



Tactical Basin Plan
for the
West, Williams and Saxtons
Rivers and adjacent
Connecticut River Tributaries

**Salmon, Canoe, Sacketts, East Putney, Chase,
Fullam, Mill, and Morse Brooks**

(Basin 11/13)

DRAFT

Prepared by:
Vermont Agency of Natural Resources
Department of Environmental
Conservation
Watershed Management Division

October 2015



This Water Quality Management Plan was prepared in accordance with 10 VSA § 1253(d), the Vermont Water Quality Standards, the Federal Clean Water Act and 40 CFR 130.6, and the Vermont Surface Water Management Strategy.

Approved¹:

David Mears, Commissioner

Date

Deb Markowitz, Secretary

Date

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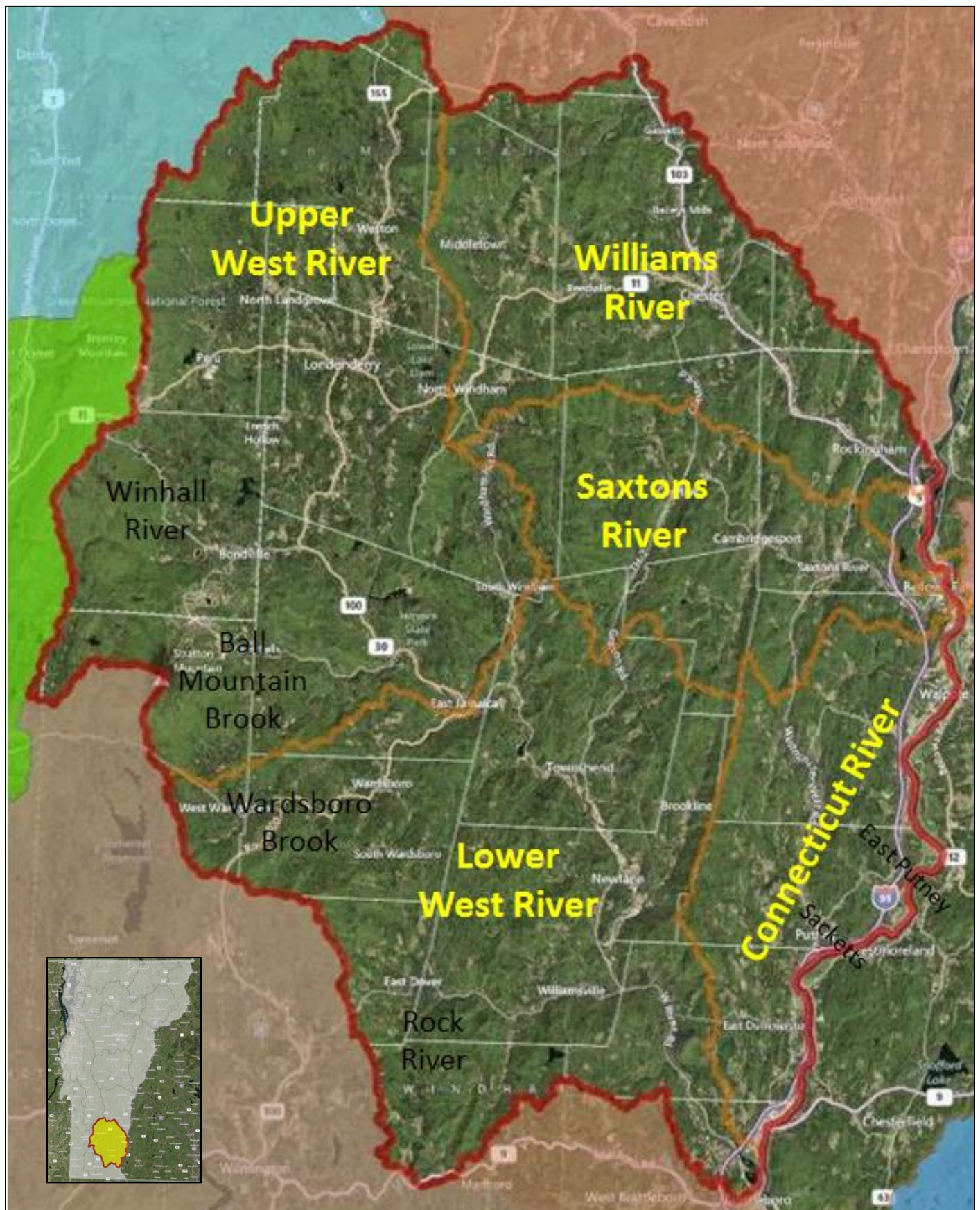
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Cover Photo: Twin Falls, Saxtons River

¹) 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.

