Vermont Agency of Natural Resources

Watershed Management Division

BASIN 14 TACTICAL BASIN PLAN- 2015 including the Stevens River, Wells River, Waits River, Ompompanoosuc River, and Mid-Connecticut River Direct Tributaries Watersheds

Peacham Bog, Wells River Watershed Groton (photo credit DEC-Wetlands staff)

The Basin 14 - Water Quality Management Plan was prepared in accordance with 10 VSA § 1253(d), the Vermont Water Quality Standards[1], the Federal Clean Water Act and 40 CFR 130.6, and the Vermont Surface Water Management Strategy.

Vermont Surface Water Management Strategy

Approved:

8/25/15

Alyssa Schuren, Commissioner
Department of Environmental Conservation

Date

4-25-15

Deb Markowitz, Secretary
Agency of Natural Resources

Date

Pursuant to Section 1-02 D (5) of the VWQS, Basin Plans shall propose the appropriate Water Management Type of Types for Class B waters based on the exiting water quality and reasonably attainable and desired water quality management goals. ANR has not included proposed Water Management Types in this Basin Plan. ANR is in the process of developing an anti-degradation rule in accordance with 10 VSA 1251a (c) and is re-evaluating whether Water Management Typing is the most effective and efficient method of ensuring that quality of Vermont's waters are maintained and enhanced as required by the VWQS, including the anti-degradation policy. Accordingly, this Basin Plan is being issued by ANR with the acknowledgement that it does not meet the requirements of Section 1-02 D (5) of the VWQS.

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Executive Summary

Basin 14 is comprised of the Stevens, Wells, Waits, Ompompanoosuc, and the Middle Connecticut River direct tributaries between the Passumpsic and White River basins. The Basin 14 Tactical Basin Plan provides an overall view of the health of the basin and defines on-going and future actions to address high-priority stressors and protection of high quality waters.

High priority stressors in the Basin 14 include: encroachments, channel erosion, invasive species, land erosion, pathogens, toxins, nutrient loading, thermal stress, acidity, and flow alteration.

The Tactical Plan actions will protect, maintain, and improve surface waters by managing the activities that cause the known stressor(s) and address the attendant pollutants associated with them. The actions will be strategically targeted to those Basin 14 sub-basins (Figure 1) and specific waters where their implementation would achieve the greatest benefit to water quality and aquatic habitat as well as being the most cost effective.

The top priority actions in the Basin 14 Tactical Basin Plan include the following (not necessarily in prioritized order):

Watershed-wide

- Continue to regularly monitor waters in this basin through the Sample Palooza interstate monitoring program to better determine nutrient load sources as part of the Long Island Sound Nitrogen TMDL implementation.
- Complete Agricultural assessments and BMP implementation through the AEM prioritization process
- Prepare road erosion inventories and capital budgets for all towns in the basin
- Hold workshop(s) in the watershed showcasing and demonstrating practices to protect water quality: Findings from the VT Timber Harvesting Assessment, AMP Revision, Voluntary Harvesting Guidelines for Vermont Landowners

Stevens River Watershed

- Identify flow improvement opportunities, and implement as appropriate, related to the Harvey's Lake dam and Stevens River immediately downstream
- Address potential erosion sources from the Town of Peacham sand storage area.
- Implement high priority recommendations included within the Stevens River Corridor plan and bridge and culvert assessment. Nine high priority river corridor reach projects have been identified. Three high priority culverts have been targeted for replacement due to both geomorphic and AOP incompatibility.
- Collect scientific data necessary to determine if Stoddard Swamp in Peacham could meet Class 1 wetland criteria.

- The Peacham Fire District #1 water supply, an artificial impoundment on South Peacham Hollow Brook which includes all waters within its watershed above the intake, is no longer used. The intake has been removed, and the town has gone to wells. DEC recommends that it be reclassified from Class A(2) to Class B to more appropriately protect this water resource.
- Protect the ecologically significant Jewett Brook wetland ecosystem complex by expanding the Roy Mountain Wildlife Management to include the remaining portions of the ecosystem, if appropriate.

Wells River Watershed

- Remediate identified agricultural phosphorus sources to Ticklenaked Pond in the implementation of the TMDL remediation plan to reduce nutrient loads to the pond. Continue monitoring pond waters post-alum treatment.
- Protect the important and unique Peacham Bog wetland ecosystems by supporting the reclassification from a Class 2 wetland to Class 1 wetland.
- Add new biomonitoring sites in the Wells River watershed to document very high quality ecological integrity. New monitoring sites should include Beaver Brook, Osmore Brook, Stillwater Brook, Red Brook, and North Branch.
- Develop and implement a monitoring and remediation plans for the Town of Newbury former landfill and Newbury Paper Sludge sites along the Wells River
- Identify flow improvement opportunities, and implement as appropriate, related to the Boltonville Dam facility on the Wells River
- Implement the 9 high priority recommendations within the Town of Groton road erosion inventory and capital budget.

- Implement high priority recommendations included within the Newbury, Ryegate, Wells River, and Groton Stormwater Mapping Reports. Eight high priority projects have been identified.
- Implement high priority recommendations included within the Wells River Corridor plan and bridge and culvert assessment. Six high priority river corridor reach projects have been identified in the Lower Wells River Corridor Plan. Three high priority culverts have been targeted for replacement due to both geomorphic and AOP incompatibility. The Upper Wells River Corridor has underway as of the writing this plan.
- Undertake the removal of the defunct Wells River Number 9 dam in Groton Village.
- Selectively restore in-stream fisheries habitat within the upper Wells River with the Groton Forest state-owned lands and Wildlife Management Areas.

Waits River Watershed

- Identify and remediate the sources responsible for the impairment of the unnamed tributary to Tabor Branch. Sources of sediment and nutrients include gravel road erosion, runoff from the East Topsham town garage, and local small farms.
- Implement riparian buffer planting projects on the South Branch, Tabor Branch and Waits River main stem sub-watersheds to address possible thermal stress and altered waters impacts.
- Implement high priority recommendations included within the Waits River Corridor plan and bridge and culvert assessment. Thirteen high priority river corridor reach projects have been identified. Twenty high priority culverts have been targeted for replacement due to both geomorphic and AOP incompatibility.
- Determine the feasibility of implementing in-stream fisheries habitat improvement projects on the Waits River main stem, and implement as appropriate.
- Implement high priority Town of Bradford Stormwater Mapping Report recommendations. Five medium and high priority projects have been identified.
- Develop and implement a remediation plan for Pike Hill Mine Super Fund site and impaired Pike Hill Brook and Cookville tributary #4.
- Pursue flow restoration opportunities related to the Bradford Dam facility on the Waits River

Ompompanoosuc River Watershed

- Implement the Ompompanoosuc Bacteria TMDL remediation plan by determining sources of bacteria, conducting additional water quality monitoring, implementing targeted agricultural BMPs, expanding and protecting riparian corridors, and septic system maintenance outreach.
- Address potential septic failures identified through illicit discharge inventories and sanitary surveys in the town of West Fairlee.
- Implement the high priority Town of West Fairlee Stormwater Mapping Report recommendations. Watershed projects 1 and 2 are highest priority projects.
- Implement high priority recommendations included within the Ompompanoosuc River Corridor plans and bridge and culvert assessments. Fourteen high priority river corridor reach projects have been identified. Fifteen high priority culverts have been targeted for replacement due to both geomorphic and AOP incompatibility.
- Continue implementing remediation measures associated with the Elizabeth Mine and impaired reaches of Cooperas Brook and unnamed tributaries to Lords Brook.
- Consider suitability of conducting a Use Attainability Analysis for Copperas Brook in consideration of the historic habitat alteration due to the Elizabeth Mine.
- Implement the remediation plan for the Ely Mine Super Fund site and impaired School House Brook and tributary.
- Continue water quality monitoring at the Fish and Game Club property in Thetford and implement BMPs that will prevent lead from entering waterways.

Middle Connecticut River Direct Watersheds

- Use Critical Source Area (CSA) "lite" agricultural runoff modeling maps (Appendix K.) to better identify potential sources of nitrogen from agricultural sources as part of the Long Island Sound N TMDL.
- Use the NRCS wetland inventory prioritization tool to direct wetland protection and restoration projects within the CT River corridor on the Vermont side.
- Implement high priority recommendations included within the Bloody Brook River Corridor plan and bridge and culvert assessment. Nine high priority river corridor project reaches have been identified. Two high priority culverts have

been targeted for replacement/removal/retrofit due to both geomorphic and AOP incompatibility.

- Complete a riparian buffer inventory along the CT River corridor (Vermont side) and downstream most reaches of direct tributaries. Implement high priority buffer projects.
- Protect the significant wetland and lakeshore ecosystems around Symes Pond by expanding the Roy Mountain Wildlife Management Area to include all these areas.
- Increase conservation flows below the Wilder Dam and reduce the magnitude of peaking operations and water level fluctuations in the impoundment which would improve aquatic habitat in the Connecticut River, as appropriate related to the Wilder Dam on the Connecticut River through the FERC re-licensing and 401 process.
- Develop a new portable skidder bridge rental program in the watershed.

Accompanying this public review draft, the Vermont Agency of Natural Resources has prepared an online mapping tool, the *ANR Natural Resources Atlas*, that allows the reader to identify the locations of many Basin features, and actions identified in the Implementation Tables 19-24 http://anrmaps.vermont.gov/websites/anra/

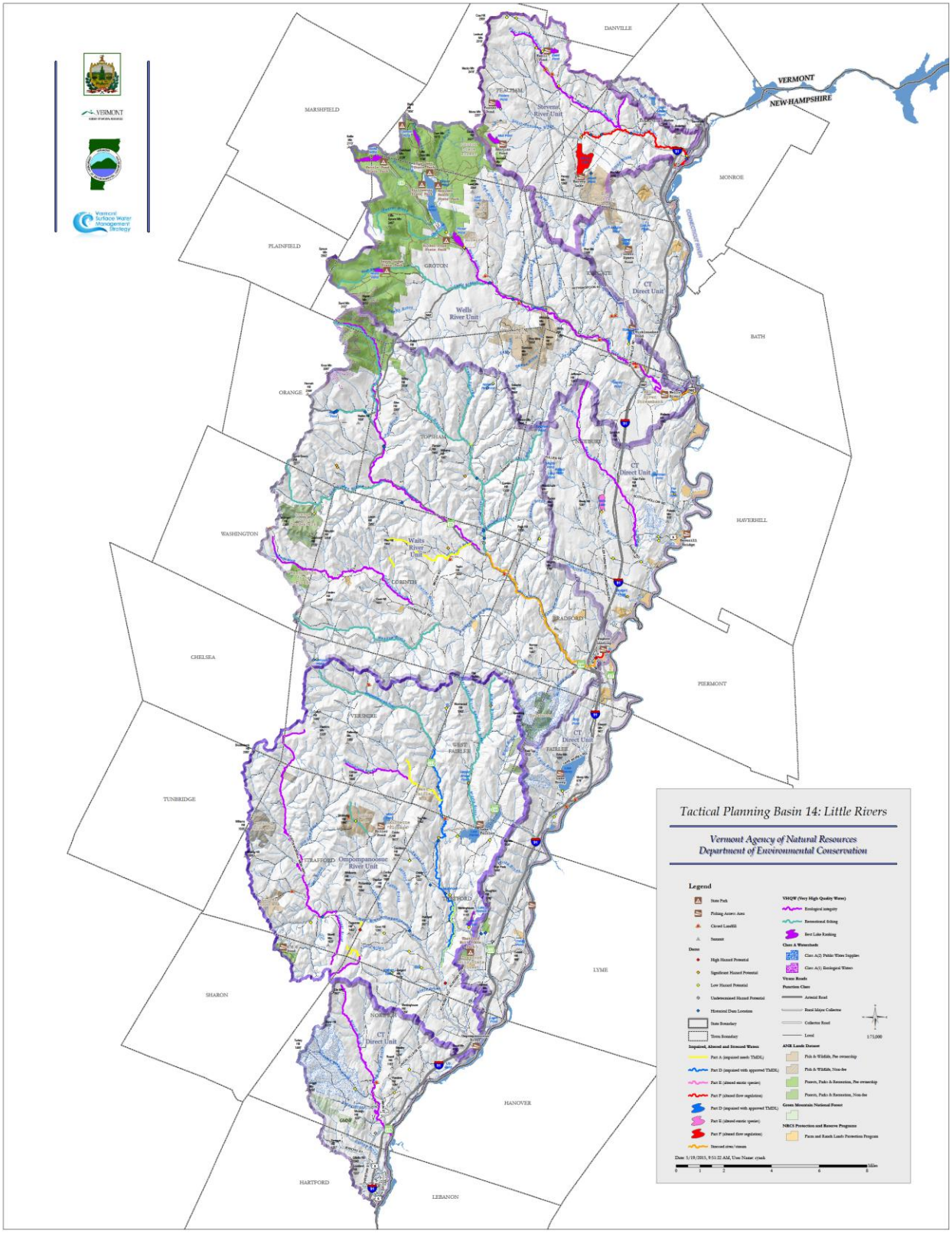


Figure 1. Basin 14 Map

Chapter 1 - Introduction

A. Basin Description

The DEC Basin 14 Water Quality and Aquatic Habitat Assessment Report, 2012 basin 14 encompasses portions of Orange, Caledonia, Washington, and Windsor Counties. Major sub-watersheds include the Stevens, Wells, Waits, and Ompompanoosuc watersheds as well as the Connecticut River direct tributaries located between the Passumpsic and White River confluences with the main stem (Figure 1.). The watershed and its sub-watersheds are described in detail in Chapter 2.

B. Purpose of the Tactical Plan

Tactical basin plans are developed according to the goals and objectives of the Vermont Surface Water Management Strategy to protect, maintain, enhance, and restore the biological, chemical, and physical integrity, and public use and enjoyment of Vermont's water resources, and to protect public health and safety. The Tactical Planning Process is outlined in Chapter 4 of the Surface Water Management Strategy.

ANR completed a Basin 14 Plan in 2008. That plan contained 117 recommendations to protect and restore water quality and aquatic habitat in the basin. Many of these recommendations have been implemented or are in progress by ANR and its watershed partners. This tactical plan builds upon those original plan recommendations by promoting specific, geographically explicit actions in areas of the basin that have been identified for intervention, using on-the-ground monitoring and assessment data or by recommending locations needed for monitoring and assessment.

C. Watershed Partners

There are numerous active organizations undertaking watershed monitoring, assessment, protection, restoration, and education and outreach projects in the Basin 14. These partners are non-profit, state, and federal organizations working on both private and public lands. Some of the watershed partners in this basin include (also see Appendix B.):

- Connecticut River Watershed Council (CRWC)
- Connecticut River Joint Commissions (CRJC)
- Two Rivers Ottauquechee Regional Commission (TRORC)
- Northeastern Vermont Development Association (NVDA)
- White River Natural Resources Conservation District (WRNRCD)
- Caledonia County Natural Resources Conservation District (CCNRCD)

- Vermont Association of Conservation Districts (VACD) and Agricultural Resource Specialists (ARS)
- Vermont Agency of Transportation (VTrans)
- Better Backroads Program
- Vermont Agency of Agriculture, Food and Markets (AAFM)
- USDA Natural Resources Conservation Service (NRCS)
- US Fish and Wildlife Service (USFWS)
- Army Corps of Engineers (ACOE)
- Vermont Land Trust (VLT)
- Vermont River Conservancy (VRC)
- Upper Valley Land Trust (UVLT)
- Municipalities
- Orange County Headwaters Project (OCHP)
- Agency of Natural Resource (ANR) Partners- Department of Fish and Wildlife (DFW), Department of Forests, Parks and Recreation (DFPR), and Department of Environmental Conservation (DEC)

D. Implementation Process

This Tactical Plan spells out clear, attainable goals and targeted strategies to achieve those goals. The plan contains an Implementation Table (Chapter 4) by which progress can be tracked with regard to measurable indicators of each major goal.

Actions defined in the Implementation Tables (Tables 19-24) will be addressed over the life of the Tactical Basin Plan. Successes and challenges in implementing Actions will be reviewed and addressed in annual meetings with watershed partners. The Tactical Plan will not be a static document. Tropical Storm Irene has taught us that DEC and its partners have to develop adaptive management techniques as new or emerging natural and anthropogenic events and stressors present themselves. The implementation of actions and Implementation table itself may have to be modified accordingly to best address any unanticipated events in this iterative process.

About Flood Resiliency

The Vermont Legislature passed Act 16, which took effect in July 2014. The Act requires municipal and regional plans to incorporate a "flood resilience" component of element. Working towards resiliency means both proactively reducing vulnerabilities to flooding and flood damage, and improving response and recovery efforts when flood events do occur, so that communities bounce back quickly long term economic, social, and natural resource impacts. The effort will include using maps to identify local flood hazard

areas, pointing to specific areas that should be protected because they slowdown or attenuate floodwaters (including floodplains, river corridors, forests and wetlands) and recommending specific strategies and policies that will help protect these areas and reduce the risks facing existing development. ANR will provide resources, such as river corridor maps (links below), and assistance to make flood resiliency an integral part of town planning. Numerous Basin 14 Tactical Plan Actions will assist communities in becoming more flood resilient (Chapter 4 Implementation Tables and Appendix J.)

http://floodready.vermont.gov/update_plans

http://floodready.vermont.gov/flood_protection/river_corridors_floodplains

http://tinyurl.com/floodreadyatlas

Aquatic Organism Passage (AOP)

The issue of aquatic organism passage affects many species and cuts across several different watershed assessment and restoration areas including: culvert assessments, dam inventories, flood resiliency, aquatic habitat assessments, and river corridor planning. Undersized and improperly installed culverts often result in perched culvert outlets, or drops, that can limit or prohibit upstream movement of fish and aquatic organisms of some or all age classes. In some cases, stream slope, outlet drop, and velocities are too great for certain fish species and age classes, limiting movement. Unless properly sized, aligned, and buried below the channel bottom, culverts lack natural channel bottom features, such as stream substrate, which can serve as resting areas during organism movement. In most cases, dams also prohibit up and downstream movement of aquatic organisms, acting as vertical obstructions. Dams also degrade aquatic habitats through deposition above and scour below the structures and often increase water temperatures by increasing water surface area being exposed to solar radiation.

An important aquatic species that can benefit from improvements to dams and culverts includes the American eel. The American eel is a *Species of Greatest Conservation Need* in Vermont and their status is under review for consideration for listing as a federally threatened or endangered species, due to declining population levels nationally and worldwide. American eels utilize freshwater environments, for most of their life before travelling to the ocean as adults to reproduce. American eels have been observed in waters above Wilder Dam on the Connecticut River, including Lake Morey and Halls Lake.

American eels are very capable of migrating over severe obstacles such as bedrock falls, but need assistance in negotiating vertical obstructions such as dams. Eel passage is currently being considered at the Connecticut River hydroelectric facilities downstream of the Ompompanoosuc River.

Dam inventory and culvert assessment tools help ANR and its partners can be used to identify top priority stream crossing and dam structures for removal or retrofit to better accommodate AOP. Many of the actions described in the Implementation Tables, (Tables 19-24) in Chapter 4, will focus on identifying and upgrading selective structures for these purposes.

Chapter 2- Water Quality in the Basin

A. Summary of Surface Water Assessments

The Agency and its partners have conducted on-going monitoring and assessment throughout the Basin. Water quality, biological and physical assessments have been completed on many of the rivers, streams and lakes. Stormwater inventories and illicit discharge and detection efforts have been carried out in most subwatersheds (Table 2.) stream geomorphic assessment has been completed or is underway in all subwatersheds (Table 3.) . These efforts, as well as those planned for execution during the implementation of this Plan are detailed in Tables 19-24.

The Ambient Biomonitoring Program of WSMD measures the macroinvertebrate and fish communities of rivers and streams in order to evaluate the biological health, or biological integrity of rivers and streams. These surveys are used for detecting aquatic life impairments and assessing their relative severity. Biomonitoring assessments indicate the overall ecological integrity of the river system and provide a method of evaluating waters in comparison to their "reference" condition without human impacts. This program also collects water quality data that are used to assess compliance with Water Quality Standards. The biological and water quality results are used to rank the condition of waters as *Excellent, Very Good, Good, Fair or Poor*, using the Department's Procedures for Ambient Biomonitoring and Assessment. Waters ranked as *Excellent* or *Very Good* have been identified as Very High Quality Waters.

