Rd, Vernon	Tunnel Rd, Vernon	Below Dobsonville Pond	At mouth (Golfland), Vernon
5A		Perlidae	Plecoptera	Common Stonefly	MOST	1	x	x	x	x	x
5B	*Pteronarcys*	Pteronarcyidae	Plecoptera	Giant Stonefly		0		x	x		
6A	*Glossosoma*	Glossosomatidae	Trichoptera	Saddle Case Maker		0	x	x			
7	*Ryacophila*	Ryacophilidae	Trichoptera	Michelin-man Caddisfly		0	x	x	x		
9		Hydropsychidae	Trichoptera	Common Netspinner	MODERATE	4	x	x	x	x	x
10	*Chimarra*	Philopotamidae	Trichoptera	Fingernet Caddisfly		3	x	x	x	x	x
11	*Stenonema*	Heptageniidae	Ephemeroptera	Flat-head Mayfly		4	x	x		x	x
12	*Psephenus*	Psephenidae	Coleoptera	Water Penny Beetle Larva		4	x				x
13B	*Nigronia*	Corydalidae	Megaloptera	Fishfly Larva		4	x	x	x		
14		Aeshnidae Gomphidae Coenagrionidae	Odonata	Dragonfly, Damselfly Nymphs		3[1]	x	x	x		
15D		Chironomidae	Diptera	Midge Fly Larva	LEAST	6	x				
15F			Gastropoda	Snail		7	x				
15G			Oligochaeta	Aquatic Earth Worm		9	x	x			

Additional Organisms in Voucher Collection (not on RBV list)

RBV Panel #	Genus	Family	Order/Class	Common name	RBV Category	Tolerance Value	Gages Bk	Tankerhoosen River			
							TAC footbridge	Bolton Rd, Vernon	Tunnel Rd, Vernon	Below Dobsonville Pond	At mouth (Golfland), Vernon
		Ephmerellidae	Ephemeroptera	Spiny Crawler Mayfly Larva		1			x		
	Hexatoma	Tipulidae	Diptera	Crane Fly Larva		3	x				
--		Baetidae	Ephemeroptera	Small Minnow Mayfly Larva		4	x		x		
--		Planariidae	Turbellaria	Flatworm		4				x	x
--	*Tipula*	Tipulidae	Diptera	Crane Fly Larva		4		x		x	
		Elmidae	Coleoptera	Riffle Beetle Larva		4	x				

[1] The RBV protocol assigns these organisms an overall tolerance value of 3. The families found have the following tolerance values: Aeshnidae, 3; Gomphidae, 1; Coenagrionidae, 9.

Attachment E – Hockanum River Rapid Bioassessment – Summary of Organism Data from 10/1/11

RBV Panel #	Genus	Family	Order/Class	Common name	RBV Category	Tolerance Value	Gages Bk	Tankerhoosen River			
							TAC footbridge	Bolton Rd, Vernon	Tunnel Rd, Vernon	Below Dobsonville Pond	At mouth (Golfland), Vernon
5A		Perlidae	Plecoptera	Common Stonefly	MOST	1	x	x	x	x	
5B	*Pteronarcys*	Pteronarcyidae	Plecoptera	Giant Stonefly		0		x	x		
6A	*Glossosoma*	Glossosomatidae	Trichoptera	Saddle Case Maker		0					x
7	*Ryacophila*	Ryacophilidae	Trichoptera	Michelin-man Caddisfly		0		x			
9		Hydropsychidae	Trichoptera	Common Netspinner	MODERATE	4	x	x	x	x	x
10	*Chimarra*	Philopotamidae	Trichoptera	Fingernet Caddisfly		3	x	x	x	x	x
11	*Stenonema*	Heptageniidae	Ephemeroptera	Flat-head Mayfly		4		x	x		
12	*Psephenus*	Psephenidae	Coleoptera	Water Penny Beetle Larva		4	x		x		x
13B	*Nigronia*	Corydalidae	Megaloptera	Fishfly Larva		4	x	x	x		
15B		Isopod	Isopoda	Sowbug	LEAST	8	x				x
15G			Oligochaeta	Aquatic Earth Worm		9				x	

Additional Organisms in Voucher Collection (not on RBV list)

RBV Panel #	Genus	Family	Order/Class	Common name	RBV Category	Tolerance Value	Gages Bk	Tankerhoosen River			
							TAC footbridge	Bolton Rd, Vernon	Tunnel Rd, Vernon	Below Dobsonville Pond	At mouth (Golfland), Vernon
		Athericidae	Diptera	Aquatic Snipe Fly		2				x	
	Hexatoma	Tipulidae	Diptera	Crane Fly Larva		3	x				
--		Baetidae	Ephemeroptera	Small Minnow Mayfly Larva		4		x			x
--		Planariidae	Turbellaria	Flatworm		4					x
--	*Tipula*	Tipulidae	Diptera	Crane Fly Larva		4					x
		Elmidae	Coleoptera	Riffle Beetle Larva		4	x				
			Bivalvia	Clams and Mussels		NA					x