Basin 11 – 13

Major Watersheds



All Towns in Basin 11 - 13

| | | |
|-------------|--------------|-------------|
| Andover | Landgrove | Springfield |
| Athens | Londonderry | Stratton |
| Brattleboro | Ludlow* | Sunderland* |
| Brookline | Marlboro | Townshend |
| Cavendish* | Mount Holly* | Wardsboro |
| Chester | Mount Tabor | Westminster |
| Dover | Newfane | Weston |
| Dummerston | Peru | Windham |
| Grafton | Putney | Winhall |
| Jamaica | Rockingham | |

Towns in Major Sub-watersheds

West River
 Andover
 Athens
 Brattleboro
 Brookline
 Dover
 Dummerston
 Jamaica
 Landgrove
 Londonderry
 Ludlow
 Marlboro
 Mount Holly*
 Mount Tabor
 Newfane
 Peru
 Putney
 Stratton
 Sunderland*
 Townshend
 Wardsboro
 Westminster
 Weston
 Windham
 Winhall

Williams River
 Andover
 Cavendish*
 Chester
 Grafton
 Londonderry
 Ludlow*
 Rockingham
 Springfield
 Weston
 Windham

Saxtons River
 Athens
 Grafton
 Rockingham
 Townshend
 Westminster
 Windham

Connecticut River
 Dummerston
 Putney
 Rockingham
 Springfield
 Westminster

Tributary Brooks

Salmon Dummerston
 Putney
Canoe Dummerston
 Putney
Mill Dummerston
 Putney
Sacketts Putney
 Westminster
East Putney Putney
 Westminster
Chase Putney
 Westminster
Fullam Westminster
Mill Westminster
Morse/Cobb/Newcomb
 Westminster
Darby Hill Rockingham
**Commissary/Little
 Commissary**
 Rockingham
 Springfield

* - towns with small areas in each watershed

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Executive Summary

Basin 11-13 consists of the West, Williams and Saxtons rivers and the adjacent Connecticut River valley tributaries. The Basin covers just under 700 square miles of southeastern Vermont. From Stratton Mountain at 3940 feet in elevation the watersheds drop over 3700 feet down to the Connecticut River.

Recreational opportunities are extensive in the Basin. The West River is well-known for paddling, the lower river and Retreat Meadows for fishing and ice-fishing and the Connecticut River for both as well. High concentrations of rare, threatened and endangered species are concentrated along the lower Connecticut River and the West River valley, while the western high elevation lands host significant natural communities especially within the Green Mountain National Forest.

Challenges exist however between the exceptional natural resources and water quality and the numerous resort areas and industrial water uses in the Basin. Water quality impacts from these include altered flows from water withdrawals for snowmaking and hydropower generation, river flow alterations associated with flood control projects, sedimentation from roads, parking lots and development and temperature changes from impoundments and loss of riparian vegetation.

The three Basin 11 watersheds have some of the highest number of miles with temperature impacts in the state. The lower Williams and Saxtons Rivers both face nutrient and sediment issues.

This Water Quality Management Plan provides a watershed-wide perspective on the health and condition of the water quality and aquatic resources of the basin. As the tactical, or implementation, portion of the [Vermont Surface Water Monitoring Strategy](#) it offers clear actions to protect, maintain, and improve surface waters by managing the activities that cause the known stressor(s) and address the resulting pollutants. Priority has been given to those waters that are identified as facing the greatest challenges due to either degraded conditions already present or the exceptional quality and characteristics that should be protected.

Tropical Storm Irene occurred in 2011 and hit this region with astonishing intensity. The Williams, Saxtons and West River had wide regions flooded, businesses and homes destroyed and infrastructure overwhelmed. No town was spared but Chester, Grafton, Newfane and Jamaica were especially hard hit and received heavy damage. The flooding and erosive damage will remain visible for decades but the rivers' response has been to re-create lost floodplains, increase sinuosity and re-distribute sediment

throughout the valleys. The new river channels and patterns, if allowed to remain, will offer some mitigation of future flood events.

Future attention to building with flood resiliency in mind will also move the region toward a more sustainable co-existence with our rivers. A number of implementation actions are direct responses to the flooding in order to move in this direction.

Strategies address both overall regional water quality issues as well as specific actions on targeted waters. Sections of the West River, Ball Mountain Brook watershed are highlighted for their impaired ² status and the need to bring these waters back into compliance with the Vermont Water Quality Standards (VWQS).

The goal is to carry out as many of these actions as possible over the next five years to bring improvements and protections to the regions surface waters.