Road Erosion Inventories- identify and prioritize significant sediment and nutrient source sites from transportation infrastructure by municipality. Remediation plans and capital budgets are then prepared for these high priority sites. ANR's Road Erosion Risk Analysis assists in identifying high priority road erosion-related sites. The Road Erosion Risk Analysis layer is located on the ANR Natural Resources Atlas.
http://www.anr.state.vt.us/site/html/maps.htm
Also see *Erosion and Sediment Source Maps* (below and Appendix K.)

The Better Backroads (BBR) Category A grants fund municipal road erosion and bridge and culvert inventories, while the BBR Category B grant targets their implementation. The vast majority of road erosion inventories and capital budgets are older than 5 years old and will need to be updated (Table 2.). These have been identified as priority tactical plan actions.

The Lake Assessment Program of WSMD monitors water quality, assesses atmospheric pollution impacts, surveys shoreland and lake habitat, and determines impacts from invasive species for lakes and ponds. Numerous lakes and ponds have been assessed in this Basin. The condition of lakes is described in Table 1.

Table 1. Lake Score Card Ratings for Basin 14 Lakes and Ponds

Lake/Pond	Water Quality	Atmospheric Pollution	Shoreland and Lake Habitat	Invasives
Upper Symes				
Lower Syms				
Harvey's Lake				
Ewell Pond				
Fosters Pond				
Mud Pond (Peac)				
Martin's Pond				
Osmore Pond				
Kettle Pond				
Groton Lake				
Levi Pond				
Ricker Pond				
Noyes Pond				
TicklenakedPond				
Harriman Pond				
Round Pond				
Halls Lake				
Lake Morey				
Lake Fairlee				
Mud Pond (Thet)				
Lake Abenaki				
Norford Lake				
Miller Pond				

Blue = Good Conditions
Yellow = Fair Conditions
Red = Reduced Conditions
White = no data available

The Agricultural Environmental Management (AEM) Process of VACD first involves windshield reconnaissance tours (Tier 1) conducted with DEC and District managers and ARS staff at the sub-watershed level. Three tours were conducted, one each in the Ompompanoosuc, Waits, lower Wells and Connecticut River direct tributaries and main stem, and Stevens and upper Wells. As a result of these tours, we identified approximately 2 dozen small farms where potential BMP needs were noted. Some of these BMPs included livestock exclusion fencing, barnyard management, manure storage, and riparian buffers. District and ARS staff have begun following up and meeting with farmers to provide technical assistance and cost-share program information. In some cases AAFM regulatory staff, and where appropriate, DEC, will be brought in (See Appendix G.). Also see *Erosion and Sediment Source Maps* (below and Appendix K.)

Geomorphic assessments and River Corridor Plans integrate watershed-wide physical stream characteristics from maps, aerial photographs, existing studies, and field data on the geographic, geologic, and hydrologic factors of the stream channel and floodplain characteristics. This information reveals equilibrium departures, ongoing channel adjustments, and provides a detailed characterization of riparian and in-stream habitat, stream-related erosion, and flood hazards for use in watershed planning. Geomorphic assessments generally include a comprehensive assessment of bridge and culverts for both geomorphic and aquatic organism passage (AOP) compatibility. Table 3. and Appendix (Figures J.1 and J.2) show the locations and links for those completed or underway in the Basin. High priority river corridor and bridge and culvert projects are included in Appendix J.

Stormwater Infrastructure Mapping and Illicit Discharge Detection and Elimination (IDDE) Stormwater Infrastructure Mapping Projects provide an overall picture and understanding of the connectivity or connectedness of the storm system on both public and private properties in order to raise the awareness of the need for regular maintenance. It is also a valuable tool for hazardous waste material spill planning and prevention. Outfall locations and system connectedness data are used as a base for locating illicit or illegal discharges of non-stormwater to the municipal storm system and tracing them up to the source. Knowledge of which areas of sewer service area have combined stormwater and sewer water systems can better assist municipalities in planning and implementation of combined sewer separation projects. High priority stormwater management remediation projects are identified in the Tactical Plan Implementation Tables (Tables 19-24) in Chapter 4.

A comprehensive summary of available assessment information from all of these processes is compiled into the Basin Water Quality Assessment Report which details the conditions on a sub-watershed and reach level.

Erosion and Sediment Source Risk Maps- These maps identify areas with a potentially higher risk of erosion and sediment loading from agricultural field and road runoff , based on readily available landscape data. The results can be used as a first step in identifying and prioritizing sites for implementation of various land-use BMPs. No ground-truthing has been conducted to verify predicted risk levels.

Table 2.Monitoring and Assessments in Basin 14

Sub-basin	River Corridor Plans*	Bridge and culvert*	Road Erosion Inventories (in last 5 years)	Stormwater Infrastructure Mapping	IDDE	AEM	Biomonitoring (See sub-basin descriptions)
Stevens	C	C	-	None	None	T1-C T2- O T3- O	C and O
Wells	Lower-C Upper-O	C/O	Groton (2015)	Groton, Ryegate, Boltonville, Wells River, Newbury	None	T1- C T2- O T3- O	C and O
Waits	C	C	Orange- planned for 2015	Bradford	None	T1-C T2- O T3-O	C and O
Ompompanoosuc	C	C	-	West Fairlee	None	T1-C T2-O T3-O	C and O
Mid Connecticut	P- Town of Norwich complete	C	Norwich	Norwich Hartford Fairlee	None	T1-C T2-O T3-O	C and O

C=completed P=partial O=on-goging T1=Tier 1T2=Tier 2 T3=Tier 3 *= River corridor and bridge and culverts- may need to be further developed or expanded for project development purposes or as the result of catastrophic events such as flash flood

Table 3. Geomorphic Assessments and River Corridor Plans in Basin 14 (also see AppendixJ.1 and J.2)
Links to various reports can be found at https://anrweb.vt.gov/DEC/SGA/finalReports.aspx

Subwatershed	Geomorphic Assessment Report	Date	Report Authors
Stevens	-	-	-
	Stevens River Watershed- Geomorphic Assessment and River Corridor Plan	2011	Redstart Consulting
Wells	-	-	-
	Wells River Watershed (lower)- River Corridor Management Plan	2009	Redstart Consulting
	Wells River Watershed (upper)- River Corridor Management Plan and Culvert Assessment	2015 (on-going)	Redstart Consulting
Waits	-	-	-
	Waits River Watershed- Phase 1 and 2 Geomorphic Assessment	2010	Redstart Consulting
Ompompanoosuc	-	-	-
	West Branch Ompompanoosuc- Phase 2 Geomorphic Assessmen, Strafford	2006	Bear Creek Environmental
	West Branch of the Ompompanoosuc Watershed- River Corridor Management Plan, Strafford	2006	Bear Creek Environmental
	Bridge and Culvert Survey- Ompompanoosuc and major tributaries	2007	Two Rivers-Ottauquechee Regional Commission
	Ompompanoosuc River Watershed- Phase 1 Geomorphic Assessment	2009	Bear Creek Environmental
	Ompompanoosuc River Corridor Plan, West Fairlee to Thetford	2011	Bear Creek Environmental
	Ompompanoosuc River Corridor Plan, Thetford to Norwich	2014	Bear Creek Environmental
CT River Direct	-	-	-
	Phase 2 Stream Geomorphic Assessment- Blood Brook, Norwich	2006	Redstart Consulting

Stressors, and Causes and Sources of Impairment

Following the assessment process, waters are categorized and placed onto one or more listings for tracking purposes. The listing of waters is undertaken for Section 303d of the Federal CWA. Outside the scope of the Act's requirements, DEC maintains several other lists for tracking and management purposes. The sum of listings maintained by DEC is collectively known as the Vermont Priority Waters List (DEC, 2005).

Full Support Waters: This assessment category includes waters of high quality that meet all use support standards for the water's classification and water management type.

Stressed Waters: These are waters that support the uses for the classification but the water quality and/or aquatic biota/ habitat have been disturbed to some degree by point or by nonpoint sources of human origin and the water may require some attention to maintain or restore its high quality; the water quality and/or aquatic habitat may be at risk of not supporting uses in the future; or the integrity of the aquatic community has been changed but not to the degree that the standards are not met or uses not supported. Data or other information that is available confirms water quality or habitat disturbance but not to the degree that any designated or existing uses have become altered or impaired (i.e. not supported). Some stressed waters have documented disturbances or impacts and the water needs further assessment.

Stressed waters support designated uses, but the water quality and/or aquatic biota/ habitat have been disturbed to some degree by point or by nonpoint sources of human origin and the water may require some attention to maintain or restore its high quality. In some instances, stressed waters may have documented disturbances or impacts and the water needs further assessment to confirm impairment.

Impaired Waters: These are surface waters where there are chemical, physical and/or biological data collected from quality assured and reliable monitoring efforts that reveal 1) an ongoing violation of one or more of the criteria in the WQS and 2) a pollutant of human origin is the most probable cause of the violation.

Impaired waters are those surface waters where there are chemical, physical and/or biological data collected from quality assured and reliable monitoring efforts that reveal 1) an ongoing violation of one or more of the criteria in the Water Quality Standards and 2) that a pollutant of human origin is the most probable cause of the violation. Impaired waters are those that require pollution control efforts under one or more provisions of the Clean Water Act. The most common mechanism to address an impaired water is the development and promulgation of a Total Maximum Daily Load.

Altered waters are impacted by lack of flow, water level or flow fluctuations, modified hydrology, physical channel alterations, documented channel degradation or stream

Waters for which DEC has no monitoring data and only limited information and knowledge is available are considered "unassessed."

The Vermont Surface Water Management Strategy identifies 10 major stressors (adjacent) that result in pollutant delivery and habitat alteration in Vermont's surface waters. DEC uses monitoring and assessment data to assess individual surface waters in relation to Vermont Water Quality Standards and other relevant guidelines (e.g., stream equilibrium standard) to measure the attainment of surface water designated uses, where three categories of impact may be documented. In this Plan, the highest priority stressors and pollutants are shown by subwatershed, in Section 2C (below). The specific pollutants or conditions that cause stress or impairment on the designated uses of surface waters in the basin that result from each stressor are also shown.

B. Surface Waters Exhibiting Very High Quality

Very High Quality Waters that support biological integrity

There are several sub-watersheds in the basin that support very high water quality condition. Based on VTDEC's long-term sampling of 105 stream locations in the Basin 14 watershed, several sub-watersheds reliably exhibit very good or even excellent ecological integrity.

Very High Quality Lakes and Ponds- Best Lakes

The Lakes and Ponds Management and Protection Section of DEC recently completed a process to identify high quality lakes in the state to prioritize conservation and protection efforts. As part of the "Best Lakes" rankings, lakes and ponds were independently ranked in three separate categories using long-term datasets for water quality, biological diversity and unusual or scenic natural features. Scores from the separate categories were combined to identify lakes with exemplary qualities in all three.

Very High Quality Waters that support recreational fishing

VT Department of Fish and Wildlife assesses wild trout populations and important nursery areas to document very high quality recreational fisheries, which are typically found in surface waters that exhibit clean and cool conditions. Abundant wild trout populations are defined as supporting multiple age classes of one or more species of wild trout (brook, brown, rainbow trout) at levels generally equal to or greater than 1,000

fish/mile and/or 20 pounds/acre. It should be recognized that wild trout populations vary widely from year to year and therefore an individual population may sometimes go below or greatly exceed these values in a given year. Other waters that have not been surveyed may also support similar wild trout densities and may be identified in the future. Certain noteworthy streams are also important to support spawning and nursery habitat. Sub-basin descriptions list streams supporting wild trout populations and nursery tributaries.

Based upon the above criteria, Table 4 lists VHQWs for Basin 14.

Table 4. VHQWs for Basin 14

Sub-basin/Water	Extent	VHQW-Biological Integrity	VHQW-Best Lakes	VHQW-Recreational Fishing
Stevens	-	-	-	-
Stevens River	entire	✓		
East Peacham Brook	entire	✓		
Foster Pond	entire		✓	
Ewell Pond	entire		✓	
Mud Pond (Peacham)	entire		✓	
Martin Pond				✓
Wells	-	-	-	-
Wells River	RM 12.0 and up	✓		
Kettle Pond	entire		✓	
Osmore Pond	entire		✓	
Levi Pond	entire		✓	
Noyes Pond	entire		✓	✓
Ricker Pond	entire		✓	
South Branch Wells	entire			✓
Hosmer Brook	entire			✓
Depot Brook	entire			✓
Coldwater Brook	entire			✓
Beaver Brook	entire			✓
Waits	-	-	-	-
Waits River	RM 10.3 and up	✓		
Cookville Brook	RM 1.5 and upstream	✓		
Waits River	Routes 302 and 25 intersection and up			✓
Riddle Pond outlet	entire			✓
East Orange Branch	entire			✓
Tabor Branch	entire			✓

Powder Spring Brook	entire			✓
Levi Brook	entire			✓
Hedgehog Brook	entire			✓
Meadow Brook	entire			✓
Ompompanoosuc	-	-	-	-
West Branch	RM 6.0 and up	✓		
Lord Brook	RM 3.4 and up	✓		
Sargent Brook	entire	✓		
Schoolhouse Brook	RM 2.3 and up	✓		
Lake Abenaki	entire		✓	
Ompompanoosuc	Upstream of Brimstone Corners			✓
Middle Brook	entire			✓
Bear Notch Brook	entire			✓
Abbott Brook tributary (Podunk Wildlife Management Area)	entire			✓
Old City Brook	entire			✓
Middle Connecticut	-	-	-	-
Bloody Brook	entire	✓		
Peach Brook	entire	✓		
Zebedee Brook	entire	✓		
Charles Brown Brook	entire			✓

C. Sub-basin Descriptions

Based upon the 2013 Assessment Report, and the available monitoring and assessment data, the following sub-watershed specific summaries have been prepared.

Stevens River Watershed

The Stevens River watershed is located adjacent to and just south of, the Passumpsic River basin and is about 49 square miles or 31,360 acres in area (Figure 3.). The origin of the river's waters are the tributaries that flow from the eastern sides of Lookout Mountain and Macks Mountain into Willow Brook; from the wetlands and ponds in the northern part of Peacham into Peacham Hollow Brook (East Peacham Brook on the USGS map) and from the tributaries and ponds on the eastern side of Morse Mountain, Devil's Hill, and Jennison Mountain into South Peacham Brook. Peacham Hollow Brook, South Peacham Brook and the drainage from Harvey's Lake, which enters South

Peacham Brook in West Barnet, all converge to form the Stevens River. Peacham Hollow Brook is about 7 miles long and its watershed is 17.2 square miles. South Peacham Brook is 4.5 miles long and has a 12.5 square mile watershed. There are a number of large lakes and ponds in the Stevens River watershed including Harvey's Lake (351 acres), Martins Pond (82 acres), Fosters Pond (61 acres), Ewell Pond (51 acres) and Mud Pond (34 acres).

Assessment Information for the Stevens Sub-watershed

Table 5. Biological Monitoring in the Stevens River watershed

Stream	Rivermile	Community	Result	Year
Stevens River	1.4	macroinvertebrates	exc-vgood	2007
Stevens River	4.0	macroinvertebrates	excellent	2010
Stevens River	4.0	fish	very good	2010
Stevens River	4.0	macroinvertebrates	exc-vgood	2012
Stevens River	4.0	fish	good	2012
East Peacham Brook	0.4	macroinvertebrates	exc-vgood	2007
East Peacham Brook	0.4	fish	excellent	2007

Table 6. Additional Biological sampling needs in the Stevens River watershed

Stream	Location	Comments
South Peacham Brook	Several sites along its length	a biologically underserved area- no bio sites on this major trib to the Stevens River at all
Tribs to South Peacham Brook	One or two tributaries sites	there are a number of tributaries to South Peacham Brook – add sample points on one or two tributaries
East Peacham Brook	One site in Peacham	two sites at least are needed upstream of where the one sample has been taken in the past
Tribs to East Peacham Brook	anywhere	none of the tributaries are sampled
Cloud Brook	anywhere	a sample

Special Values and Features

Lucy Mallary Bugbee Natural Area- 12 acres, Towns of Peacham and Danville. This Natural Area includes Stoddard Swamp, a northern white cedar swamp, and a fen (type of peatland) rich with a variety of wildflowers, some of which are listed as threatened and endangered. The Natural Area was named after a pioneer in the protection of Vermont's wildflowers and given to the State by the New England Wildflower Society.

Jewett Brook Wetland Complex is Tier 1 *Biofinder* designated wetland, indicating that it yields a great contribution to biological diversity. There is significant northern cedar swamp, a rare sedge, a vernal pool, and it is part of a landscape connecting block.

On the map (Figure 2), yellow shading is the wetland layer; the purple outlines significant natural communities and in this case, the cedar swamp; the red hatching is a rare species general location.

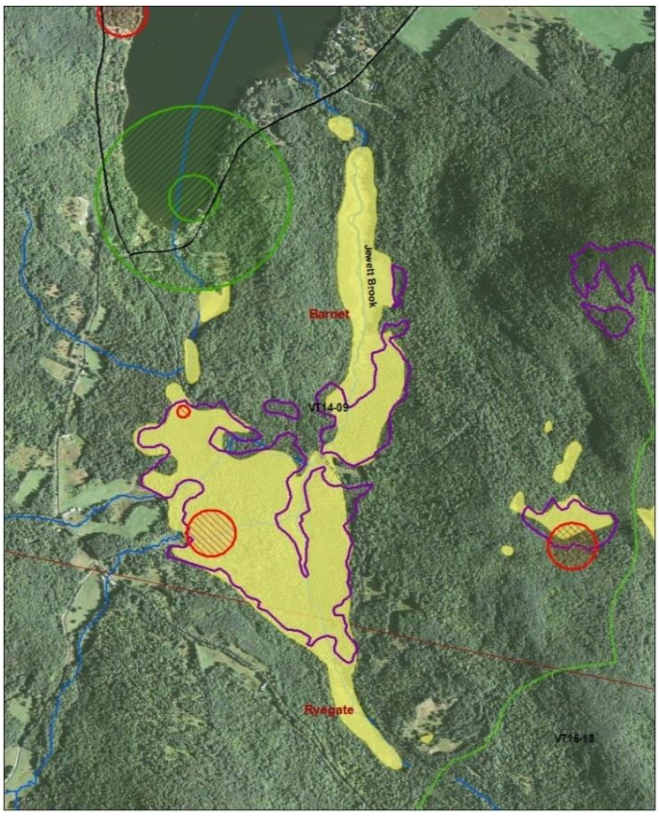


Figure 2 Jewett Brook Wetland Complex

Impacts or Stresses

Table 7. Stevens River Watershed Summary of Waters on the Vermont Priority Surface Waters Lists

Stream or Lake Segment	Milage & Status	Pollutant/stressors	Source	Other information
Stevens River – below Harveys Lake	***Altered –*** Part F list	Flow alteration 	Dam management alters aquatic habitat	(see next row)

Harveys Lake	***Altered-*** Part F list	Flow alteration 	Water level management alters aquatic habitat	Town is exploring dam reconstruction

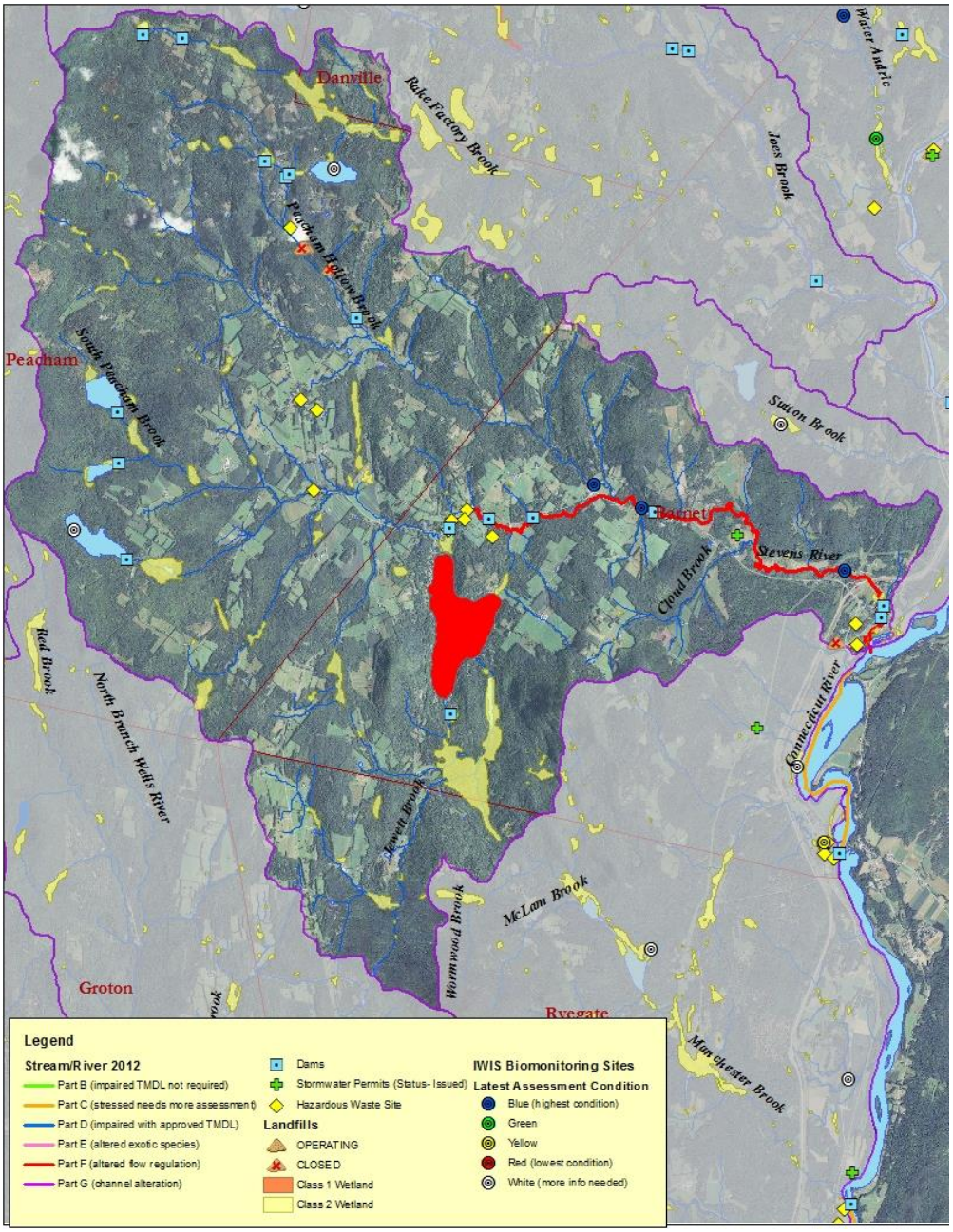


Figure 3. Steven River Watershed Features

Wells River Watershed

The Wells River watershed lies south of the Stevens River watershed and is approximately 99 square miles or 63,400 acres (Figure 4). The headwaters of this drainage area arise in part on the slopes of Blake Hill, Owl's Head Mountain, Spice Mountain, Kettle Mountain and Little Spruce Mountain all in Groton State Forest and flow either into Kettle and Osmore Ponds or form brooks that flow into Groton Lake or Ricker Pond. Drainage from the slopes of Devil's Hill, Jennison Mountain, Jerry Lund Mountain and Wesson Hill form Red Brook and the North Branch Wells River, which are two of the three largest tributaries to the Wells.

The Wells River itself begins below Lake Groton and Ricker Pond and flows southeasterly through Groton, South Ryegate and the northern portion of Newbury before meeting the Connecticut River in the Village of Wells River.

The South Branch Wells River is the other significant tributary, in addition to Red Brook and the North Branch. It arises in Noyes Pond and flows for approximately 7 miles before it joins the Wells River mainstem between West Groton and Groton.

There are seven large lakes and ponds in the Wells River watershed including Lake Groton (422 acres), Kettle Pond (109 acres), Ricker Pond (95 acres), Ticklenaked Pond (54 acres), Osmore Pond (48 acres), and Noyes Pond (39 acres).

Assessment Information for the Wells River

The map below (Figure 4.) compiles some of the assessment information for the Wells River and its tributaries. Shown are the Vermont DEC biomonitoring sites (macroinvertebrate or fish communities), hazardous waste sites, stormwater permits that have been issued, landfill locations, as well as impaired, altered, or stressed streams and which priority water list that waterbody is on.

Table 8. Biological Monitoring results for the Wells River Watershed

Stream	Rivermile	Community	
Wells River	Rm 10.5	macroinvertebrates	excellent
Scotch Burn	Rm 0.5	macroinvertebrates	exc-vgood
Scotch Burn	Rm 0.5	fish	poor

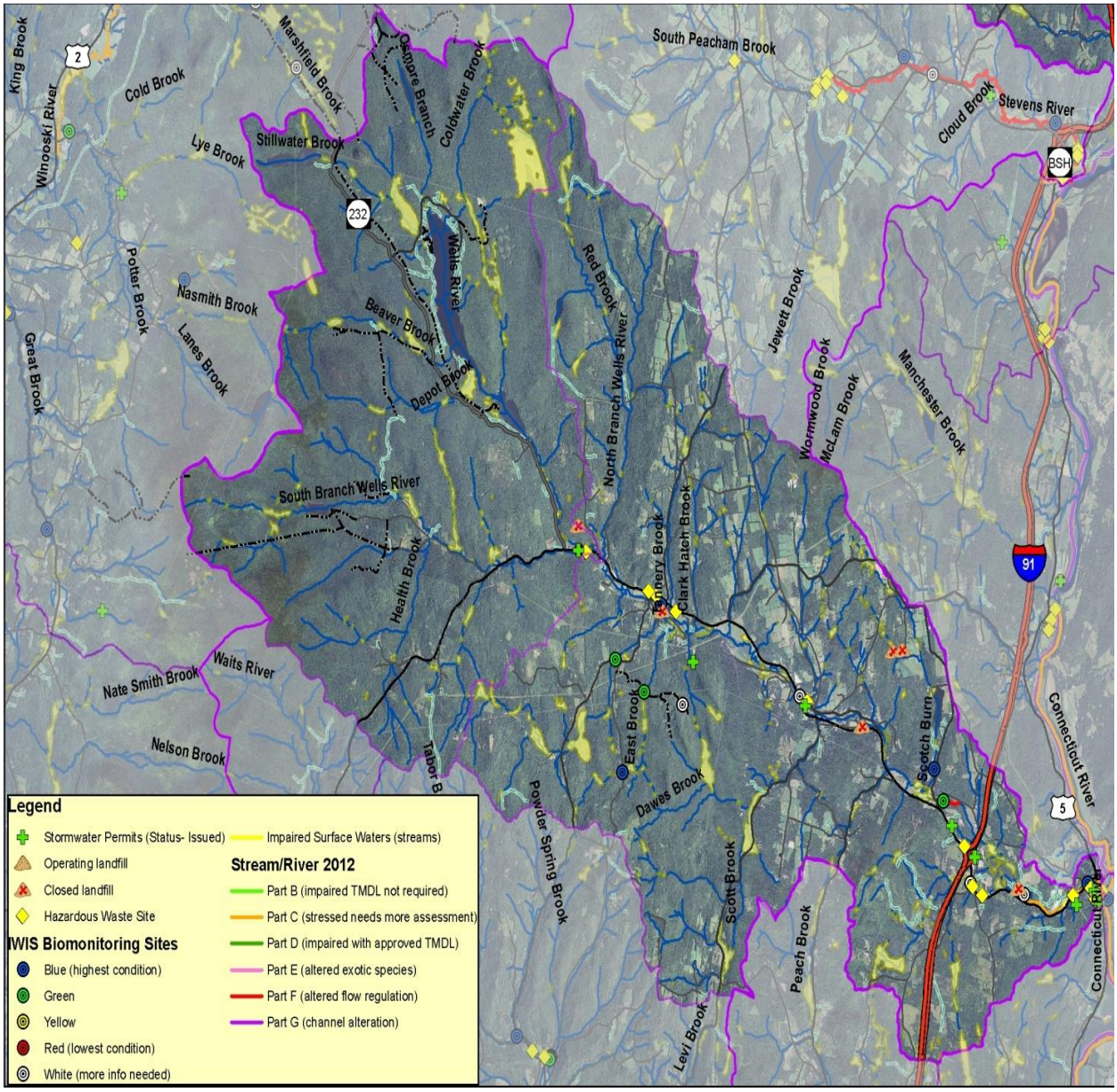


Figure 4. Wells River Watershed Features

Table 9. Additional Biological Monitoring Needs in the Wells River Watershed

Stream or river name	Location/number of sites	Comment
Wells River	Two – stations 4.4 and 10.5	Update current sites
North Branch Wells River	One or two.	Have no bio data
Red Brook	One site.	Have no bio data
Beaver Brook	One site	Have no bio data
Osmore Brook	One site	Have no bio data
Coldwater Brook	One site	Have no bio data
Tannery Brook	One site	Have no bio data

Special Values and Features

Peacham Bog

This natural area is 748 acres in Groton State Forest in town of Peacham. Peacham Bog is the second largest peatland in Vermont, one of the two documented "raised" (slightly domed due to peat build-up at the center) bogs in the state. The Natural Area includes the bog of 125 acres and an extensive buffer of a variety of wetlands and upland softwoods. Many wildlife species, including moose, bobcat, and fisher, use the area.

Biodiversity

The headwaters area of the Wells River watershed is mapped (Figure 5.) as making the "greatest", Tier 1, or "very high," Tier 2, contribution to biodiversity. There are additional scattered areas of this very high biodiversity.

The purple/deep blue that indicates the very high and greatest contribution to biodiversity is an area that contains a number of rare species locations, a number of uncommon species locations, Peacham Bog (a rare natural community), a lot of area mapped as uncommon natural community, some vernal pools, four areas mapped as mast stands, and surface waters with good riparian areas. This upper part of the watershed is also part of a very large habitat block and a portion of it is considered rare physical landscape. It is an "anchor block" in terms of connectivity.

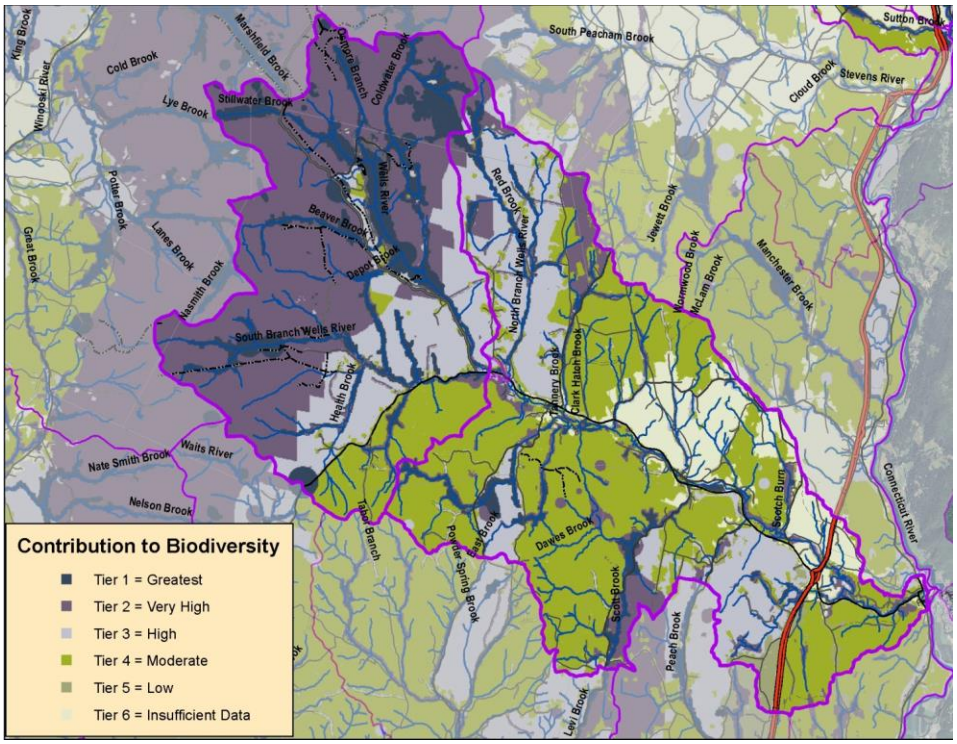


Figure 5. Degrees of Known Biodiversity in the Wells River watershed.

Impacts or Stresses

Table 10. Wells River Watershed Summary of Waters on the Vermont Priority Surface Waters Lists

Stream or Lake Segment	Milage & Status	Pollutant/stressors	Source	Other information
Levi Pond (Groton)	***Impaired-*** Part D list	Acid 	acid deposition	EPA approved the TMDL on September 20, 2004
Ticklenaked Pond (Ryegate)	***Impaired-*** Part D list	Phosphorus 	Ag runoff in the past	Algae blooms, low D.O. EPA approved the TMDL November 30,2009. Pond treated with Alum summer 2014. (see Chapter 4)
Wells River – below Boltonville dam	0.4 miles ***Altered –*** Part F list	Poor flow, physical alterations in bypass section 	Boltonville hydro facility	FERC Exemption
Wells River – downstream of Newbury Landfill	0.5 miles ***Stressed***	Iron 	Newbury Landfill (closed)	Landfill leachate enters the river via groundwater – aesthetics is stressed (see Chapter 4)

The TMDL for Vermont Acid Impaired Lake, including Levi Pond, can be viewed at: http://www.anr.state.vt.us/dec/waterq/mapp/docs/mp_TMDL.acid2004.pdf

Waits River Watershed

The Waits River originates below the slopes of Signal, Burnt and Butterfield Mountains in the southern part of Groton State Forest (Figure 6.). It is 23 miles long and flows southerly for about 8 or 9 miles before taking a turn and flowing southeasterly for 14 or 15 miles before entering the Connecticut River in Bradford. The total drainage area of the watershed is approximately 144.3 square miles or 92,400 acres.

The two largest tributaries to the Waits River are the South Branch and the Tabor Branch. The Tabor Branch is 10 miles long and drains 28.4 square miles or 18,180 acres. It flows from the base of the hills in northwestern Topsham south, southeast then south again converging with the Waits River just below East Corinth. The South Branch of the Waits River is 10 miles long and drains 44 square miles or approximately 28,160 acres. The South Branch is formed by the confluence of Cookville and Meadow Brooks in the southeastern part of Corinth and flows easterly the northeasterly meeting the Waits River on the eastern edge of Bradford.

Assessment Information for the Waits River and tributaries

The map below compiles some of the assessment information for the Waits River and its tributaries. Shown (Figure 6. And Table 11) are the Vermont DEC biomonitoring sites, hazardous waste sites, stormwater permits that have been issued, landfill locations, as well as impaired, altered, or stressed streams and the associated list on which they appear.

Table 11. Biological sampling results in the Waits River watershed

River/stream	Rivermile	Year	Result	Community
Waits River	2.4	2012	excellent	bugs
Waits River	2.4	2012	good	fish
Waits River	10.3	2002	excellent	bugs
Waits River	10.3	2005	very good	bugs
Waits River	13.0	2005	very good	bugs
Pike Hill Brook	0.1	2005	fair	bugs
Pike Hill Brook	0.3	2002	poor	bugs
Pike Hill Brook	0.3	2002	poor	fish
Pike Hill Brook	0.4	2005	fair-poor	bugs
Pike Hill Brook	0.4	2005	poor	fish
Pike Hill Brook	0.4	2007	fair	bugs
Pike Hill Brook	0.9	2005	good-fair	bugs
Pike Hill Brook	0.9	2007	fair	bugs
Pike Hill Brook	1.3	2007	good-fair	bugs
Pike Hill Brook	1.4	2005	fair	bugs
Pike Hill Brook	1.4	2007	good	bugs
Pike Hill Brook	1.9	2007	poor	bugs
Pike Hill Brook	2.0	2007	fair	bugs
Pike Hill Brook	2.1	2005	poor	bugs
Pike Hill Brook	2.1	2007	poor	bugs
Pike Hill Brook	2.5	2002	poor	bugs
Pike Hill Brook	2.5	2002	poor	fish
Pike Hill Brook	2.6	2005	poor	bugs
Pike Hill Brook	4.0	2007	poor	bugs
Pike Hill Brook Trib #3	0.2	2007	good	bugs
Powder Spring Brook	0.1	2008	excellent	bugs
Tabor Branch Trib 5	0.5	2008	good	bugs
Tabor Branch Trib 6	0.0	2007	good-fair	bugs
Tabor Branch Trib 6	0.1	2012	fair	bugs
Cookville Brook	1.5	2007	excellent	bugs
Cookville Brook	8.1	2007	excellent	bugs
Cookville Brook	8.2	2007	exc-vgood	bugs
Cookville Brook Trib #4	0.1	2007	exc-vgood	bugs
Cookville Brook Trib #4	0.9	2005	good-fair	bugs
Cookville Brook Trib #4	1.7	2007	poor	bugs
Cookville Brook Trib #4	1.8	2007	good	bugs

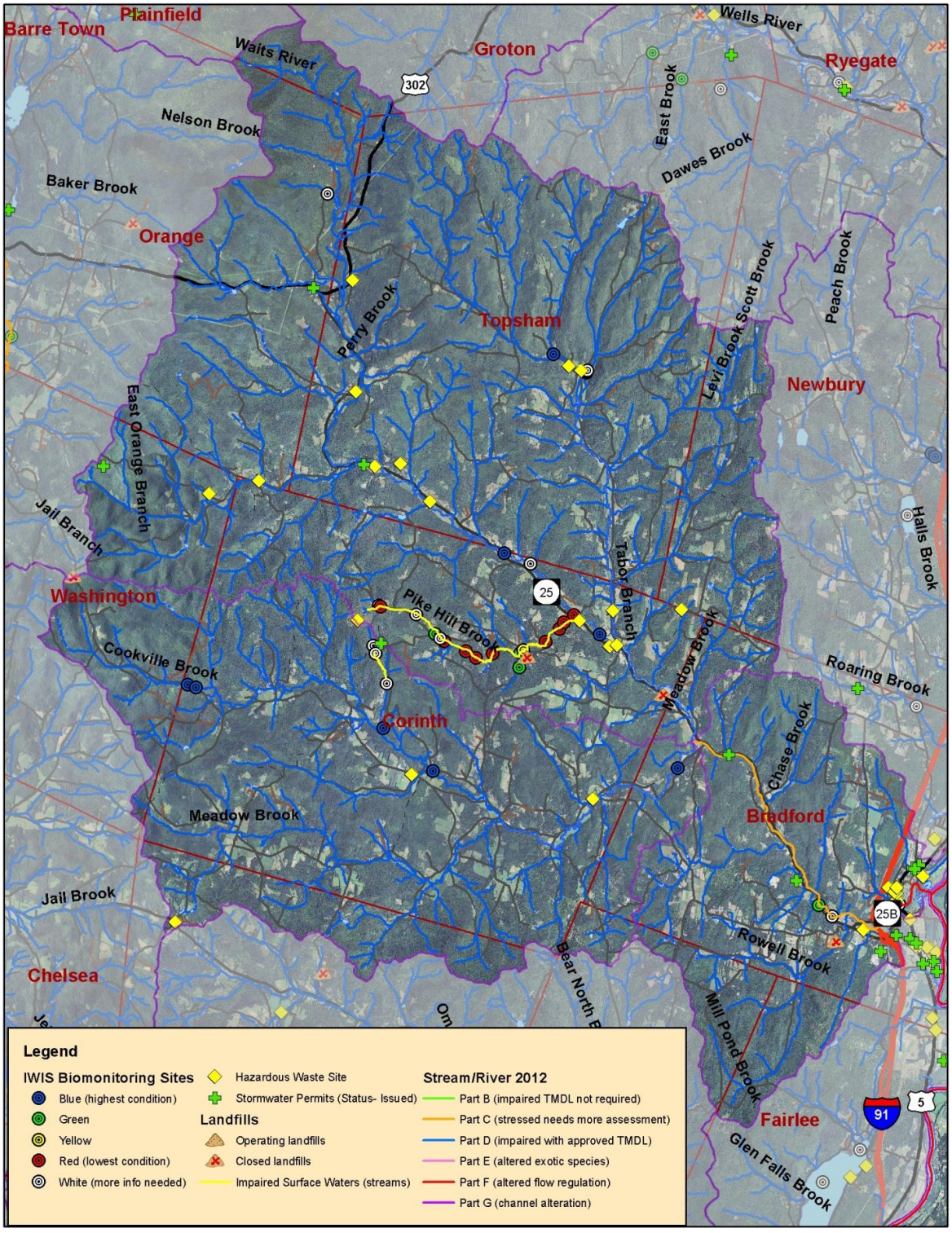


Figure 6. Waits River Watershed Features

Special Values and Features

Biological Diversity

As shown in the map below, there are three areas in the Waits River watershed/Halls Brook watersheds that have a very high contribution to biological diversity (the purplish color in the map below.)