Priority Actions

- Incorporate river corridors, floodplain protection and flood resiliency strategies into local and regional development plans and zoning.
- Protect the land and habitat along the Connecticut River to enhance survival of the high concentration of RTE species in Brattleboro and Rockingham.
- Implement recommendations of the Bacteria TMDL to control high levels of bacteria in the West River in Londonderry.
- Implement restoration projects on the North Branch of Ball Mountain Brook and its tributaries that address sediment and stormwater impacts.
- Work with GMNF to reclassify appropriate waters within the Forest from Class B to Class A.
- Implement restoration projects prioritized in River Corridor Plans for the Williams River, Saxtons River, Rock River, Winhall River, Ball Mountain Brook and Wardsboro Brook.
- Remove the man-made blockage from Adams Brook and restore the streambed and banks.
- Implement stormwater control projects and green infrastructure practices to reduce flows and sediment. Focus areas: Brattleboro, Bellows Falls and Chester villages, and Stratton/Winhall resort areas.
- Work with the towns of Chester, Grafton and Rockingham to address sediment, nutrient and temperature impairments on the lower Williams and Saxtons rivers

² Words in **BOLD** are defined in the [Glossary](#) of the Vermont Surface Water Management Strategy or at the end of this document.

- Work with the towns of Winhall, Londonderry, Jamaica and Wardsboro to address sediment and temperature impairments on the Winhall River and Wardsboro Brook.
- Reduce sediment inputs from Commissary Brook to the Connecticut River from mass failures and erosion on first tributary.

Summary of Classification Opportunities.

Water recommended for reclassification to Class A(1):

- | | |
|--|-------------------------------------|
| • Greendale Brook & Jenny Coolidge Brook | Biomonitoring Exc to VeryGood |
| • Saxtons River above village | Biomonitoring Exc to VeryGood |
| • Upper Sacketts Brook | Biomonitoring Exc to VeryGood |
| • Kenny Pond | Best Lakes, Top 25% Overall |
| • Lowell Lake and contiguous wetlands | Top 5% Best Lakes Overall |
| • Moses Pond | Long term acid research |
| • Wantastiquet Lake | Top 10-Best Lakes for Water Quality |

Water identified as Very High Quality:

- | | |
|--|-------------------------|
| • Williams River and tributaries above Rte 10 | Biomonitoring Exc |
| • Andover Branch and tributaries above RM_4.8 | Biomonitoring Exc |
| • Turkey Mountain Brook | Biomonitoring Exc |
| • Grassy Brook and tributaries above Parker Road | Biomonitoring Exc-VGood |
| • Salmon Brook | Biomonitoring Exc |
| • All waters identified as meeting VGood to Excellent conditions | See Table 17. |

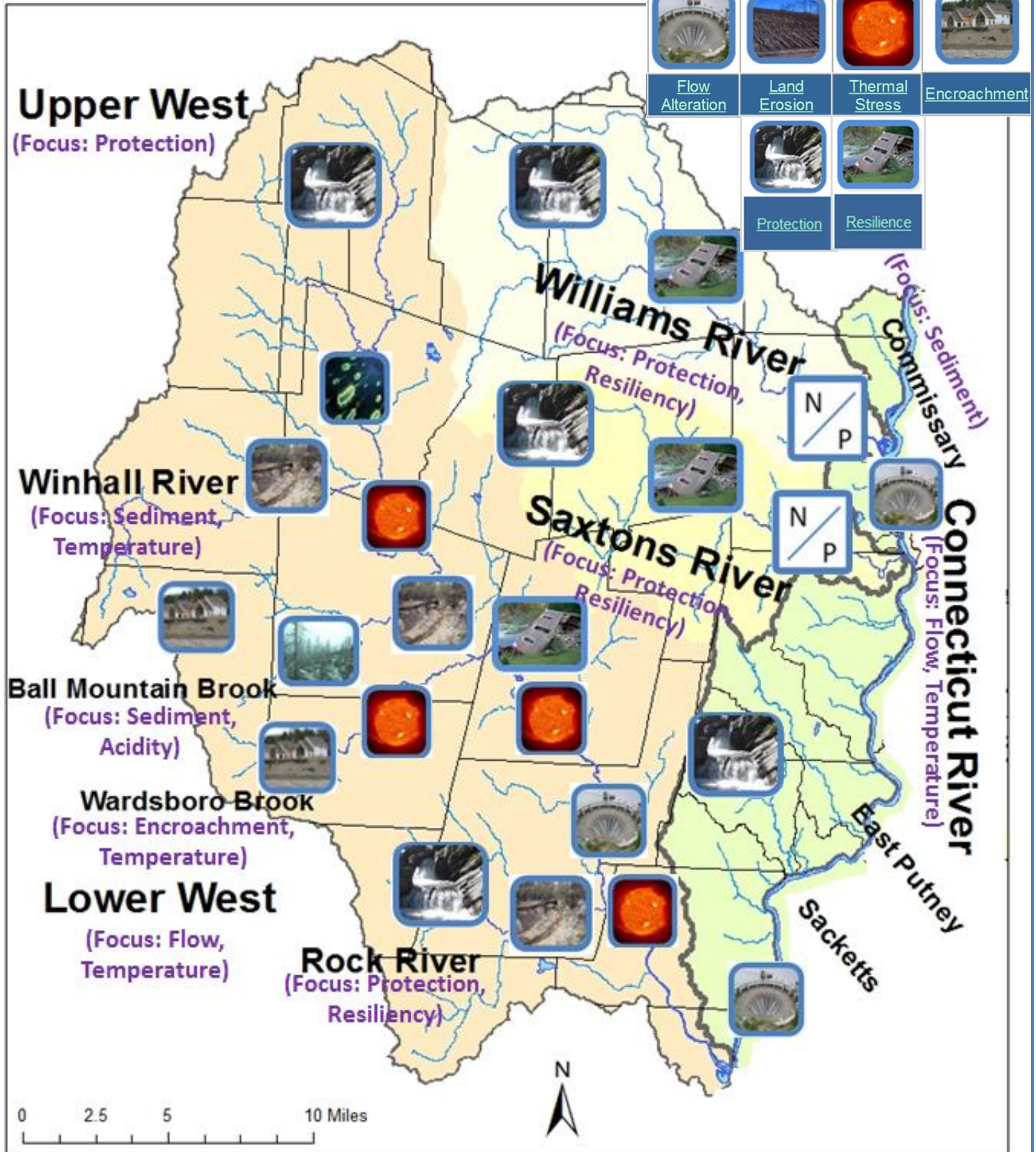
Water recommended for evaluation as prospective Outstanding Resource Waters:

- | | |
|------------------------------------|---|
| • Jelly Mill Falls, Stickney Brook | Unique geological feature, recreation |
| • Rock River | Unique geological feature, recreation |
| • Adams Brook, Bemis Brook | Unique geological feature |
| • West River mainstem | High concentration of RT&E, recreation, fish spawning |
| • Twin Falls | Unique geological feature |
| • Brockways Mills Gorge | Unique geological feature, recreation |
| • Connecticut River | High concentration of RT&E |
| • Connecticut River, Great Falls | 1st canal in USA, 1st CT River bridge, petroglyphs, falls, high concentration of RT&E |

Wetlands proposed for study to determine Class I potential:

- Eddy Brook wetlands (>180 acres) Large complex
- Winhall River headwaters wetlands Class A(1) river, GMNF
 complex (>900 acres)

Basin Overview



Chapter 1. Introduction

Setting and Purpose of this Plan

From the headwaters off of South Mountain in Mount Holly, and framed by Bromley, Stratton, and Hogback Mountains on the west and the Connecticut River on the east, Basin 11-13 runs from the crest of the southern Green Mountains almost to the Massachusetts line, dropping over 3700' in elevation from the high point in Stratton to its lowest point in Brattleboro. Twenty-nine towns in full or in part, make up the Basin.

The largest of the major watersheds in the Basin is the West River draining 423 square miles from Weston to Brattleboro. Its larger tributaries include the Rock and Winhall Rivers and Wardsboro and Ball Mountain Brooks. The Williams River running from the hills of Andover down to Herrick's Cover in Rockingham drains 117 square miles and the Saxtons River covers 78 squares miles from Windham to Westminster. These waters make up Planning Basin 11.

The approximately 26 miles of the Connecticut River mainstem covered in this basin include Rockingham/Bellows Falls to Brattleboro. The largest brooks feeding directly into the Connecticut River are East Putney and Sacketts Brooks both of which are in Westminster and Putney. These waters make up Planning Basin 13.

The Vermont Department of Environmental Conservation's (VDEC) tactical planning process is designed to identify and prioritize state and local water quality issues and implement on-the-ground watershed protection and restoration projects. Plans are designed to meet the goals and objectives of the [Vermont Surface Water Management Strategy](#)³ to protect, maintain 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 VDEC collaborates with state, federal and municipal organizations, local conservation groups, businesses, and a variety of landowners and interested citizens to develop the water quality management plan for waters in these Basins.

In 2015 the Vermont Legislature passed Act 64, the Vermont Clean Water Act. This Act strengthens multiple statutes related to water quality in the State. The Act addresses agricultural water quality on small, medium and large farms through the Agency of Agriculture, Food and Markets. It establishes water quality requirements for stormwater discharges from new and existing development, industrial and municipal

³ <http://www.anr.state.vt.us/dec/waterg/swms.html>

stormwater discharges, and runoff from municipal roads through the Department of Environmental Conservation. And through the Department of Forests, Parks and Recreation, the Act addresses water quality runoff from forest silvicultural activities.