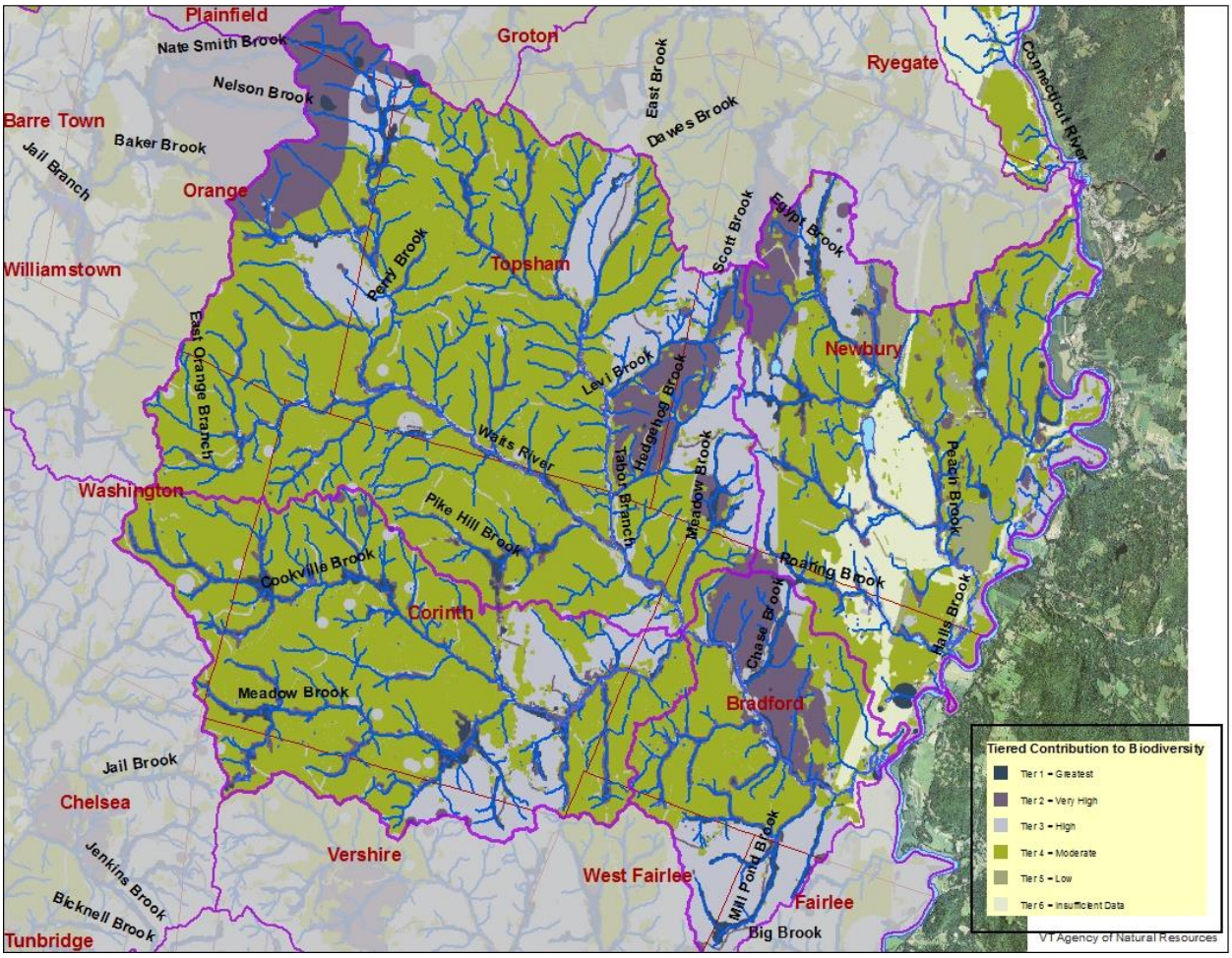


Figure 7. Degrees of Known Biodiversity in the Waits River Watershed

Impacts or Stresses

Table 12. Waits River Watershed Summary of Waters on the Vermont Priority Surface Waters Lists

Stream or Lake Segment	Milage & Status	Pollutant/stressors	Source	Other information
Pike Hill Brook from mouth upstream	4.0 miles ***Impaired*** – Part A list	Metals 	Former Pike Hill Mine	(see Chapter 4)
Tabor Branch Trib #6	0.1 mile ***Impaired*** – Part A list	Undefined   	Agricultural runoff	(see Chapter 4)
Cookville Brook Trib #4	0.7 miles ***Impaired*** – Part A list	Metals 	Drainage from abandoned Pike Hill Mile	Possible some enrichment/organic material as well (see Chapter 4)
Waits River below South Branch confluence to mouth	6.2 miles ***Stressed***	sediment, temperature, physical habitat alteration  	Channelization, flood impacts	Waits River watershed hard hit in 1970s, and 1998

				
Waits River between South Branch and Tabor Branch	***Stressed***		Channelization and alteration	Over-widened and shallow
Waits River below Bradford dam	0.3 mile ***Altered*** – Part F list	flow alterations, low flows 	Bradford dam	

Pike Hill Copper Mine: The Pike Hill Copper Mine (Site) is an abandoned copper mine located in Corinth, VT that operated from about 1847 to 1919. The mine waste piles on site are generating acid run off containing high levels of copper and zinc and contributing to sediment loading in local streams. The Site was placed on the US EPA National Priorities List in 2004 due to severe ecological impacts to Pike Hill Brook and Cookville Brook watersheds. DEC water quality monitoring has determined that Pike Hill Brook and a portion of an unnamed tributary to Cookville Brook do not meet Vermont Water Quality Standards and having an impact on the macro invertebrate and fish populations. A series of four wetlands downstream of Pike Hill Brook are also impaired. EPA will continue to conduct additional remedial investigations to assess the potential threats to human health and the environment for future development of a cleanup proposal. Currently there is not any current activity at the Pike hill Copper Mine due to lack of funding.

Ompompanoosuc River Watershed

The Ompompanoosuc River originates above the town of Vershire in Vershire Heights and flows southeasterly for about six miles and then southerly for another 18 miles to its confluence with the Connecticut River near Pompanoosuc Village in the town of Norwich. The river drains a watershed of about 136 square miles or 87,040 acres. The river drops 1020 feet in elevation over the first 6 miles then 430 feet in the remaining 18 miles.

The West Branch is the largest tributary to the Ompompanoosuc River with a length of 16.5 miles and a watershed of about 60 square miles or 38,400 acres. The West Branch originates near Hawkins Mountain in the southwestern portion of Vershire. It flows south until South Strafford then flows generally easterly until its confluence with the Ompompanoosuc just above Union Village Dam.

The largest lakes in this watershed include Lake Fairlee (457 acres), Miller Pond (64 acres), Lake Abenaki (44 acres), and Mud Pond (20 acres).

Assessment Information for the Ompompanoosuc River Watershed

Extensive biomonitoring has occurred in the Ompompanoosuc River watershed and especially in the West Branch subwatershed as documentation of the impacts to the streams affected by the abandoned copper mines has been necessary.

After decades of impairment to the streams below the Elizabeth Mine, recovery has occurred resulting from extensive remediation efforts by EPA and its contractors (see Chapter 4 for a TMDL implementation update). A summary of the mine's impacts and documentation of the recovery can be found at ANR, 2013.

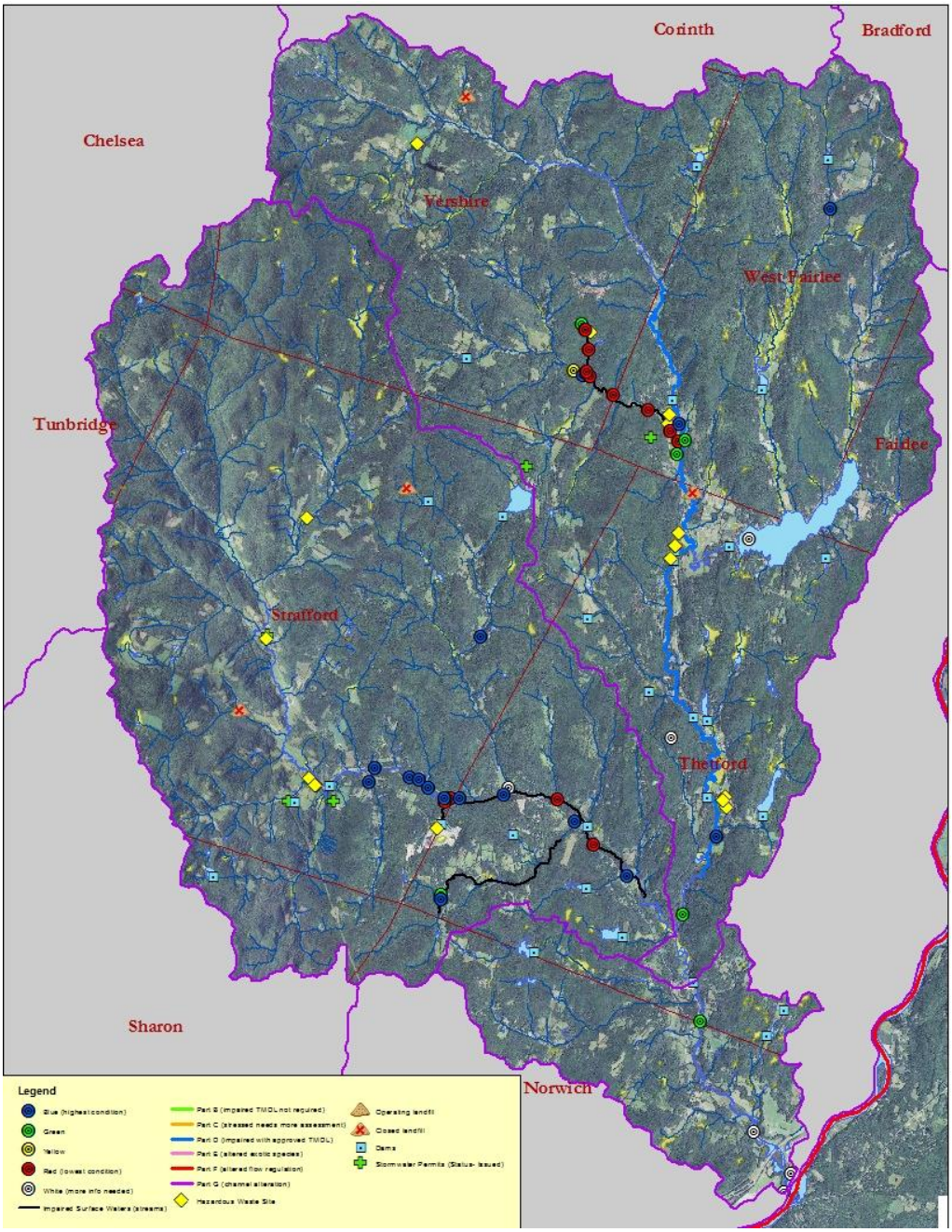


Figure 8. Ompompanoosuc River Watershed Features

Special Values and Features

(See Ompompanoosuc ORW narrative in Chapter 3)

Impacts or Stresses

Table 13. Ompompanoosuc Watershed Summary of Waters on the Vermont Priority Surface Waters Lists

Stream or Lake Segment	Milage & Status	Pollutant/stressors	Source	Other information
West Branch Ompompanoosuc River*	3.8 miles Removed from Part A-List in 2014	metals, acid 	Drainage from abandoned Elizabeth Mine	EPA-DEC remediation has dramatically improved waters (see Chapter 4)
Copperas Brook*	1.0 miles ***Impaired*** – Part A list	metals, acid 	Drainage from abandoned Elizabeth Mine	(see Chapter 4)
Lords Brook*	2.8 miles		Drainage from the "South Cut"	Removed from the A-List in 2014 (see Chapter 4)
Lords Brook-unnamed headwater tributaries*	***Impaired*** – Part A list	metals, acid 	Drainage from the "South Cut"	Added to the 303d list- in 2014 (see Chapter 4)
Schoolhouse Brook and tributary*	2.2 miles ***Impaired*** – Part A list	metals, acid 	Drainage from abandoned Ely Mine	(see Chapter 4)
Ompompanoosuc River from Brimstone Corners to ACOE swimming area*	9.8 miles ***Impaired*** – Part D list	E. coli 	Source unknown	EPA approved a TMDL September 30, 2011 (see Chapter 4)

*See Chapter 4 Recent and On-going Projects for an update of the TMDL implementation

Direct Tributaries to the Connecticut River included within Basin 14

Sub-basin Description

Several unnamed direct tributaries and the Connecticut River streambank and river corridor river right. This section of the Connecticut River is influenced by the McIndoe Falls, Dodge Falls, and Wilder dams (see Flow Altered narrative below). Major direct tributaries to the Connecticut River in this basin (Figures 9a. and 9b.) include:

- Sutton Brook
- Manchester Brook
- Harriman Brook
- Halls Brook /Peach Brook /Roaring Brook
- Roaring Brook (Newbury)
- Roaring Brook (Bradford)
- Bog Pond Brook
- Zebedee Brook
- Dothan Brook
- Bloody Brook/New Boston Brook/Charles Brown Brook

Sutton Brook begins on the western side of Barnet and flows east/southeast into Warden Pond. After Warden Pond, it flows a short stretch into the small Sarah Moores and then on easterly to the Connecticut River entering the river near Nine Islands. Its length is 2.5 miles and its watershed is 3.5 square miles.

Manchester Brook watershed is 8.4 square miles in size. The watershed includes Wormwood Brook which flows into McLam Pond (formerly Upper Symes Pond), which flows into Symes Pond (formerly Lower Symes Pond), the outlet of which is Manchester Brook. It winds southeasterly for 5.5 miles down to the Connecticut river entering just north of East Ryegate village. Manchester Brook and several unnamed tributaries enter the section of the Connecticut River is influenced by the Dodge Falls Dam. Manchester Brook flows southeasterly for 5.5 miles before joining the Connecticut River just upstream of East Ryegate.

Halls Brook, several unnamed direct tributaries and the Connecticut River streambank and river corridor river right. The Halls Brook watershed includes Halls Lake, Egypt Brook, Peach Brook, Round Pond and Muddy Pond. The unnamed tributaries include Harriman Pond and Fish Pond.

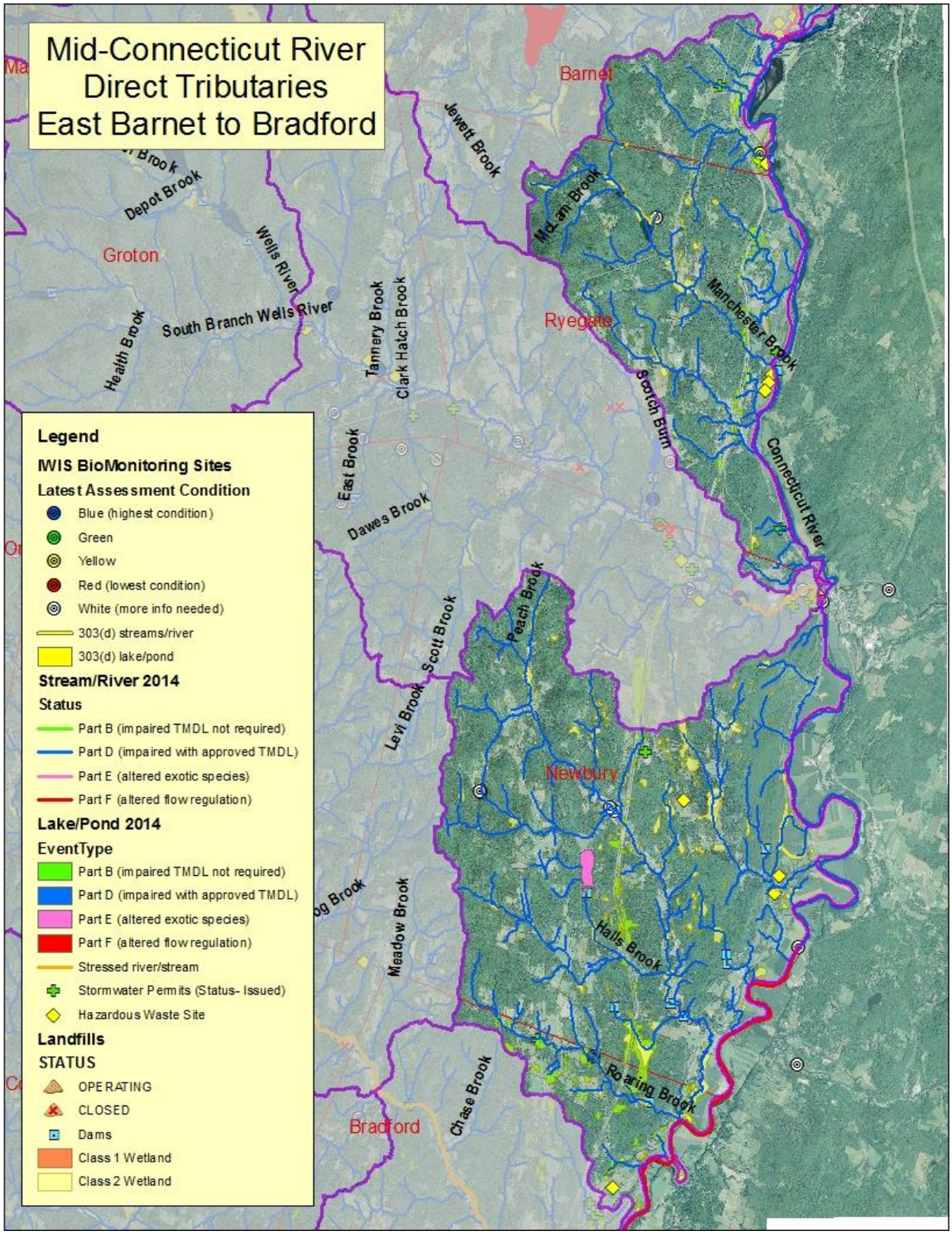


Figure 9a. Middle Connecticut River Direct Tributaries map (upper)

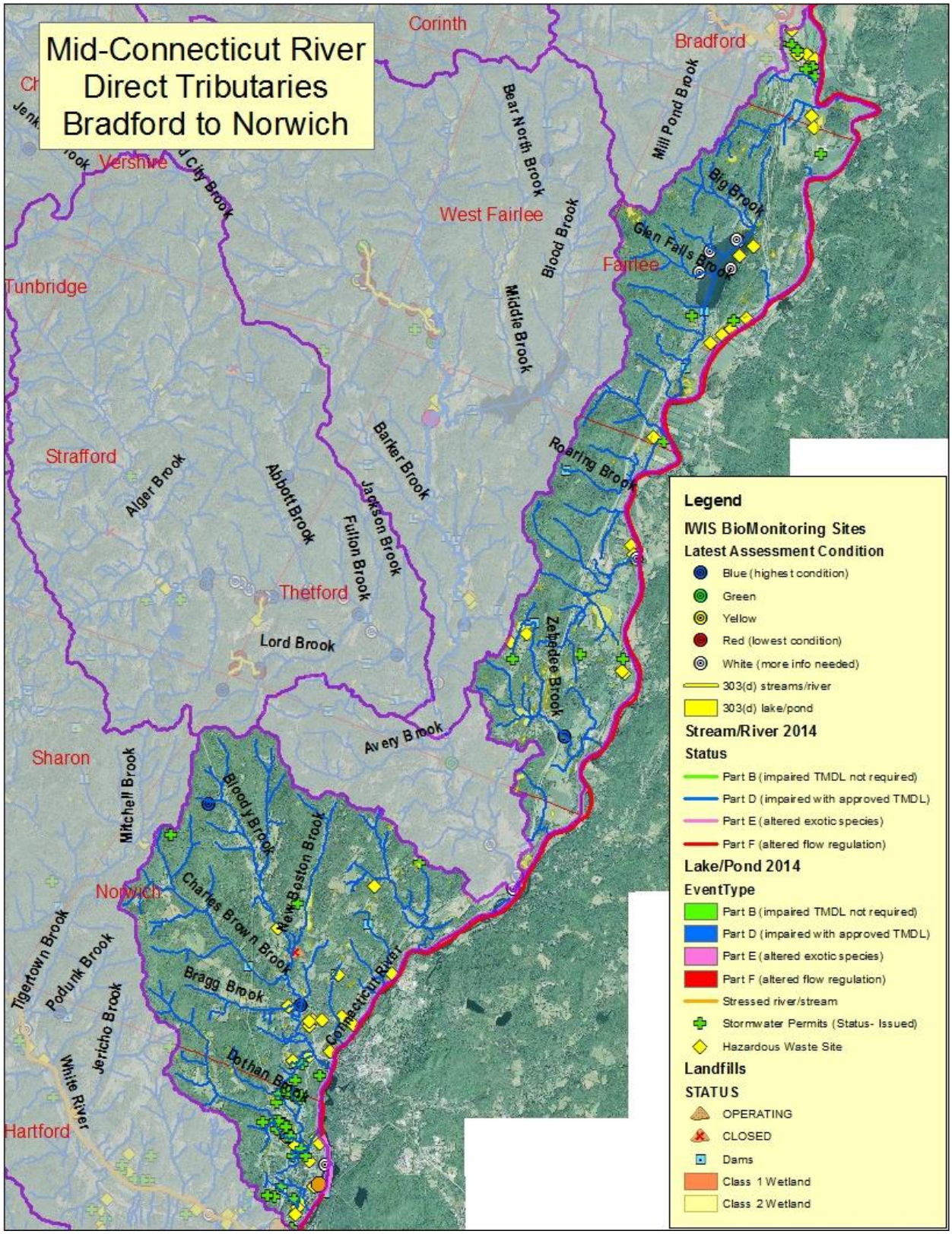


Figure 9b. Middle Connecticut River Basin map (lower)

Harriman Brook begins at Harriman Pond, flows through a wetland and field, then tumbles southeasterly down to the Connecticut passing through the village of Newbury on its way. Scotch Hollow Road follows the brook too closely and crosses it several times.

Halls Brook originates at the 85 acre Halls Lake and flows southeasterly overall down to the Connecticut River. From the lake down, Halls Brook: goes under Interstate 91; winds through an alder swamp; cascades along Snake Road; has a pool behind an old dam for swimming and fishing; is fast below the dam for a stretch; passes through agricultural land; goes under Route 5; and meets the Connecticut. Its length is six miles and it drains a 26.5 square mile watershed.

Peach Brook is a very significant tributary to Halls Brook. It starts up in Scotch Hollow, with Eygpt Brook as an early tributary to it, and flows southeasterly 8.5 miles before it joins Halls Brook. It is a clear, healthy, intact stream with either wetland vegetation or forest adjacent to it for much of its length. There are nice cascades and moss-covered boulders downstream of Moore Hill Road.

Roaring Brook and the lowest portions of Halls Brook, several unnamed direct tributaries and the Connecticut River streambank and river corridor river right.

Roaring Brook begins in Newbury but then flows south into Bradford then easterly and southeasterly through a wetland; under I-91; through Blodgett Pond; and into the Connecticut River. It is about 5.5 miles long and drains a five square mile watershed

Bog Pond Brook begins in the northern portion of the town of Fairlee. It flows northeasterly and easterly in Fairlee then northeasterly again into the town of Bradford where it continues on into the Connecticut River. The brook is culverted under the Maurice Roberts Highway and then Interstate 91 in Fairlee and then it is culverted and ditched through a farm in Bradford before reaching the Connecticut River.

Several streams drain into Lake Morey and then the Lake Morey outlet stream flows south into the Connecticut River. Big Brook begins to the east and north of May Hill (1626 feet) and flows east/southeast to the wetlands at the northern end of Lake Morey. Glen Falls Brook begins to the west of Lake Morey and flows east/southeast into the lake. An unnamed tributary also originating west of Lake Morey flows easterly into the

southern end of the lake. At least three unnamed tributaries also join the Lake Morey outlet stream as it flows south under the interstate and through wetlands.

An unnamed tributary originates on the north side of Ely Mountain and flows north before turning east and southeast to flow into the Connecticut River near the village of Ely. Route 244 follows much of its length west of the interstate.

Roaring Brook and Zebedee Brook are located in Thetford, as well as three are unnamed streams although one goes by the name North Thetford Brook. Zebedee Brook begins on the eastern side of Thetford Hill and makes its way with many changes in direction down to the Connecticut River. A very forked tributary enters Zebedee just west of Interstate 91. Zebedee Brook is 4.5 miles long and drains a 5.2 square mile watershed.

The so-called North Thetford Brook is also a brook with many forks or branches. It begins in Childs Pond, which is quite near the Connecticut River itself, then flows northwest and then northeast and joins the Connecticut in North Thetford. It is 4.4 square miles in size. Roaring Brook begins in the drainage between High Peak and some hills to the north and flows down a steep valley to the Connecticut River.

Bloody Brook and several unnamed direct tributaries and the Connecticut River streambank and river corridor river right in the Town of Norwich. The Bloody Brook watershed includes Charles Brown Brook and Boston Brook. The unnamed tributary watersheds Lewin Pond and Lily Pond.

The watershed of Bloody Brook and its tributaries is the largest watershed feeding to the Connecticut River in Norwich. The completed river corridor plan and geomorphic assessments call this Blood Brook but it has been historically called Bloody Brook, and therefore will be called so here. Bloody Brook originates east of Gile Mountain up near the Sharon-Norwich town line. It flows generally southerly, but at times, southeasterly, for 7.5 miles to the Connecticut River. The upper two-thirds of the watershed is forest land and rural residential while the lower third includes the village area of Norwich as well as the Interstate 91 interchange 13. The Bloody Brook watershed has a relatively high percentage of developed land (about 15%). Bloody Brook drains an 18 square mile watershed. Named tributaries to Blood Brook include New Boston Brook, Charles Brown Brook, and Bragg Brook.

New Boston Brook originates near the drainage divide with the Ompompanoosuc River watershed. It flows south-southwesterly in a small valley for 3.4 miles before reaching Bloody Brook. A large area of wetland surrounds the brook in its middle section. Charles Brown Brook is a significant tributary to Bloody Brook. It originates south of Stone Hill near the drainage divide with the White River watershed. It flows south then southeasterly for approximately 4.5 miles until it joins Bloody Brook just upstream of Moore Road. Beaver Meadow Road follows the brook for much of its length. Charles Brown Brook drains a 5.7 square mile watershed.

Extensive portions of the Blood Brook mainstem and part of Charles Brown Brook were bulldozed and windrowed with the stone removed from the channel following the 1973 floods that hit part of the Connecticut River Valley. This historical instream work and current encroachment have led to stream channel instability in Bloody Brook. The brook has lost access to floodplain areas in upper reaches because the stream channel has downcut in a number of stretches. The brook has over-widened and moved laterally in downstream reaches. The Town of Norwich swimming area located at the dam on Charles Brown Brook, failed catastrophically, as the result of Tropical Storm Irene. Currently, the Town and DEC are determining the future of the site.

Table 14. Biological monitoring sampling results 2010 – 2013 for the Middle Connecticut River Watershed.

Waterbody ID	Stream	Station & Community	Date	Assessment
VT16-20	Zebedee Brook	1.5 – bugs	10/16/2012	Exc-very good
VT16-20	Zebedee Brook	1.5 - bugs	9/06/2013	Excellent
VT16-20	Zebedee Brook	1.5 – fish	9/06/2013	Excellent
VT16-21	Bloody Brook	6.7- bugs	10/13/10	Excellent

Table 15. Biological sampling needed in Middle Connecticut River Basin.

Stream	Location	Comments
Sutton Brook	At least one site upstream of the interstate but downstream of Sarah Moore Pond	Only one old bio site sampled (qualitative) in Sarah Moore Pond back in 2006.
Unnamed tributaries north of Manchester Brook	A site on one or two of the unnamed tributaries that go to the Conn R north of where Manchester Brook enters	Update sample from McIndoes Falls tributary and get a sample from another of the unnamed tributaries
Manchester Brook	Upstream of the interstate	DEC has no samples from this brook.

Special Values and Features

Symes Pond, the origin of Manchester Brook, is a hotspot for biological diversity with a Sweet Gale Shoreline Swamp, a rare pondweed that is considered "extant", and three state-threatened plants.

On the map to the right (Figure 10), yellow shading indicates wetland; the purple outlines significant natural communities; the red hatching indicates the state-threatened plant species; and the green hatching is a rare plant species' potential location.

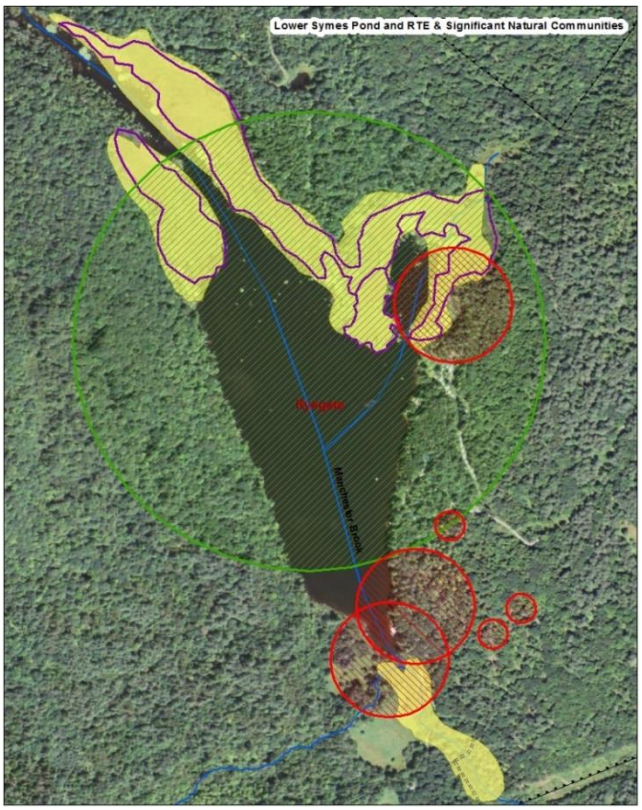


Figure 10. Symes Pond and Wetlands

Impacts or Stresses

Table 16. Middle Connecticut River Watershed waters on the Vermont Priority Surface Waters Lists

Stream or Lake Segment	Mileage and Status	Pollutant/Stressor	Source	Other information
Connecticut River above Wilder Dam to Bradford	30 miles ***Altered***	Flow alteration 	Hydro-electric dams	
Halls Lake	***E-list***	Invasive Species 		

Connecticut River Hydroelectric Facilities

Dodge Falls Hydroelectric Project is located at river mile 268 on the Connecticut River in the town of Ryegate, Vermont. Dodge Falls received a water quality certification from the State in March 1986. The project is operated as a true run-of-river mode with a conservation flow of 1108 cfs or inflows if less. The impoundment created by the Dodge Falls dam essentially the tailwater of the McIndoe Falls facility.

McIndoe Falls hydroelectric facility is the most downstream facility of the Fifteen Miles Falls Hydroelectric Project located on the Connecticut River. Fifteen Miles Falls Project received a new license in 2002 as part of a comprehensive Settlement Agreement between the then licensee New England Power Company (now TransCanada Hydro Northeast, Inc.) and Vermont and numerous other federal and state agencies and conservation organizations. The facility is licensed to operate in peaking mode with a 3.5 foot fluctuation of the impoundment. There are some seasonal restrictions on the magnitude of the peaking operations at the facility. Additionally, seasonal conservation flows are required to be release below the project.

The Wilder Project is located on the Connecticut River at river mile 217.4 and extends upstream approximately 46 miles upstream. The dam and powerhouse is approximately 1.5 miles upstream of the White River and approximately 7 miles downstream of the Ompompanoosuc River. The current FERC license expires in April 30, 2018. Trans Canada is in the process of re-applying for a new FERC permit.

D. Direct discharges to surface waters in the Basin 14

Overview

There are two municipal wastewater treatment facilities that are subject to NPDES discharge permits in the basin (Table 17). These facilities are subject to State of Vermont issued NPDES permits.

An overarching consideration for the issuance of permits in the White River Basin is the Long Island Sound TMDL for nitrogen. This multi-state TMDL has been promulgated with interim wasteload and nonpoint source nitrogen load allocations. As of the issuance of this Plan, all facilities are operating under administrative continuance of existing permits while the wasteload allocations are being refined. Specifically, the WSMD is implementing a wasteload allocation plan and permitting strategy in all CT River direct discharges to account for the new nitrogen limitations, to meet an interim total Vermont load of 1,727 lbs. N/day. Under that strategy, permit reauthorizations are proceeding for the Bradford facility in 2015 and Hartford-WRJ in 2017.

As part of a necessary refinement of the facility-specific nitrogen wasteload allocations, WSMD, with assistance from certain municipalities, is conducting an extensive sampling effort to document the current loading conditions for nitrogen, which is only recently regulated by the States of Vermont and New Hampshire.

Table 17. Basin 14 Wastewater Treatment Facilities and other Facilities Subject to NPDES Direct Discharge Permits

Facility (permit #)	Permit expiration date	Planned permit re-issuance year	Design flow MGD	IWC* 7Q10 /LMM	Treatment type	Receiving water
Bradford 3-1157	6/30/2009	2015	0.137	0.010/0.004	Extended aeration	Waits River
Hartford – WRJ 3-1225	12/31/2016	2017	1.215	0.002/0.001	Sequencing batch reactor	Connecticut River

* Instream Waste Concentration – or the proportion of river flow at lowest base (7Q10) and low median monthly (LMM) flow attributable to discharge, for the facility design flow. Note that the IWC is specific to the flow of receiving water.

Facility –specific information

Bradford

The Town of Bradford operates an extended aeration, secondary wastewater treatment facility that discharges to the Waits River. Disinfection is accomplished by means of liquid chlorine followed by dechlorination.

Hartford – WRJ

The Hartford-WRJ WWTF has recently undergone a significant facility upgrade. Previous treatment consisted of an extended aeration process and clarification for secondary treatment and chlorine addition for disinfection. The upgraded and expanded facility now consists of sequential batch reactors (SBR) for secondary treatment with an ultraviolet light disinfection system.

The *Town Hartford, Vermont Combined Sewer Overflow Effectiveness Study Update for CSO 009 (S/N 006) and CSO 010 (S/N 007)* dated September 2013 indicates the Town is close to complying with the Vermont CSO Control Policy and is planning to complete additional work on the CSOs. Once VT DEC determines the Town is in compliance with the Vermont CSO Control Policy, the effluent limits established in Condition I.A.2 of Discharge Permit #3-1225 will become effective including an increase in the annual average flow from 1.215 MGD to 1.450 MGD.

Chapter 3- Management Goals for Surface Waters in Basin 14

The protection or improvement of water quality and water-related uses can be promoted by establishing specific management goals for particular bodies or stretches of water. The management goals describe the values and uses of the surface water that are to be protected or achieved through appropriate management. In Chapter 2 of this plan, a number of waters were identified as being of notable high quality, and these, as well as other unique areas, may be candidates for establishing alternate management goals or augmented protections through one of the processes that are further described below.

- Identification of existing uses
- Opportunities for designation of Outstanding Resource Waters.
- Opportunities for reclassification of waters.
- Classification of wetlands
- Designation of waters as warm and cold water fisheries.

The Agency of Natural Resources is responsible for determining the presence of existing uses on a case by case basis or through basin planning, and is also responsible for classification or other designations. Once the Agency establishes a management goal, the Agency manages state lands and issues permits to achieve all management goals established for the associated surface water. Before the Agency recommends management goals through a classification or designation action, input from the public on any proposal is required and considered. The public may present a proposal for establishing management goals for Agency consideration at any time. When the public develops proposals regarding management goals, the increased community awareness can lead to protection of uses and values by the community and individuals.

Public involvement is an essential component to restoring and protecting river and lake ecology. The Vermont Water Quality Standards state "Public participation shall be sought to identify and inventory problems, solutions, high quality waters, existing uses and significant resources of high public interest." Emphasis on the identification of values and expectations for future water quality conditions can only be achieved through public contributions to the planning process.

Since the 1960s, Vermont has had a classification system for waters that establishes management goals. These goals describe the values and uses of surface waters that are to be protected or restored through appropriate management practices. The Agency works to implement activities that restore, maintain or protect the management goals. The current classification system includes three classes: A(1), A(2), and B.

A. Class A(1), A(2) and B Waters

Presently in all basins across Vermont, waters above 2,500 feet in elevation are classified A(1) by Vermont statute. In Basin 14, the only A(1) waters include those above 2,500 feet in elevation. The management objective for A(1) waters is to maintain their natural condition.

Table 18. Basin 14 Waters Identified as having Biological Integrity consistent with A(1) Goals and Objectives

Stream	Rivermile	Community	Result	Year
Stevens River	4.0	macroinvertebrates	Excellent	2010
Stevens River	4.0	macroinvertebrates	Excellent-very good	2012
Roaring Brook (Bradford)	2.0	macroinvertebrates	Excellent-very good	2012
Roaring Brook	2.0	macroinvertebrates	Excellent	2013
Zebedee Brook	1.5	macroinvertebrates	Very good	2012
Zebedee Brook	1.5	macroinvertebrates	Excellent	2013
Zebedee Brook	1.5	fish	Excellent	2013
Lord Brook	3.4	macroinvertebrates	Excellent-very good	2010
Lord Brook	3.4	macroinvertebrates	Excellent	2012

The Division, through the process of water quality assessment, has identified a set of surface waters on State Lands and within the Groton State Forest, which may meet criteria necessary to propose reclassification to Class A(1). These opportunities will be further considered during implementation of this Plan.

Waters used as public water supplies are classified A(2). The only class A(2) water in Basin 14 that is currently actively and used as a public water supplies is Mill Pond Brook. Mill Pond Brook and all waters within its watershed above the intake dam in the Towns of Fairlee, Bradford, and West Fairlee serve as the Village of Bradford water supply, reserved for emergency use. A second A(2) waterbody, the Peacham Fire District #1 water supply, is an artificial impoundment on South Peacham Hollow Brook and includes all waters within its watershed above the intake. The intake has been

removed, and the town has gone to wells. DEC recommends that it be reclassified from A2 to B to preclude management of the pond as a water supply, as this is no longer appropriate.

As of July 1, 2012, authority for the promulgation of the WQS and related rules moved to Agency of Natural Resources.

As consistent with prior Plans issued by ANR, this Plan does not make specific recommendations for water management types. However, the surface waters identified in Section 2.B have been listed specifically in recognition of their elevated quality. It is the intent of the Agency to provide protections to the very high quality condition of these surface waters coincident with application of the Agency's Anti-degradation Procedure. Further, the list of waters in Section 2.B is intended to be used by municipalities to impart additional municipal protections as determined to be appropriate. The Agency, in partnership with TRORC and NVDA, will provide technical assistance to municipalities who are interested in promoting further surface water protections.

B. Existing Uses

There are many identified special uses, features, and values of the basin and its numerous tributaries including waterfalls, cascades, whitewater boating stretches, and swimming holes. All surface waters in Vermont are managed to support designated uses valued by the public including swimming, boating, and fishing. The degree of protection afforded to these uses is based on the water's class as described above. In particular surface waters, however, the existence of uses is protected absolutely if the Agency of Natural Resources identifies them as existing uses under the anti-degradation policy of the Vermont Water Quality Standards. Specifically, this means that an existing use may not be eliminated by the issuance of a permit or other action where compliance with the Water Quality Standards is assessed (DEC Anti-degradation Procedure, 2012). The Agency identifies existing uses of particular waters either during the basin planning process or on a case-by-case basis during application reviews for state or federal permits. During the Basin 14 planning development, DEC has identified:

- The existing use of the waters for swimming;
- The existing use of waters for boating;
- The existing use of the water for water supply,
- The existing use for habitat, and
- The existing use of water for recreational fishing.

It is DEC's long-standing stipulation that all lakes and ponds in the basin have existing uses of swimming, boating and fishing. During the planning process, DEC has collected sufficient information to identify the existing uses listed in Appendix A for rivers and streams. The list is not meant to be exhaustive.

Likewise, we recognize that fishing activities in streams and rivers are widespread throughout the state and can be too numerous to document. The Vermont Water Quality Standards stipulate that existing uses may be documented in any surface water location where that use has occurred since November 28, 1975. Therefore information presented in Appendix A should be viewed as only a partial accounting of known fishing uses based upon limited criteria and does not change protection under the Clean Water Act or Vermont Water Quality Standards for waters not listed. The public is encouraged to nominate other existing uses, which may be included in the basin plan or catalogued for a more thorough investigation when an application is submitted for an activity that might adversely affect the use.

C. Outstanding Resource Waters

In 1987, the Vermont Legislature passed Act 67, "An Act Relating to Establishing a Comprehensive State Rivers Policy." A part of Act 67 provides protection to rivers and streams that have "exceptional natural, cultural, recreational or scenic values" through the designation of Outstanding Resource Waters (ORW). Depending on the values for which designation is sought, ORW designation may protect exceptional waters through the permits for stream alteration, dams, wastewater discharges, aquatic nuisance controls, solid waste disposal, Act 250 projects and other activities.