The Act also establishes the requirement that all water quality improvement actions undertaken by the State be integrated by means of Tactical Basin Plans, and establishes partnerships with Regional Planning Commissions, Conservation Districts, and other organizations to support this work. Lastly, the Act establishes a cleanup fund to dedicate resources towards the highest priority water quality remediation actions.

Act 64 is just beginning to be implemented. Drafting procedures and legislative rule-making are in process. The resulting policies and procedures will take several years to be fully implemented, and will ensure improved water quality throughout the state. For more information, readers should review the content of the Clean Water Vermont website, at <http://cleanwater.vermont.gov/>.

Many partners are integral to the planning process, these include:

- Connecticut River Joint Commissions and Wantastiquet and Mount Ascutney Local River Subcommittees
- Connecticut River Watershed Council
- Municipalities of Brattleboro, Chester, Dover, Dummerston, Grafton, Londonderry, Marlboro, Newfane, Putney, Rockingham, Stratton, Wardsboro, Windham.
- Rock River Preservation
- Southeastern Vermont Watershed Alliance
- Southern Windsor County Regional Planning Commission
- Stratton Corporation
- TransCanada Hydro Northeast Inc.
- Trout Unlimited
- US Army Corps of Engineers
- USDA
 - Forest Service and
 - Natural Resources Conservation Service
- VT Agency of Agriculture, Food and Markets
- VT Agency of Natural Resources Departments of
 - Environmental Conservation
 - Fish and Wildlife and
 - Forests, Parks and Recreation
- VT Agency of Transportation
- Windham Natural Resources Conservation District
- Windham Regional Commission

Chapter 2. Water Quality in the Basin

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. Stream geomorphic assessments have been completed or are underway in two major watersheds, and a stormwater inventory and illicit discharge and detection has been carried out in one town. These efforts, as well as those planned for execution during the implementation of this Plan are detailed in Table 1.

Geomorphic assessments incorporate watershed-wide information from maps, aerial photographs, existing studies, and field data into a detailed characterization of **riparian** and in-stream habitat, erosion, and flood hazards for use in watershed planning. Table 1 and Figure 1 show the locations and links for those completed or underway in the Basin.

The Ambient Biomonitoring Program of Watershed Management Division (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](#).

The Lake Assessment Program of the WSMD performs similar functions for lakes and ponds, and numerous lakes and ponds have been assessed in this Basin. Figure 2 shows monitoring locations for both programs, and provides an assessment of current biological integrity for streams. The condition of lakes is described separately in this Chapter.

A comprehensive summary of available assessment information from all of these processes is compiled into individual reports for each major watershed which details the conditions on a sub-watershed and reach level for the major watersheds in the Basin. These are presented in Tables 1. and 2.

Table 1. Assessments in the Basin 11-13

| Stream Geomorphic Assessments | | |
|---|----------------------------------|----------------------------|
| Subwatershed | Date | Coverage |
| Saxtons River Corridor Plan | 2010 | Phase 1, 2 & Corridor Plan |
| Williams River | Underway Est. Completion 2016 | Phase 1, 2 & Corridor Plan |
| West River | 2010 | Phase 1 Only |
| Ball Mountain Brook Corridor Plan | 2007 | Phase 1, 2 & Corridor Plan |
| Rock River Watershed Phase 2 SGA | 2007 | Phase 1, 2 & Corridor Plan |
| Winhall River Corridor Plan | 2014 | Phase 1, 2 & Corridor Plan |
| Wardsboro River Corridor Plan | 2014 | Phase 1, 2 & Corridor Plan |
| Water Quality and Aquatic Habitat Assessments | | |
| West River Watershed October 2014 | 2014 | |
| Williams River Watershed October 2014 | 2014 | |
| Saxtons River Watershed October 2014 | 2014 | |
| Lower Connecticut Tributaries | | |
| 11 - West, Williams, and Saxtons Rivers plus Lower Conn River Tribs | November 2001 | |
| 13 - Lower Connecticut River | March 2011 | |
| Stormwater Assessments | | |
| Stormwater Mapping Project - Brattleboro | August 2010 | |
| Putney Road - Crosby Brook Restoration Study Project Report | February 2015 | |