At the present time the 3.8 miles of the Ompompanoosuc River is designated an ORW. It was designated an ORW in 1996 for its exceptional natural, cultural, scenic, and recreational values. There are a diversity of recreational opportunities on this stretch of river including swimming, white water boating, fishing, picnicking, photography, and hiking. This stretch of river also includes many unique historic sites, and an unusual length of river with vegetated banks, natural river bottoms, and wooded land corridor. The designated ORW reach begins at the confluence of the unnamed tributary draining Gillette Swamp and Mud Pond to the confluence of the West Branch Ompompanoosuc. Although no other waters have been identified as ORW in this plan, there may be additional waters in the basin which merit this designation and which ORW status should be pursued.

ORW designation may be based on any one or more of the following features:
1. existing water quality and current water quality classification;

2. the presence of aquifer protection areas;

3. the waters' value in providing temporary water storage for flood water and storm runoff;

4. the waters' value as fish habitat;

5. the waters' value in providing or maintaining habitat for threatened or endangered plants or animals;

6. the waters' value in providing habitat for wildlife, including stopover habitat for migratory birds;

7. the presence of gorges, rapids, waterfalls, or other significant geologic features;

8. the presence of scenic areas and sites;

9. the presence of rare and irreplaceable natural areas;

10. the presence of known archeological sites;

11. the presence of historic resources, including those designated as historic districts or structures;

12. existing usage and accessibility of the waters for recreational, educational, and research purposes and for other public uses;

13. studies, inventories and plans prepared by local, regional, statewide, national, or international groups or agencies, that indicate the waters in question merit protection as outstanding resource waters; and

14. existing alterations, diversions or impoundments by permit holders under state or federal law.

D. Other High Quality Waters

Many of Basin 14's rivers and streams, lakes and ponds, and wetlands currently achieve a very high quality of water and aquatic habitat and are exceptional places to swim, fish, boat, and otherwise enjoy. Some of these are identified in Chapter 2 (above). In addition to protecting and improving water resources by managing stressors, there is the opportunity to protect surface waters by identifying and documenting the excellent quality and preserving those excellent conditions or features through various classifications or designations. Several statewide references and reports available to the exceptional ecological quality or recreational uses of Vermont surface waters. A major new resource, the Agency's BioFinder, http://biofinder.vt.gov/provides a statewide application identifying surface water and riparian areas with a high contribution to biodiversity.

E. Class 1 Wetland Designations

It is policy of the State of Vermont to identify and protect significant wetlands and the values and functions they serve in such a manner that the goal of no net loss of such

wetlands and their functions is achieved. Based on an evaluation of the extent to which a wetland provides functions and values it is classified at one of three levels:

Class I: Exceptional or irreplaceable in its contribution to Vermont's natural heritage and therefore, merits the highest level of protection

Class II: Merits protection, either taken alone or in conjunction with other wetlands

Class III: Neither a Class I or Class II wetland

There are currently no Class I wetlands in Basin 14. However, as part of the development of this tactical basin plan, the Peacham Bog has been identified as prospective candidates for Class I designation. In addition, the Stoddard Swamp in Peacham also merits evaluation for its Class I potential. As part of the implementation of this tactical basin plan, the Department will develop and implement procedures and documents to enable submission, evaluation, and implementation of petitions to classify wetlands as Class I. Those wetlands that satisfy criteria for designation may be proposed for such designation through Departmental rulemaking authority, and as consistent with the Vermont Wetland Rules.

F. Fish Habitat Designations

Warm Water Fish Habitat

All wetlands and the following waters are designated as warm water fish habitat for purposes of the Vermont Water Quality Standards:

- Lake Abenaki,
- Ticklenaked Pond,
- Lake Morey,
- Harriman Pond,
- Halls Lake,
- Lower Symes Pond, and the
- Waits River from the GMP dam in Bradford to the Connecticut River from June 1st to September 30th.

For Warm Water Fish Habitat, the WQS specifies a lower minimum dissolved oxygen concentration than waters in the remainder of the basin which are Cold Water Habitat. No changes to warm water fish habitat designations are proposed by this plan.

Cold Water Fish Habitat

All waters not designated as warm water fish habitat above are designated as cold water fish habitat for the Basin 14 in the Vermont Water Quality Standards. No changes to cold water fish habitat designations are proposed in this plan.

G. Irrigation and Animal Watering

Water from the basin is an important resource for agriculture. Farms use a combination of drilled wells, springs and surface water for livestock watering. Vegetables, cut flowers, orchards, berries, and nursery stock are all supported by limited irrigation.

Chapter 4- Watershed Improvement Projects and the Implementation Tables

Introduction

The tactical plan implementation tables (Tables 19-24) identify specific objectives for the basin, and frames-out specific actions to achieve the stated objectives. Action items include data collection and assessment efforts, and specific implementation activities. It is envisioned that the action items will be accomplished within the next five years. Action items reflect many of the primary goals and objectives of the Statewide Surface Water Management Strategy. This implementation table serves to identify high priority implementation actions and tasks that provide opportunities for all stakeholders in surface water management across each major river basin to pursue and secure technical and financial support for implementation. Specific locations for target actions are mapped http://anrmaps.vermont.gov/websites/anra/

The priorities included within these tables were the result of a comprehensive compilation and review effort of both internal ANR monitoring and assessment data, and those of our watershed partner organizations (Chapter 2 and Appendices). These monitoring and assessment reports include, but are not limited to, stormwater mapping reports, geomorphic assessments, river corridor plans, bridge and culvert assessments, agricultural modeling and assessments, road erosion inventories and capital budgets, TMDL reports, biological and chemical monitoring, lake assessments, fisheries assessments, and natural communities and biological diversity mapping.

Implementation Table Objectives

The overall objectives of the Implementation Tables can be broken down into three broad categories: identifying waters in need of further monitoring and assessment, protecting high quality waters, and restoring altered, stressed and other high priority waters. Watershed outreach and education opportunities cut across all of these priority categories. It is DEC's goal to prioritize staff time and direct internal and external grant funding opportunities towards these recommended Actions. These Actions include all water media within the basin and all the spectrums of land use that could potentially impact water quality and aquatic habitat. It is our hope that these tables outline priorities that are realistic to implement over a five year period, noting that there are many unforeseen variables, like landowner willingness and securing project funding, and not all issues can be addressed in this planning cycle.

Basin-wide Implementation

Table 19. Basin 14 Watershed- wide Actions Implementation Table- Actions are considered high priority and are to be implemented from 2015-2019.

Watershed-wide Objectives and Actions	Stressors Addressed	Potential Project Partners	Potential Funding Sources
Objective- gather additional nutrient water quality data to better direct ANR and partners' watershed protection and restoration work in the watershed	• Land erosion • Nutrient loading • Metals	-	-
Action 1- Continue to regularly monitor waters in this basin through the Sample Palooza interstate monitoring program to better determine nutrient load sources as part of the Long Island Sound Nitrogen TMDL implementation.	-	DEC, NH DES, and CRWC	LaRosa Lab
Action 2- Continue to support volunteer water quality monitoring on lakes in the basin- Fosters, Groton, Halls, Harveys, Morey, Ticklenaked	-	DEC and local lakes volunteers	-
Objective- Promote sustainable timber harvesting practices to control soil erosion and reduce sedimentation to waterways	• Land erosion • Encroachments • Nutrient loading	-	-
Action 3- Hold workshop(s) in the watershed showcasing and demonstrating practices to protect water quality: Findings from the Vermont Timber Harvesting Assessment, AMP Revision, Voluntary Harvesting Guidelines for Vermont Landowners	-	FPR, DEC, and Center for Northern Woodlands	Watershed License Plate MEF
Objective- remediate impacts of impervious surface-related stressors to waters	• Land erosion • Nutrient loading • Metals	-	-
Action 4- Assist municipalities in developing Stormwater Master Plans that identify and remediate sources of stormwater-related NPS pollution in Village Centers through educational work sessions.	-	TRORC DEC Watershed towns	604(b)
Objective- Promote littoral habitat protection on lakes by control of shoreland soil erosion, nutrient loss and sedimentation	• Land erosion • Nutrient loading • Invasive	-	-

	species		
Action 5- Build local knowledge of shoreland best management practices among contractors, landscapers, and other shoreland site workers by offering a Shoreland Erosion Control Certification Course annually	-	DEC	-
Action 6- Recruit homeowners, recreation area managers, and state parks to demonstration sites showcasing shoreland BMPs	-	DEC and FPR	-
Objective- Reduce the spread of invasive species and protect existing biodiversity in basin lakes	• Invasive species		
Action 7- Continue to support local Access Greeter programs on Lakes Fairlee, Harveys, and Morey	-	DEC and lake volunteers	-
Action 8- Recruit residents to join the *Vermont Invasive Patrollers*. There are currently no *VIPs* in this basin	-	DEC and lake volunteers	-

Stevens River Watershed

Table 20. Stevens River Watershed- Implementation Table- Actions described below are in addition to those listed in the Watershed-wide Actions Table above. All Actions are considered high priority and are to be implemented from 2015-2019.

Stevens River Sub-watershed Objectives and Actions	Targeted Watershed Area(s)	Stressors Addressed	Potential Project Partners	Potential Funding Sources
Objective- Address significant sources of sediment, nutrients, and bacteria entering waters in the watershed	-	• Land erosion • Nutrient loading • Pathogens	-	-
Action 9- Complete agricultural AEM assessments Tier 1 and 2 in the watershed identified by agricultural partners and implement priority BMPs contained within	• Peacham Hollow Brook • Stevens River • South Peacham Brook • Cloud Brook • Willow Brook • Unnamed tributary to Harvey's Lake (See Appendix G.1)	-	CCNRCD, small farmers, VACD,AAFM, and DEC	-

Action 10- Prepare road erosion inventories and capital budgets targeting medium and high priority road segments using the *ANR Atlas Road Erosion Risk Ranking* and implement BMPs accordingly.	Towns of Peacham and Barnet		Towns of Peacham and Barnet, BBR program, NVDA, and DEC	BBR Category A
Action 11 - Address potential erosion sources from municipal winter sand storage area	Town of Peacham		Town of Peacham, DEC, and NVDA	VTrans Transportation Mitigation funds
Objective- Identify and remediate undersized stream crossings that contribute to stream disequilibrium and/or hinder aquatic organism passage		• Channel erosion • Encroachment		
Action 12- Replace or retrofit high priority stream crossings that have been identified through previously completed or new the bridge and culvert assessment process. Conduct additional assessments as necessary.	Stevens River watershed- 3 high priority structures have been identified (See Appendix J.) for specific crossings)	-	Towns of Peacham and Barnet, landowners, VTrans, CRWC, CCNRCD, DEC, FWD, and NVDA	VTrans Structures MEF
Objective- restore, maintain, and protect stream equilibrium and floodplain attenuation assets and flood resiliency	-	• Channel erosion • Encroachment • Nutrient loading • Land erosion	-	-
Action 13- develop projects identified in river corridor plan as high priority actions	Stevens River Watershed- 9 high priority reaches have been identified (See Appendix J.)	-	DEC, CRWC, CCNRCD, Towns of Barnet and Peacham,	ERP, MEF, Watershed License Plate, USDA NRCS, USFWS Partners

			landowners, NVDA, and VTrans	for Fish and Wildlife
Objective- address flow alteration issues in the watershed	-	• Flow alteration		
Action 14- address flow alteration issues associated with the Harvey's Lake dam	South Peacham Brook and Harvey's Lake	-	Town of Barnet, DEC, Harvey's Lake Association FWD	-
Objective- gather additional water quality data to better direct ANR and partners' watershed protection and restoration work in the watershed	-	• All stressors		
Action 15- collect additional assessment data for Stoddard Swamp and, if appropriate, support the re-classification of this wetland ecosystem as a Class 1 wetland	Stoddard Swamp	-	DEC and FWD NGNH	N/A
Action 16- add additional biological monitoring sites within this sub-watershed to better prioritize watershed protection and restoration measures	South Peacham Brook and tributaries East Peacham Brook and tributaries	-	DEC	N/A
Objective- reclassify waters to better reflect current and future waters management goals	-	N/A	-	-
Action 17 - DEC recommends that South Peacham Hollow Brook be re-classified from A2 to B since it	South Peacham Hollow Brook	-	DEC and the Town of Peacham	N/A

is no longer used as a public water supply				
Objective- Protect VHQW lakes and pond undeveloped lakeshores	-	• Encroachment	-	-
Action 18- Complete shoreland and lake habitat surveys to better direct lakeshore protection and restoration efforts	Ewell Pond Mud Pond (Peacham)	-	DEC	N/A
Action 19- Protect the ecologically significant Jewett Brook and associated wetland complexes by expanding the Roy Mountain Wildlife Management Area to include all of these areas Figure 2.	Jewett Brook and adjacent lands		DEC, FWD, LARC	LARC

Wells River Watershed

Table 21. Wells River Watershed- Implementation Table- All Actions are considered high priority and are to be implemented from 2015-2019, not necessarily in priority order.

Wells River Sub-watershed Objectives and Actions	Targeted Watershed Area(s)	Stressors Addressed	Potential Project Partners	Potential Funding Sources
Objective- identify and remediate stressors responsible causing water quality impairments and stressed waters	-	• Nutrient loading • Toxics/ metals • Land erosion	-	-
Action 20(a)- Continue to implement the Ticklenaked Pond TMDL post-restoration monitoring and remove from the D-List of Waters when and if appropriate.	Ticklenaked Pond	-	DEC	N/A
Action 20(b)- Implement high priority agricultural BMPs and protection	Ticklenaked	-	DEC, AAFM,	ERP,

measures in the Ticklenaked Pond watershed. Two farms have been specifically targeted for additional BMP installation. Practices include: barn roof gutters, barnyard management, manure storage, gully stabilization, milkhouse waste management, and livestock exclusion	Pond watershed (See Appendices G.1 and K.).		NRCS, White River NRCD and ARS	AAFM BMPs, NRCS EQIP
Action 21- Develop a monitoring plan for the Town of Newbury old landfill site	Wells River, Newbury	-	Town of Newbury, DEC	N/A
Action 22- Develop a revised new monitoring plan for the Newbury Paper Sludge site. Develop and implement a remediation plan to address metal discharges from the site.	Wells River, Newbury	-	DEC Sites Management Program and property owner	N/A
Objective- Identify and address significant sources of sediment, nutrients, and bacteria entering waters in the watershed	-	• Land erosion • Nutrient loading • Pathogens	-	-
Action 23- Complete agricultural AEM assessments Tier 1 and 2 in the watershed identified by agricultural partners and implement priority BMPs contained within	Wells River and tributaries (See Appendices G.1 and K.)	-	CC and White River NRCDs, AAFM, VACD, small farmers, and DEC	ERP VACD
Action 24- Prepare road erosion inventories and capital budgets targeting medium and high priority road segments using the *ANR Atlas Road Erosion Risk Analys*is and implement BMPs accordingly.	Towns of Ryegate, Groton, and Newbury Capital budget completed for Groton.	-	Towns of Ryegate, Groton, and Newbury, BBR, NVDA, TROC, and DEC	BBR Category A and B

Objective- Identify and remediate undersized stream crossings that contribute to stream disequilibrium and/or hinder aquatic organism passage	-	• Channel erosion • Encroachment	-	-
Action 25- Replace or retrofit high priority stream crossings that have been identified through previously completed or new the bridge and culvert assessment process. Conduct additional assessments as necessary.	Wells River watershed- 3 high priority crossings (See Appendix J.)	-	Towns of Ryegate, Groton, Newbury, VTrans, FPR, landowners, FWD, DEC, USFWS, NRCS, CRWC, CC and White River NRCDs, NVDA, TROC, and DEC	ERP MEF SWIG
Objective- restore, maintain, and protect stream equilibrium and floodplain attenuation assets and flood resiliency		• Channel erosion • Encroachment • Nutrient loading • Land erosion		
Action 26- Develop projects identified in river corridor plan as high priority actions	Wells River watershed- 6 high priority	-	Towns of Ryegate, Groton, and	MEF ERP USFWS

	reaches have been identified (see Appendix J.)		Newbury, DEC, NVDA, TROC, CC and White River NRCD and CRWC.	PFFW
Action 27- Prepare an infrastructure-river conflict management plan and restoration designs for Wells River Village. Implement plan and design recommendations if appropriate	Wells River within Wells River Village	-	Town of Newbury, Wells River Village, DEC, and TRORC	ERP, MEF
Objective- Improve in-stream aquatic habitat and passage	-	• Channel Erosion • Encroachment • Thermal	-	-
Action 28- Implement the removal of Groton Village Number 9 dam	Wells River, Groton	-	CRWC, American Rivers, USFWS, FWD, DEC, Town of Groton, TU, and landowner	MEF, ERP, Watershed License Plate, TU, USFWS
Action 29- Inventory Groton State Forest lands within the sub-basin and identify streams that would benefit from in-stream habitat restoration practices. Implement these projects as appropriate	Waters within Groton State Forest		FPR, FWD, TU, and DEC	TU, MEF, Eastern Brook Trout, NFWF
Objective- reclassify waters to better reflect current and future waters	-	• All	-	-

management and protection goals		stressors		
Action 30- Further protect the important functions and values of Peacham Bog by re-classifying the wetland ecosystem from Class 2 to Class 1	Peacham Bog	-	DEC and FPR	N/A
Action 31- Pending (See Chapter 3, page 56, paragraph 3 for more information)			DEC and FPR	
Objective- gather additional water quality data to better direct ANR and partners' watershed protection and restoration work in the watershed	-	• All stressors	-	-
Action 32- Add new biomonitoring sites in this Sub-watershed to potentially to better prioritize watershed protection and restoration measures	• Beaver Brook • Osmore Brook • Stillwater Brook • Red Brook • North Branch • Coldwater Brook • Tannery Brook • Wells River (update RM 4.4 and 10.5)	-	DEC	N/A
Objective- address flow alteration issues in the watershed	-	• Flow alteration	-	-
Action 33- Identify flow improvement opportunities associated with the Boltonville Dam, and implement as appropriate,	Wells River, Ryegate	-	DEC dam operator FWD	N/A
Objective- remediate impacts of impervious surface-related stressors to	-	• Nutrient	-	-

waters		loading • Toxics/ metals • Land erosion		
Action 34- Implement high priority recommendations included within the Boltonville, Ryegate, and Groton Stormwater Infrastructure Mapping Reports http://www.watershedmanagement.vt.gov/erp/htm/SW_IDDE_program.htm .	• Wells River (Watersheds 9 and 12- top priority 11- second priority) • Boltonville (Watersheds 2 and 3) • East Ryegate (Watershed 8) • Groton Village (Watershed 6) ANR (2014 and 2015)	-	NVDA, TROC, targeted municipalities, and DEC	ERP
Objective- Protect VHQW lakes and ponds and undeveloped lakeshores	-	• Encroachment • Land	-	-

		erosion • Nutrient loading		
Action 35- Complete shoreland and lake habitat surveys to better direct lakeshore protection and restoration efforts	• Ricker Pond • Levi Pond • Noyes Pond • Kettle Pond • Osmore Pond	-	DEC FPR FWD	N/A

Waits River Watershed

Table 22. Waits River Watershed- Implementation Table- Actions described below are in addition to the Watershed-wide Actions Table above**.** All Actions are considered high priority and are to be implemented from 2015-2019.