Figure 1. Stream Geomorphic Assessments in Basin 11-13

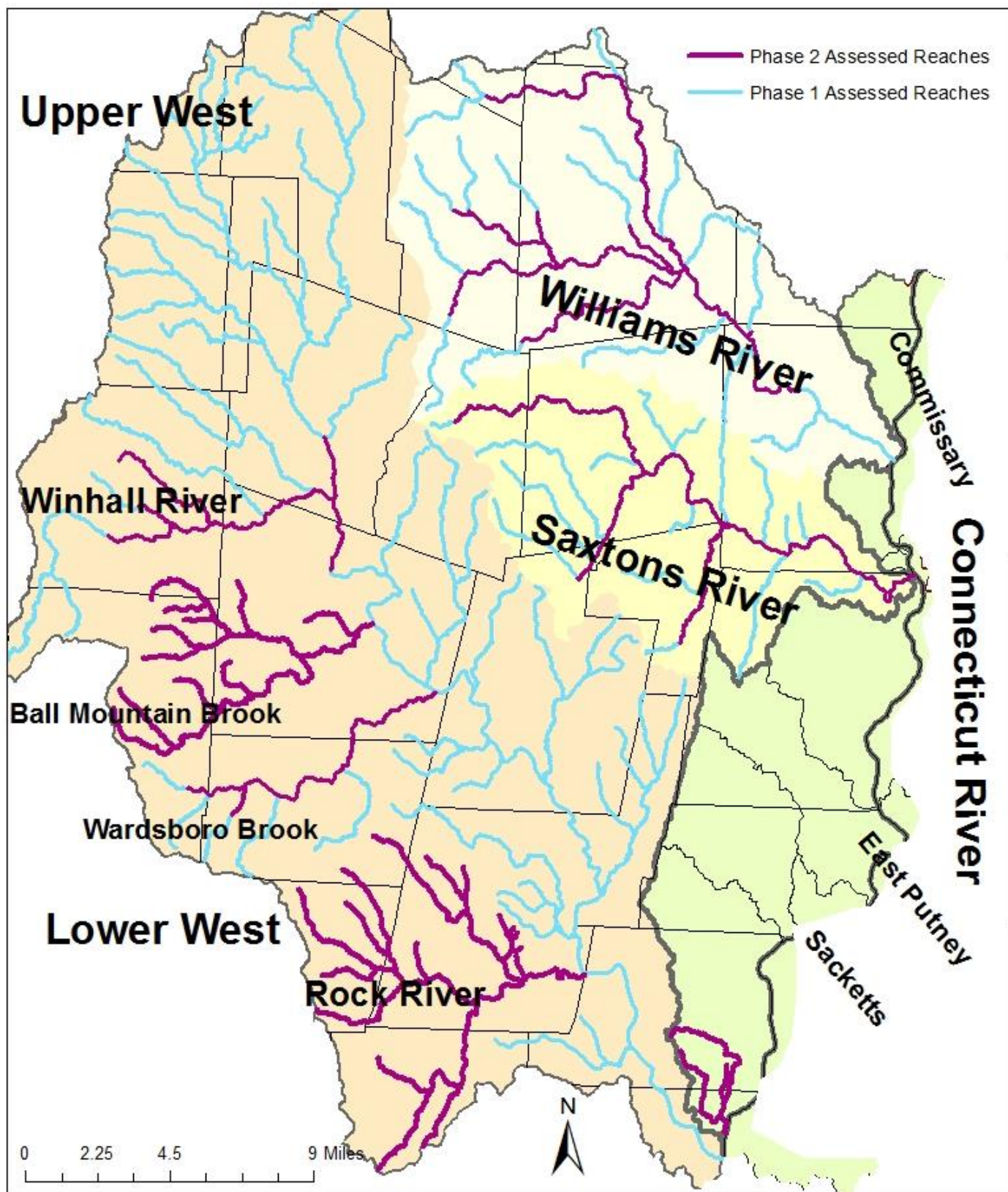


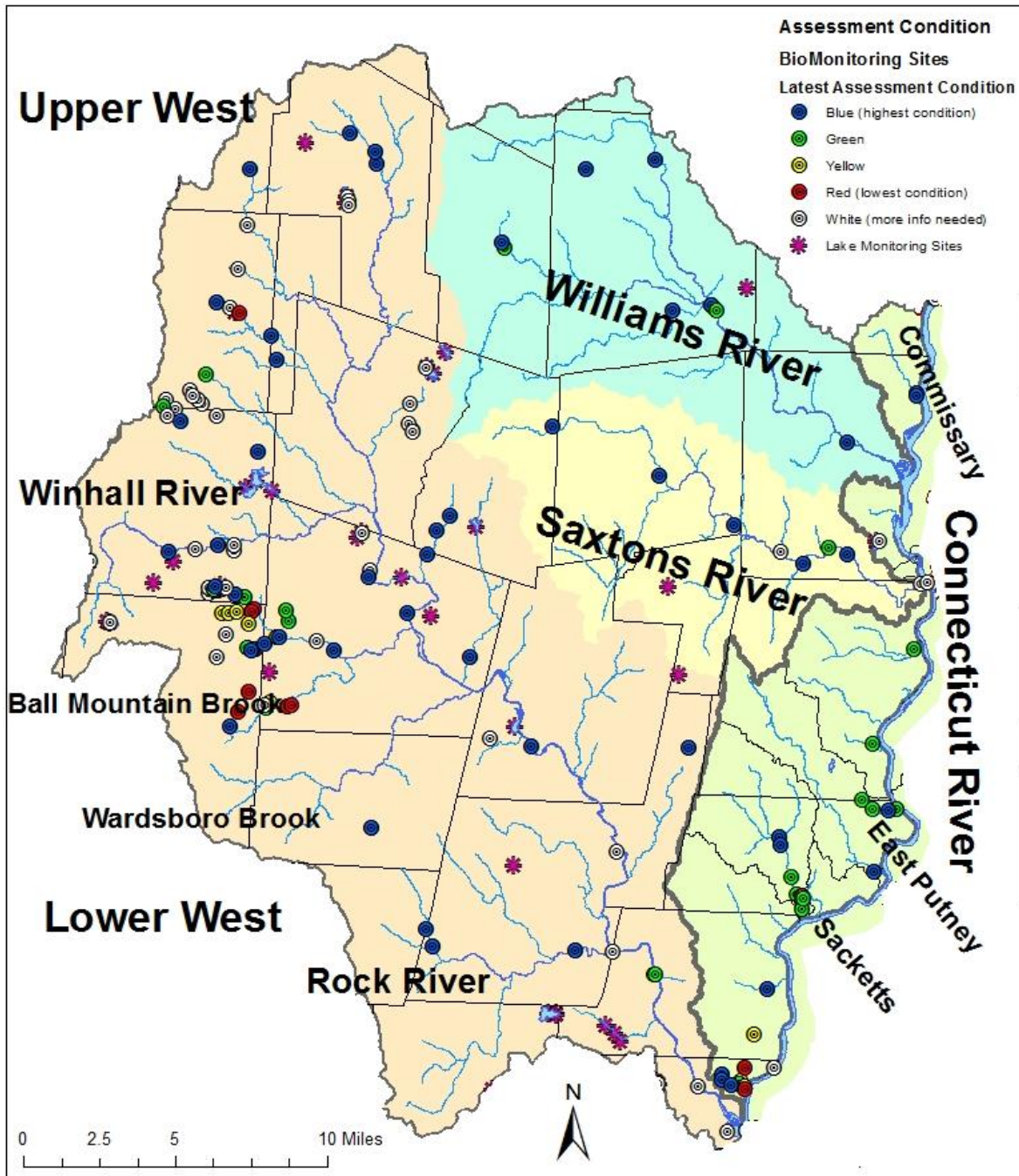
Table 2. Status of Completed and Planned Assessments for the Basin 11 – 13 Region.

| X = proposed in plan, C = Completed, PC = Partial Completed, O = On-going, U = Underway, P = Planned, N = Not planned | | | | | | | | | |
|---|---|---|--------------------------|---------------------------------------|-------------------------|--|--|----------------------------------|---------|
| | Sub-Basin | Geomorphic Assessment | Water Quality Monitoring | Bio-monitoring (completed / planned*) | Agricultural Assessment | Stormwater Inventory & Illicit Discharge Detection | Status: Listed / Pollutant | Full or Partial reach listed? | |
| West River | | | | | | | | | |
| | Upper West from Winhall River to headwaters | PC | O | 2010 / * | X | | Part D (E. coli) | Partial | |
| | Middle West from Grassy Brook to Winhall River | PC | O | | X | | Part F (altered flow regulation, impoundment) | Partial | |
| | Lower West from mouth to Grassy Brook | PC | O | | X | PC | Part F (altered flow regulation) | Full | |
| | Retreat Meadows | N | O | | | C | Part E (Eurasian watermilfoil) | Full | |
| | Stickney Brook | N | O | | | | Part F (altered flow regulation, dredging) | Partial | |
| | Rock River | C | O | 1993 / * | | | Stressed (sediment, temperature, physical alterations) | Partial | |
| | Winhall River | C | O | 2014 / * | | X | Stressed (sediment, temperature) | Partial | |
| | ◆ Mill Brook | | | | | | Part F (altered flow regulation) | Partial | |
| | ▲ Mill Brook trib #6 | | | 2013 / * | | | Part F (altered flow regulation) | Partial | |
| TRIBUTARIES | Grassy Brook | N | O | | | | | | |
| | Cobb Brook | N | O | 2012 / * | | | | | |
| | Turkey Mountain Brook | N | O | | | | | | |
| | Wardsboro Brook | C | O | | | | Stressed (sediment, temperature) | Partial | |