Waits River Sub-watershed Objectives and Actions	Target Watershed Area(s)	Stressors Addressed	Potential Project Partners	Potential Funding Sources
Objective- identify and remediate stressors responsible causing water quality impairments and stressed waters	-	• Land erosion	-	-

		• Nutrient loading • Pathogens • Thermal • Encroachments • Acidity		
Action 36- Identify and remediate possible sources of impairment to the Tabor Branch Tributary, including agricultural and road-related sources	Tabor Branch watershed	-	WRNRCD, AAFM, DEC, Town of Topsham Highway Department, landowners	BBR, AAFM BMP program
Action 37- initiate riparian buffer planting and protection projects along stressed and altered waters in the sub-basin	• South Branch Waits • Waits River • Tabor Branch • Cookville (See Appendix J.)	-	WRNRCD, DEC, AAFM, VTrans	TFS, ERP, AAFM BMP program
Action 38- determine the feasibility of improving in-stream aquatic habitat and implement if appropriate	Waits River main stem- downstream of South Branch confluence	-	FWD, DEC, CRWC, WRNRCD	TU, USFWS, Watershed License Plate, MEF
Action 39- Identify flow improvement opportunities associated with the Bradford Dam, and implement as appropriate,	Bradford Dam, Waits River	-	Dam owner FWD	N/A

			DEC	
Action 40- Develop a remediation plan for Pike Hill Mine Super Fund Site	Pike Hill Brook and Cookville tributary number 4 watersheds	-	EPA, DEC, FWD, and landowner	Super Fund program
Objective- Identify and address significant sources of sediment, nutrients, and bacteria entering waters in the watershed	-	• Land erosion • Nutrient loading • Pathogens	-	-
Action 41- Complete agricultural AEM assessments Tier 1 and 2 in the watershed identified by agricultural partners and implement priority BMPs contained within	• Waits River • South Branch • Tabor Branch (see Appendices G.1 and K)	-	WRNRCD, VACD, AAFM, and DEC	ERP VACD
Action 42- Prepare road erosion inventories and capital budgets targeting medium and high priority road segments using the *ANR Atlas Road Erosion Risk Ranking* and implement BMPs accordingly.	• Bradford • Cornith • Topsham • Washington	-	TORC, CVRPC, DEC, BBR, Bradford, Corinth, Topsham, and Washington	BBR Category A
Objective- restore, maintain, and protect stream equilibrium and floodplain attenuation assets and flood	-	• Channel erosion • Encroachment • Nutrient loading • Land erosion	-	-

Action 43- develop projects identified in river corridor plan as high priority actions	Waits River watershed- 30 high priority reaches have been identified (See Appendix J.)	-	CRWC, DEC, WRNRCD, TROC, watershed towns	ERP MEF 604(b)
Objective- Identify and remediate undersized stream crossings that contribute to stream disequilibrium and/or hinder aquatic organism passage	-	• Channel erosion • Encroachment	-	-
Action 44- Replace or retrofit high priority stream crossings that have been identified through previously completed or new the bridge and culvert assessment process. Conduct additional assessments as necessary.	Waits River watershed- 20 high priority structures have been identified (Appendix J.)	-	Watershed towns, VTrans, FPR, landowners, FWD, DEC, USFWS, NRCS, CRWC, CC and White River NRCD, TROC, and DEC	ERP MEF SWG USFWS Eastern Brook Trout Joint Venture
Objective- reclassify waters to better reflect current and future waters management and protection goals	-	• All stressors	-	-
Action 45- Pending (See Chapter 3, page 56, paragraph 3 for more information)		-	DEC and FPR	N/A
Objective- address flow alteration issues in the watershed	-	• Flow alteration	-	-
Action 46- Identify flow improvement opportunities associated with the Bradford Dam, and implement as appropriate	Waits River, Bradford	-	DEC FWD dam operator	N/A

Objective- remediate impacts of impervious surface-related stressors to waters	-	• Nutrient loading • Toxics/metals • Land erosion	-	-
Action 47- Implement high priority recommendations included within the Bradford Stormwater Infrastructure Mapping Reports http://www.watershedmanagement.vt.gov/erp/htm/SW_IDDE_program.htm .	Bradford Village-Watershed's first priority- 26, 18, 22 second priority-20 and 21 third priority 16 and 32 (ANR, 2014)	-	Town and Village of Bradford, TROC, DEC	ERP Watershed License Plate

Ompompanoosuc River Watershed

Table 23. Ompompanoosuc River Watershed- Implementation Table- All Actions are considered high priority and are to be implemented from 2015-2019, not necessarily in priority order.

Ompompanoosuc Sub-watershed Actions	Watershed Area(s)	Stressors Addressed	Potential Project Partners	Potential Funding Sources
Objective- identify and remediate stressors responsible causing water quality impairments and stressed waters	-	• Pathogens • Toxics/metals • Thermal • Channel erosion • Land erosion • Nutrient loading • Acidity	-	-

Action 48- Implement the Ompompanoosuc bacteria TMDL by identifying and remediating potential agricultural and septic sources, expanding and conserving riparian buffers and floodplains, and promoting septic system maintenance.	East Branch Ompompanoosuc		Towns of Vershire, West Fairlee, and Thetford, DEC, WRNRCD, CRWC, and UVLT	TFS, ERP, MEF, Watershed License Plate
Action 49- Develop a better understanding of current water quality conditions of the bacteria impaired reach of the Ompompanoosuc with additional water quality monitoring	Impaired section of the East Branch Ompompanoosuc and tributaries	-	Towns of Vershire, West Fairlee, and Thetford, DEC, WRNRCD, CRWC, and UVLT	DEC LaRosa Lab grant
Action 50- Continue the implementation of the Elizabeth Mine Remediation Plan and monitoring – evaluate feasibility of developing Use Attainability Analysis for aquatic habitat in Cooperas Brook.	• West Branch Ompompanoosuc • Lords Brook Cooperas	-	EPA, DEC, Towns of Strafford	EPA Super Fund Program

	Brook watersheds		and Thetford	
Action 51- Complete and begin implementing the Ely Mine Implementation Plan	Schoolhouse Brook and tributary	-	EPA, DEC, FWD, Town of Thetford	EPA Super Fund Program
Action 52(a)-assure the implementation of the Environmental Stewardship BMPs to reduce lead shot residue from entering waterways from the Thetford Fish and Game Club shooting range**.**	Unnamed tributary to Gillette Swamp, Thetford	-	Town of Thetford , Fish and Game Club, DEC WMPD, and FWD,	VT DFW Shooting Range Improvement Grant
Action 52(b)- Conduct monitoring at the to determine efficacy of BMP implementation at this shooting range.	Unnamed tributary to Gillette Swamp, Thetford	-	DEC WMD and WMPD	DEC
Objective- Identify and address significant sources of sediment, nutrients, and bacteria entering waters in the watershed	-	• Nutrient loading • Land erosion • Pathogens	-	-
Action 53- Complete agricultural AEM assessments Tier 1 and 2 in the watershed identified by agricultural partners and implement priority BMPs contained within	Ompompanoosuc watershed, with a focus on the East Branch watershed	-	WRNRCD, VACD, AAFM, and DEC	ERP VACD

	(See Appendices G.1 and K.)			
Action 54(a)- Prepare road erosion inventories and capital budgets targeting medium and high priority road segments using the *ANR Atlas Road Erosion Risk Ranking* and implement BMPs accordingly.	Vershire, West Fairlee, Thetford and Strafford	-	TORC, DEC, BBR, Vershire, West Fairlee, and Strafford	BBR Category A
Action 54(b)- Address runoff from the Town of Vershire's road sand storage area.	Vershire,	-	Vershire DEC TRORC	VTrans Transportation Alternatives, ERP
Objective- restore, maintain, and protect stream equilibrium and floodplain attenuation assets and flood	-	• Channel erosion • Encroachment • Nutrient loading • Land erosion	-	-
Action 55- develop projects identified in river corridor plan as high priority actions, both active and passive, and determine feasibility of implementation	(See Appendix J.)	-	DEC, TRORC, WRNRCD	
Objective- remediate impacts of impervious surface-related stressors to waters	-	• Nutrient loading • Toxics/m	-	-

		etals • Land erosion		
Action 56- Design and implement high priority recommendations included in the Town of West Fairlee Stormwater Infrastructure Mapping Report and complete IDDE survey of the Village. http://www.watershedmanagement.vt.gov/erp/htm/SW_IDDE_program.htm .	Town of West Fairlee – Watershed Number 1 and 2 (ANR, 2015)	• Land erosion • Nutrient loading • Metals	Town of West Fairlee, TROC, and DEC	ERP
Objective- Improve in-stream aquatic habitat and passage		• Flow Alteration		
Action 57- Determine the feasibility of removal of the Geer and Montague Rod and Reel Dams and develop these projects if appropriate	Ompompanoosuc River West Fairlee and Thetford	-	CRWC AM DEC FWD	MEF USFWS Eastern Brook Trout program TU
Objective- Protect VHQW lakes and ponds and undeveloped lakeshores and important wetland ecosystem complexes.	-	• Encroachment • Land erosion • Nutrient loading	-	-
Action 58- Complete shoreland and lake habitat surveys to better direct lakeshore protection and restoration efforts	• Abenaki Pond • Miller Pond	.	DEC	N/A

Mid-Connecticut River Watershed

Table 24. Mid-Connecticut River Watershed and Direct Tributaries - Implementation Table-All Actions are considered high priority and are to be implemented from 2015-2019, not necessarily in priority order.

Mid-CT Direct Sub-watershed Objectives and Actions	Watershed Area(s)	Stressors Addressed	Potential Project Partners	Potential Funding Sources
Objective- Identify and address significant sources of sediment, nutrients, and bacteria entering waters in the watershed	-	• Nutrient loading • Land erosion • Pathogens	-	-
Action 59- Use the Critical Source Area (CSA) "lite" agricultural runoff model maps to better identify potential sources of nitrogen from agricultural sources as part of the LI Sound N TMDL. Target high erosion potential polygons for BMP outreach and implementation	Mid-CT River and direct tributaries watershed (Appendix K.)	-	DEC, NRCS, and AAFM	ERP, NRCS
Action 60- Develop a comprehensive wetland inventory and restoration prioritization and restore and protect high priority wetland ecosystems	Mid- CT River and direct tributaries watershed	• All stressors	DEC, CRWC, and TROC	604(b), ERP, and MEF
Action 61- Complete a riparian buffer inventory for the CT River corridor, river right, and downstream most reaches of direct tributaries and implement high priority projects.	Mid-CT River and direct tributaries	• All stressors	DEC, CRWC, and TROC	604(b), ERP, and MEF
Objective- Identify and remediate dams and undersized stream crossings that contribute to stream disequilibrium and/or hinder aquatic organism passage	-	• Channel erosion • Encroachment	-	-
Action 62- Replace or retrofit high priority stream crossings that have been identified through previously completed or new the bridge and culvert assessment process	Middle Connecticut River watershed (See Appendix J.)	-	FWD, DEC, towns	VTrans Structures
Action 63- Initiate a new portable skidder bridge rental program in this sub-watershed	Fairlee or other suitable location	-	FPR, WRNRCN, and DEC	ERP
Objective- restore, maintain, and protect stream equilibrium and floodplain attenuation assets and flood resiliency	-	• Channel erosion • Nutrient	-	-

		loading • Land erosion • Encroachment		
Action 64- Implement high priority actions within the Bloody Brook River Corridor Management Plan and stream crossing assessment	Bloody Brook watershed – (See Appendix J.)	-	Town of Norwich, DEC. TROC,	ERP VTrans Structures FEMA
Objective- remediate impacts of impervious surface-related stressors to waters	-	• Nutrient loading • Toxics/metals • Land erosion	-	-
Action 65- Implement high priority recommendations included within the Norwich, Fairlee, Newbury Village, and Hartford Stormwater Infrastructure Mapping Reports http://www.watershedmanagement.vt.gov/erp/htm/SW_IDDE_program.htm .	Towns of Norwich (Watersheds 1 and 4- top priority and 18 second priority), Newbury Village (Watershed 1), Fairlee (Watershed 3), and Hartford (ANR, 2014)	-	Towns of Norwich and Hartford, TROC, CRWC, and DEC	ERP
Action 66- Determine sources of erosion to Dothan Brook and implement protection and restoration measures accordingly	Dothan Brook	-	Town of Hartford, TROC, and DEC	ERP
Action 67- Complete IDDE surveys for Norwich, Fairlee and Hartford	Norwich Village Hartford- Wilder-WRJ Fairlee Village			
Objective- gather additional water quality data to better direct ANR and partners' watershed protection and restoration work in the	-	• All stressors	-	-

watershed				
Action 68- add additional biological monitoring sites in this sub-watershed to better prioritize watershed protection and restoration measures	• Sutton Brook • Manchester Brook • Unnamed tributaries north of Manchester Brook	-	DEC	N/A
Objective- address flow alteration issues in the watershed	-	• Flow alteration	-	-
Action 69- expand and protect riparian buffers within the FERC jurisdictional impoundment associated with Wilder Dam.	CT River main stem riparian buffer (river right, Wilder Dam impoundment area)	-	DEC and TransCanada	TransCanada
Action 70- Increase conservation flows below the Wilder Dam and reduce the magnitude of peaking operations and water level fluctuations in the impoundment which would improve aquatic habitat in the Connecticut River, as appropriate related to the Wilder Dam on the Connecticut River through the FERC re-licensing and 401 Water Quality Certification process.	CT River main stem above and below Wilder Dam	• Flow alteration	DEC FWD TransCanada	TransCanada
Objective- Protect VHQW lakes and ponds and undeveloped lakeshores	-	• Encroachment • Land erosion • Nutrient loading	-	-
Action 71- Complete shoreland and lake habitat survey to better direct lakeshore protection and restoration efforts	• Harriman Pond • Lake Morey	-	DEC	N/A
Action 72- Protect the ecologically significant Symes Pond lakeshore and	• Symes	-	DEC,	LARC

associated wetland complexes by expanding the Roy Mountain Wildlife Management Area to include all of these areas (Figure 10).	Pond and adjacent lands		FWD, and LARC	
Objective- Raise awareness of aquatic invasive plants, animals, and pathogens spread prevention.	-	Invasive species	-	-
Action 73- continue variable-leaved milfoil surveys to confirm eradication	Halls Lake	-	DEC and Halls Lake Association	N/A
Objective- Improve recreational boating opportunities in the Middle Connecticut River	-	N/A	-	-
Action 74(a)- improve canoe access areas between McIndoe Falls to Dodge Falls and in Norwich	• McIndoe Falls impoundment • Downstream of Dodge Falls • Connecticut River near Norwich	-	VRC VYCC	MEF
Action 74(b)- expand canoe-accessible river camping sites	Between North Thetford and Norwich on the Connecticut River	-	VRC VYCC	MEF

Table 25. Projects completed or underway during the Tactical Basin Planning Process (2012-2014)

Sub-watershed	Waterway/location	Project Description	Stressors	lead/partners	Funding
Watershed-wide	All major tributaries	Sample Palooza- Water quality monitoring*	Nutrient loading	DEC and CRWC (VT sites)	LaRosa Lab
	Watershed-wide	Dam removal prioritization	Channel erosion, flow alteration	CRWC, AR, and DEC	Partner in-kind
Stevens	Sub-watershed wide	AEM Tier 1 and 2 Assessment	Land erosion, nutrient loading, pathogens, thermal	CCNRCD, VACD, and DEC	Partner in-kind
Wells	Wells River/Groton	Groton Dam removal*	Channel erosion, flow alteration	CRWC, VTrans, Town of Groton, USFWS, DEC	MEF, Watershed License Plate, USFWS Northeast Brook Trout?, TU
	Wells River/Newbury	TFS buffer planting	Thermal, nutrient loading, land erosion, channel erosion	WRNRCD, Town of Newbury, and DEC	ERP
	Town of Groton	Road erosion and stream crossing inventory and capital budget	Sediment, nutrients, channel erosion, encroachment	Town of Groton, NVDA, and DEC	BBR Category A
	Sub-watershed wide	AEM Tier 1 and 2 assessment	Land erosion, nutrient loading, pathogens, thermal	WRNRCD, VACD, and DEC	Partner in-kind
	Wells River/Landfill and Paper Sludge site, Newbury	On-site assessment and additional monitoring to determine possible stressor sources*	Toxins	DEC	In-kind

	Ticklenaked Pond/Ryegate	Ticklenaked Pond Alum treatment*	Nutrient Loading	DEC, Ticklenaked Pond Association, Town of Ryegate	??
Waits	East Orange Branch/Orange	Road BMP treatments*	Land erosion, nutrient loading	Town of Orange and DEC	BBR Category B
	Waits River/Bradford	Bank stabilization/buffer*	Channel erosion	CRWC and Town of Bradford	MEF, TU, Watershed License Plate?
Ompompanoosuc	Schoolhouse Brook/Thetford	Ely Mine Remediation Plan*	Toxics	EPA ANR	EPA funds
	West Branch/Strafford	Elizabeth Mine Remediation Implementation*	Toxics	EPA ANR	EPA Super Fund
	Ompompanoosuc/West Fairlee	Riparian buffer plantings*	Thermal, pathogens, channel erosion, land erosion, nutrient loading	WRNRCD, Town of West Fairlee, and volunteers	TFS- ERP
	Ompompanoosuc/West Fairlee	River Corridor Easements*	Thermal, pathogens, channel erosion, land erosion, nutrient loading	UVLT and DEC	ERP
	Sub-watershed wide	AEM Tier 1 and 2 assessment*	Land erosion, nutrient loading, pathogens, thermal	WRNRCD, VACD, and DEC	Partner in-kind
Middle Connecticut	Sub-watershed wide	AEM Tier 1 and 2 assessment	Land erosion, nutrient loading, pathogens, thermal	WRNRCD, VACD, and DEC	Partner in-kind

*= See project descriptions and photos below

Some Highlighted Basin 14 Watershed Restoration Projects

Figure 11. Groton Franconia Dam, Wells River, Groton- before removal (photo credit David Deen)

Figure 12. Post-removal of the Groton Franconia Dam, Wells River, Groton CRWC (photo credit David Deen)

Figure 13. Ompompanoosuc WRNRCD TFS buffer planting, West Fairlee (photo credit Mary Childs)

Figure 14. Stone-lined ditch stabilization, East Orange Branch Waits River Watershed, Town of Orange (photo credit- Jim Ryan)

Figure 15. CRWC Bradford Golf Course bank stabilization with rootwads and riparian buffer installation, Waits River (photo credit- Jim Ryan)

Figure 16. CMP Paper Sludge Landfill discharge to the Wells River, Newbury (photo credit Jim Ryan)

Figure 17. Iron seep at monitoring well located at the closed Town of Newbury landfill (Photo credit Jim Ryan)

The Wells River downstream of the Newbury Landfill and CPM landfill

The Newbury Landfill stopped accepting waste and was closed in 1993. Monitoring activities following closure indicated significant production of contaminated leachate which lead to a synthetic geomembrane cap being installed in 2001. Groundwater and surface water monitoring continue today as part of the requirements of the landfills post-closure certification in the Solid Waste Management Program. Iron and manganese are the primary contaminants of concern at this site and two seeps are present down-gradient of the landfill and adjacent to the Wells River. Over the next certification period for the landfill (five year period) it is anticipated that post-closure monitoring work will not only continue the groundwater and surface water sampling, but will also aim to identify the source of the elevated iron and manganese within the seeps (natural background concentrations or landfill sourced) and initiate activities to reduce or remediate discharge from these seeps to the Wells River.

The CPM Landfill (formerly Longmoore Landfill) accepted paper sludge waste from 1985 until 1993 at which point it was closed and capped. Post-closure monitoring has not been continuous since closure with the most recent monitoring completed in 2006. There are two identified seeps down-gradient of the landfill, both of which had visible staining and bacterial mats along with exceedences of iron and manganese and discharge into the Wells River. Future work at this site will target securing funds to re-establish post-closure care, evaluating current groundwater and surface water

contamination at this site by updating monitoring of both groundwater and surface water on the site and determining the feasibility of either remediating or diverting the seeps to prevent discharge into the Wells River.

Ticklenaked Pond Phosphorous Remediation

The town of Ryegate received an Ecosystem Restoration Grant for $95,990 to complete an Alum Treatment of Ticklenaked Pond which is impaired due to elevated phosphorus levels and regular algae blooms which have limited the use of the pond for recreation. The town hired Aquatic Control Technology to implement the treatment. The treatment took place in the spring of 2014. This treatment, along with the extensive watershed phosphorous reduction efforts will restore nutrient levels in the pond to allow for swimming and other uses which have been impaired due to elevated phosphorus levels and the resulting algae blooms that this causes. Additional farm BMP installation is planned for two farms located within the watershed.

DEC water quality monitoring results from spring 2015 has indicated water quality improvements in phosphorus level reductions and increases in dissolved oxygen and water clarity. Additional monitoring is scheduled for 2016.

The TMDL for Ticklenaked Pond can be viewed at:
http://www.vtwaterquality.org/mapp/htm/mp_tmdl.htm

Figure 18. Ticklenaked Pond during Alum treatment in summer of 2014, photo credit Ben Copans

Algae Bloom at Ticklenaked Pond, Vermont – Before and After Successful Treatment

Figure 19. Ticklenaked Pond- before and after treatment, Photo credit- Sally Wilson

The Elizabeth Mine Remediation

The Elizabeth Mine is an abandoned copperas and copper mine located in Stafford and Thetford, Vermont. Acid mine drainage (AMD) from the Elizabeth Mine had impaired a 3.8-mile reach of the West Branch of the Ompompanoosuc River, all of Copperas Brook, and a reach of Lords Brook near New Boston Road. In 2001, Elizabeth Mine was placed on the National Priorities List (a.k.a. Superfund List). As of 2014, the majority of EPA's response actions has primarily focused on the three largest sources of AMD: the TP-1 and TP-2 tailing piles (approximately 40 acres combined) and an approximately 12-acre waste rock pile known as TP-3. These three mine features are located within the Copperas Brook Watershed.