| | Ball Mountain Brook | C | O | 1988 / * | | X | Part A (acid) | Full, Partial | |
| | ◆ No. Branch Ball Mountain Brook | | | 2014 / * | | | Part B (manganese) | Partial | |
| | ▲ Styles Brook | | | 2014 / * | | | Removed from impaired list | | |
| | ◆ Bear Creek Brook | | | | | | Part A (acid) | Partial | |
| | ◆ Kidder Brook | | | 2013 / * | | | Part A (acid) | Partial | |
| | Flood Brook | N | O | 2008 / * | | | Stressed (temperature) | Partial | |
| | Williams River | | | | | | | | |
| | MAINSTEM | Upper Williams From Middle Branch to headwaters | U | O | 2002 / * | X | N | Stressed (sediment, temperature) | Partial |
| Lower Williams from mouth to Middle Branch | | U | O | 2012 / * | X | X | Stressed (sediment, nutrients, temperature) | Full | |
| TRIBUTARIES | Middle Branch | U | O | | X | X | Stressed (physical alterations) | Partial | |
| | South Branch | U | O | 0993 / * | N | N | | | |
| Saxtons River | | | | | | | | | |
| MAINSTEM | Upper Saxtons from South Branch to headwaters | C | O | 2006 / * | N | N | | | |
| | Lower Saxtons from mouth to South Branch | C | O | 2012 / * | X | X | Stressed (sediment, temperature, phosphorus) | Full, Partial | |
| TRIBUTARIES | South Branch | C | O | | X | N | | | |
| | Signal Hill Brook | | | | | | Removed from impaired list | | |
| Connecticut River | | | | | | | | | |
| MAINSTEM | WBID 13-03 – Bellows Falls Dam to West River confluence | N | N | 2009 / * | X | X | Part F (altered flow regulation) | Full | |
| TRIBUTARIES | Commissary & Little Commissary Brooks Brook | X | O | 2008 / * | | | Part A (sediment) | Partial | |
| | East Putney Brook | N | O | 2012 / * | | | | | |
| | Sacketts Brook | C | O | 2012 / * | | C | Part F (altered flow regulation) | Partial | |
| | Ellis Brook (Minards Pond outlet) | N | N | | | | Part F (altered flow regulation) | Full | |