The response action was phased over several years and consisted of surface water and groundwater diversions; the removal of waste rock from TP-3 to the top of TP-1; and the installation of a cover system over TP-1, TP-2, and relocated waste rock from TP-3 and from AMD sources within the Lords Brook Watershed. In 2008, EPA installed a temporary water treatment system to treat AMD draining from the toe of TP-1 during construction activities. EPA plans to operate this system at least through 2015 and possibly longer. Significant reduction in metal loads have taken place into downstream waters from the mine. Over the last several years the WBOR looks significantly better. The water quality data and benthic assessment supports this observation. Since TP-3 was removed, the concentrations of toxic metals in Copperas Brook at its

confluence with the West Branch have been reduced by at least two orders of magnitude. The trend in pre-treatment iron loading from the toe of TP-3 is also decreasing. Further reduction of iron loading occurs when the temporary treatment system is in operation, which is typically from mid-May through October. At this time, the current long-term plan for treatment is to install a passive system. However, the design or necessity of such system will be evaluated in the next several years after the "final" iron loading due to the response actions has been established. Based on the ongoing water quality and biological assessments of fish and macroinvertebrate communities, the formerly impaired reaches of the West Branch have meet the Water Quality Standards for Class B waters for at least two consecutive years. In 2014, based on assessments of biological condition, DEC removed the 3.8 mile reach of the West Branch from the impaired waters list for Aquatic Life Support. Follow up biological assessments are recommended if and when a passive system is incorporated into the long term management of the site.

Lords Brook was determined to be impaired by AMD from areas of the mine known as the South Cut, the waste rock pile TP-4, and South Mine. TP-4 and much of the waste rock around the South Mine has already been removed. EPA is planning to finalize the remedial design for the South Cut and the residual contamination remaining at the South Mine in 2014. Currently, there is no federal funding for this next phase of remediation. Based on water quality and biological assessments of fish and macroinvertebrate communities Lords Brook has met and exceeded DEC biocriteria guidelines for two consecutive years. Lords Brook is now considered in very good biological condition. DEC removed this reach of Lords Brook from the impaired list in 2014 for Aquatic Life Support. However, a tributary of Lords Brook with origins from two very small (possibly intermittent streams) directly from the south mine and south cut are going to be added to the impaired waters list based on a 2013 water quality and biological assessments of the macroinvertebrate communities. The results of this assessment found that the Lords Brook Tributary entering Lords Brook just above New Boston Road and its tributaries are impaired from AMD. These tributaries contain toxic levels of metals, including copper and cadmium, and were found to be biologically impaired when compared to an adjacent reference stream of similar stream type and drainage area.

A summary of the mine's impacts and documentation of the recovery can be found at ANR, May 2013.

Figure 20. Pre-treatment of the West Branch Ompompanoosuc, river mile 3.8 in 2007

Figure 21. Post-treatment of the West Branch Ompompanoosuc, river mile 3.8 in 2011

Ely Copper Mine Remediation

The Ely Copper Mine (site) is an abandoned copper mine located in Vershire, that operated predominantly in the 1850-1905. The site was added to the US EPA National Priorities List in September 2001 due to the environmental degradation from acid rock

drainage (ARD) from the site on Ely Brook and Schoolhouse Brook. From 2002-2010, extensive site investigations at both the state and federal level were conducted to determine the nature and extent of contamination and assess the potential threats to human health and the environment. Portions of Ely Brook and Schoolhouse Brook are failing water quality standards and are having a significant impact on the macro invertebrates and fish populations. Based on these investigations, it was determined that a cleanup response was necessary to prevent existing and future potential threats to human health and the environment.

The cleanup response is ongoing and will be progressing in two phases or "Operable Units." The first phase (OU1) includes the excavation of contaminated waste, rock, soil and sediment from the upper waste area, lower waste area, Ely Brook and its tributaries, Pond 4 and Pond 5 for consolidation into an onsite containment cell west of Ely Brook. It also includes the excavation of about 4,000 cubic yards of contaminated tailings from the Tailings Area and consolidates under a cover system to be installed over the Ore Roast Bed. In addition, an Early Action for the second phase (OU2) was developed to prevent residential use of the smelter/slag area and prevent the consumption of groundwater. EPA and their consultant Nobis have been conducting additional investigations to support the development of the OU1 remedial design and additional assessment on the potential groundwater impacts related to the underground workings and associated mine pool for OU2. This has included additional field hydrogeological investigations, ground-based/aerial surveys; wetland survey; stream water hydrology; and preliminary design specifications. This work will continue into 2015 based on available federal funding.

Ompompanoosuc Bacteria Impairment

The nearly 10 miles of the impaired section of the Ompompanoosuc includes the towns of West Fairlee and Thetford. DEC, WRNRCD, and ARS staff identified several potential sources of bacteria as well as identifying many riparian buffer enhancement opportunities.

Potential sources of bacteria include livestock, human, and/or wildlife. There were several locations along both the Ompompanoosuc and tributaries where multiple homes were located within the river corridor. Grandfathered septic systems could have been constructed in close proximity to surfaces waters and/or located in hydric soils. In addition, mobile home park in the watershed has addressed a failed septic system.

The Estate of George Huntington applied for a wastewater permit to replace a failed wastewater disposal system that served three existing lots in Cold Springs Mobile

Home Park in spring (March/April) 2011. A tributary to the Ompompanoosac River runs along the backside of this mobile home park. A new wastewater system was approved to replace the failed system and had received an "installation certification" that all was functioning well. There were some questions at the time of this failed system/new permit about the number of lots that had been approved at this park through Act 250 – it appeared that only 12 lots were approved but 16 lots are at the park. However, this failed system could have been at least some of the source of the elevated *E. coli* found in the Ompompanoosac River. This park is in West Fairlee. (See map below).

Opportunities for improvement were noted a several small horse and beef farm operations. Potential water quality problems from these farms include livestock access to waterways, manure storage in close proximity to waters, and livestock overgrazing. The WRNRCD and ARS staff are currently contacting these farmers to provide best management practice technical assistance and funding opportunities to address these potential sources of bacteria, sediment, and nutrients to the Ompompanoosuc.

Several riparian buffer opportunities have been identified along the Ompompanoosuc and tributaries. Buffer plantings were completed at two adjacent agricultural properties upstream of West Fairlee Village during the 2013 and 2014 field seasons. Additionally, the Upper Valley Land Trust is applying for funding to secure permanent riparian corridor easements on these two properties, totally over 32 acres of riparian and floodplain property. Several additional landowners have been contacted as part of the tactical basin planning process and are interested in establishing riparian buffers.

Due to the elevated bacteria measurements, the Ompompanoosuc River, from the USACOE beach area to Brimstone Corner, did not meet Vermont's water quality standards, was identified as impaired and was placed on the 303(d) list. The 303(d) listing states that use of the Ompompanoosuc River for contact recreation (i.e., swimming) is impaired. The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with state water quality standards.

The Ompompanoosuc River is a Class B, cold water fishery with designated uses including swimming, fishing and boating (VTDEC 2008a). In 2006 and 2007, the Ompompanoosuc Watershed Council (OWC) collected samples of *E.coli* bacteria from June through August at 19 different locations (OWC 2006; OWC 2007). The results show that *E.coli* levels were above the water quality criterion value (of 77 counts/100 mL)

during numerous sampling events and at numerous different locations. Annual geometric mean *E. coli* concentration values were also above the proposed criterion value (of 126 counts/100 mL) at several locations.

Three potential source areas were identified and an initial reconnaissance conducted in these areas. The three potential sources were identified as the agricultural land upstream of West Fairlee Village, West Fairlee Village itself, and the reach between West Fairlee Village and Cross Road area. Several potential agricultural and septic sources were observed. A "Water Quality in the Pompy," three town community meeting was held in the winter of 2015 (Figure 21.). Water Quality data, septic system maintenance practices, and next steps were presented with input from the community. The following are next steps and recommendations:

- Additional bacteria sampling scheduled for summer 2015 with DEC LaRosa Lab grant funding- to bracket potential sources
- Illicit discharge assessments- within West Fairlee Village and a mobile home park located just off the Cross Road
- Agricultural runoff assessments- upstream of West Fairlee Village, within West Fairlee Village, and along the Cross Road
- Riparian buffer establishment and river corridor protection throughout the entire impaired reach

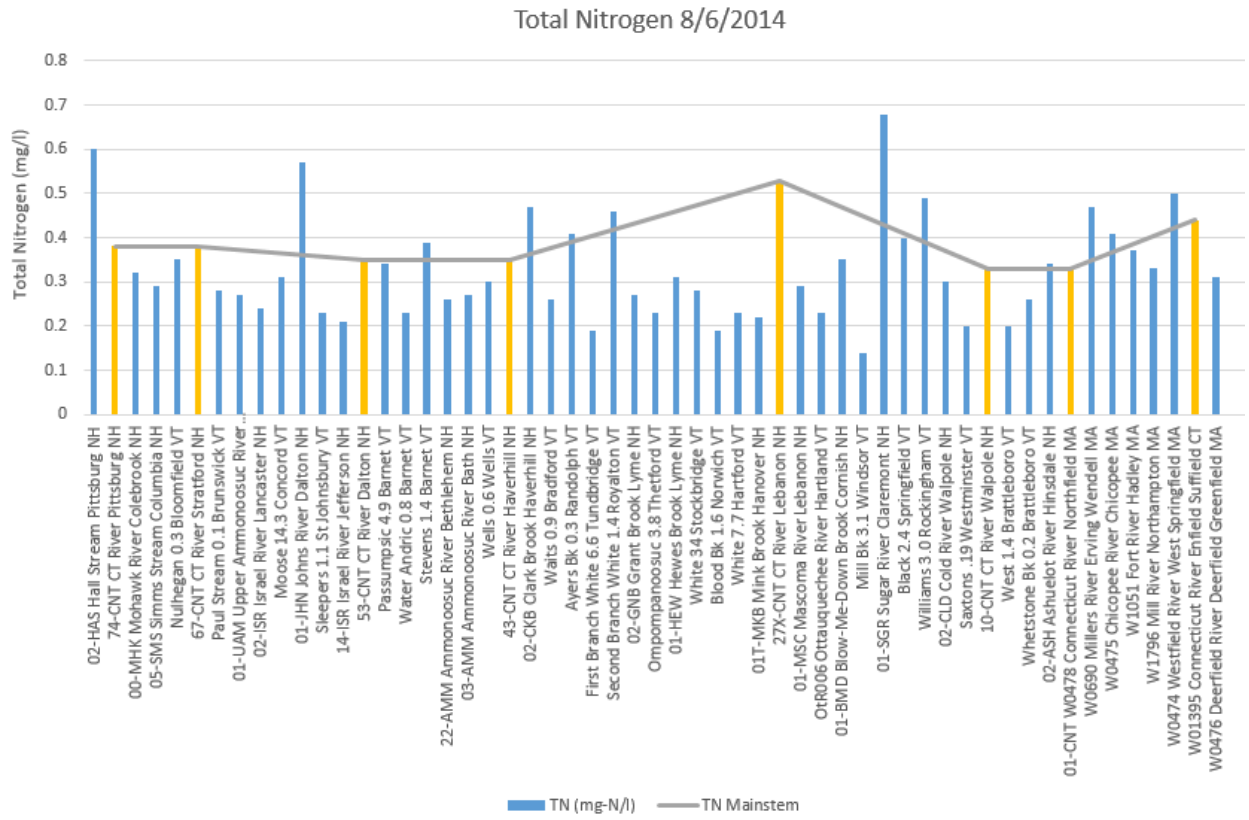
The Vermont TMDL for Bacteria Impaired Waters can be viewed at:
http://www.anr.state.vt.us/dec/waterq/mapp/docs/mp_bacteriatmdl.pdf

Figure 22." Water Quality on the Pompy" Community meeting, winter 2015 (Photo credit- Jim Ryan)

Sample Palooza water quality monitoring

The Connecticut River Watershed Council (CRWC), New Hampshire Department of Environmental Services (NHDES), Vermont Department of Environmental Conservation (VTDEC), Massachusetts Department of Environmental Protection (MassDEP), and US Environmental Protection Agency (EPA) coordinated the first of its kind, large-scale, one-day water testing event in the Connecticut River basin, known as "Samplepalooza 2014". On August 6, 2014 multiple teams of volunteers and professionals visited over 50 locations (Table 22. below) covering more than 1,000 river miles across the three states. Samples were tested for nutrients, chloride, and other water quality parameters to help determine the amount and impact of these pollutants. Sample Palooza is scheduled to continue in 2015.

Samplepalooza is a coordinated effort between the state agencies, CRWC and citizen scientists to collect data to support a multi-state effort working to reduce nitrogen pollution in Long Island Sound. Nitrogen from the Connecticut River and other rivers entering the Sound has been determined to be the cause of the "dead zone" documented by researchers in the Long Island Sound. Excess nitrogen causes large amounts of algae to grow. As the algae dies, it depletes the water of dissolved oxygen that is critical for aquatic wildlife.


Total Nitrogen 8/6/2014
Total Nitrogen (mg/l)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
02-HAS Hall Stream Pittsburg NH
74-CNT CT River Pittsburg NH
00-MHK Mohawk River Colebrook NH
05-SMS Simms Stream Columbia NH
Nulhegan 0.3 Bloomfield VT
67-CNT CT River Stratford NH
Paul Stream 0.1 Brunswick VT
01-UAM Upper Ammonoosuc River ..
02-ISR Israel River Lancaster NH
Moose 14.3 Concord VT
01-JHN Johns River Dalton NH
Sleepers 1.1 St Johnsbury VT
14-ISR Israel River Jefferson NH
53-CNT CT River Dalton NH
Passumpsic 4.9 Barnet VT
Water Andric 0.8 Barnet VT
Stevens 1.4 Barnet VT
22-AMM Ammonoosuc River Bethlehem NH
03-AMM Ammonoosuc River Bath NH
Wells 0.6 Wells VT
43-CNT CT River Haverhill NH
02-CKB Clark Brook Haverhill NH
Waits 0.9 Bradford VT
Ayers Bk 0.3 Randolph VT
First Branch White 6.6 Tunbridge VT
Second Branch White 1.4 Royalton VT
02-GNB Grant Brook Lyme NH
Ompompanoosuc 3.8 Thetford VT
01-HEW Hewes Brook Lyme NH
White 3.4 Stockbridge VT
Blood Bk 1.6 Norwich VT
White 7.7 Hartford VT
01T-MKB Mink Brook Hanover NH
27X-CNT CT River Lebanon NH
01-MSC Mascoma River Lebanon NH
OtR006 Ottauquechee River Hartland VT
01-BMD Blow-Me-Down Brook Cornish NH
Mill Bk 3.1 Windsor VT
01-SGR Sugar River Claremont NH
Black 2.4 Springfield VT
Williams 3.0 Rockingham VT
02-CLD Cold River Walpole NH
Saxtons .19 Westminster VT
10-CNT CT River Walpole NH
West 1.4 Brattleboro VT
Whetstone Bk 0.2 Brattleboro VT
02-ASH Ashuelot River Hinsdale NH
01-CNT W0478 Connecticut River Northfield MA
W0690 Millers River Erving Wendell MA
W0475 Chicopee River Chicopee MA
W1051 Fort River Hadley MA
W1796 Mill River Northampton MA
W0474 Westfield River West Springfield MA
W01395 Connecticut River Enfield Suffield CT
W0476 Deerfield River Deerfield Greenfield MA
TN (mg-N/l)
TN Mainstem

Glossary

10 V.S.A., Chapter 47 - Title 10 of the Vermont Statutes Annotated, Chapter 47, Water Pollution Control, which is Vermont's basic water pollution control legislation.

Accepted Agricultural Practices (AAP) - land management practices adopted by the Secretary of Agriculture, Food and Markets in accordance with applicable State law.

Acceptable Management Practices (AMP) - methods of silvicultural activity generally approved by regulatory authorities and practitioners as acceptable and common to that type of operation. AMPs may not be the best methods, but are acceptable.

Aquatic biota - all organisms that, as part of their natural life cycle, live in or on waters.

Basin - one of fifteen planning units in Vermont. Some basins include only one major watershed after which it is named such as the Lamoille River Basin. Other Basins include two or major watersheds such as the Poultney/ Mettawee Basin.

Best Management Practices (BMP) - a practice or combination of practices that may be necessary, in addition to any applicable Accepted Agricultural or Silvicultural Practices, to prevent or reduce pollution from nonpoint source pollution to a level consistent with State regulations and statutes. Regulatory authorities and practitioners generally establish these methods as the best manner of operation. BMPs may not be established for all industries or in agency regulations, but are often listed by professional associations and regulatory agencies as the best manner of operation for a particular industry practice.

Classification - a method of designating the waters of the State into categories with more or less stringent standards above a minimum standard as described in the Vermont Water Quality Standards.

Designated use - any value or use, whether presently occurring or not, that is specified in the management objectives for each class of water as set forth in §§ 3-02 (A), 3-03(A), and 3-04(A) of the Vermont Water Quality Standards.

Existing use - a use that has actually occurred on or after November 28, 1975, in or on waters, whether or not the use is included in the standard for classification of the waters, and whether or not the use is presently occurring

Fluvial geomorphology - a science that seeks to explain the physical interrelationships of flowing water and sediment in varying land forms

Impaired water - a water that has documentation and data to show a violation of one or more criteria in the Vermont Water Quality Standards for the water's class or management type.

Improved Barnyards - a series of practices to manage and protect the area around the barn, which is frequently and intensively used by people, animals, or vehicles, by controlling runoff to prevent erosion and maintain or improve water quality. Practices may include: heavy use area protection, access roads, animal trails and walkways, roof runoff management, and others.

Mesotrophic – An intermediate level of nutrient availability and biological productivity in an aquatic ecosystem.

Natural condition - the condition representing chemical, physical, and biological characteristics that occur naturally with only minimal effects from human influences.

Nonpoint source pollution - waste that reaches waters in a diffuse manner from any source other than a point source including, but not limited to, overland runoff from construction sites, or as a result of agricultural or silvicultural activities.

pH - a measure of the hydrogen ion concentration in water on an inverse logarithmic scale ranging from 0 to 14. A pH under 7 indicates more hydrogen ions and therefore more acidic solutions. A pH greater than 7 indicates a more alkaline solution. A pH of 7.0 is considered neutral, neither acidic nor alkaline.

Point source - any discernible, confined and discrete conveyance including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which either a pollutant or waste is or may be discharged.

Reference condition - the range of chemical, physical, and biological characteristics of waters minimally affected by human influences. In the context of an evaluation of biological indices, or where necessary to perform other evaluations of water quality, the reference condition establishes attainable chemical, physical, and biological conditions for specific water body types against which the condition of waters of similar water body type is evaluated.

Riparian vegetation - the native or natural vegetation growing adjacent to lakes, rivers, or streams.

Sedimentation - the sinking of soil, sand, silt, algae, and other particles and their deposition frequently on the bottom of rivers, streams, lakes, ponds, or wetlands.

Thermal modification - the change in water temperature

Turbidity - the capacity of materials suspended in water to scatter light usually measured in Jackson Turbidity Units (JTU). Highly turbid waters appear dark and "muddy."

Waste Management System -a planned system in which all necessary components are installed for managing liquid and solid waste, including runoff from concentrated waste areas and silage leachate, in a manner that does not degrade air, soil, or water resources. The purpose of the system is to manage waste in rural areas in a manner that prevents or minimizes degradation of air, soil, and water resources and protects public health and safety. Such systems are planned to preclude discharge of pollutants to surface or ground water and to recycle waste through soil and plants to the fullest extent practicable.

Water Quality Standards - the minimum or maximum limits specified for certain water quality parameters at specific locations for the purpose of managing waters to support their designated uses. In Vermont, Water Quality Standards include both Water Classification Orders and the Regulations Governing Water Classification and Control of Quality.

Waters - all rivers, streams, creeks, brooks, reservoirs, ponds, lakes, springs and all bodies of surface waters, artificial or natural, which are contained within, flow through or border upon the State or any portion of it.

Watershed - all the land within which water drains to a common waterbody (river, stream, lake pond or wetland).

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