* monitoring rotation scheduled for Basin 11-13 in 2016, exact sites TBD

Figure 2. Biological Condition at Stream Monitoring Sites and Lake Monitoring Site Locations

Biological Conditions



Water quality, biological condition, habitat, and geomorphic condition of specific subwatersheds

The Basin 11 - 13 planning unit includes the West, Williams and Saxtons River watersheds (Basin 11), the mainstem of the Connecticut River from Rockingham down to Brattleboro and all the smaller tributaries that drain directly into the Connecticut, such as Sacketts, East Putney and Morse Brooks along this reach (Basin 13).

The Silvio O. Conte Fish and Wildlife Refuge Environmental Impact Statement identifies four areas in the region as nationally important fish and wildlife habitats: the West River including the Rock River, Winhall River, and Wardsboro Brook tributaries, the Retreat Meadows, and in the Connecticut River watershed - Westminster Flats, and Putney Mountain.

West River

The mainstem of the West River originates in the southern part of Mount Holly, 2,400 feet above sea level. It flows southerly through Weston and Londonderry then through Jamaica, Townshend, Newfane, Dummerston and Brattleboro reaching the Connecticut River at the Retreat Meadows. It is 46 miles in length and the watershed covers 423 square miles.

Upper West River - Winhall River to headwaters

The headwaters of the West River include true gems like Greendale and Jenny Coolidge Brooks flowing from the GMNF. Both of these tributaries have **aquatic life support** (ALS) ratings of *Excellent* or *Very Good*.

Flood Brook above and two miles below Hapgood Pond has an ALS rating of *Excellent* however the dam and the annual draining of the pond impairs alters the pond and stresses outlet brook for flow and temperature.

The West River mainstem is not monitored above Ball Mountain Reservoir.

Mid-West River -Grassy Brook to Winhall River

The middle section of the West River is the segment hosting the two USACE flood control dams. The entire segment between the dams is impaired for temperature. This and the river below are impacted by the flow alterations from the dam operations.

Three majors tributaries join the West in this segment the Winhall River, Wardsboro Brook and Ball Mountain Brook. Cobb Brook is Class A(1).

The West River mainstem is not monitored in this section.

Winhall River

The upper Winhall River is monitored to track impacts from development related to the Stratton ski area. From the uppermost site at the end of Kendall Farm Road (**RM 8.1**) to the road's junction with Route 30 the ALS rates *Excellent*. The watershed above this point is on Green Mountain National Forest land and is classified as A(1) – Ecological Waters. The river habitat from RM 8.1 to its mouth is **Stressed** for sediment and temperature affecting the fishery due to channelization, road runoff, loss riparian vegetation and erosion/sedimentation. The macroinvertebrate community, however, is *Excellent to Very Good*.

Mill Brook is the largest tributary to the Winhall River. Mill Brook is Stressed above Gale Meadows Pond due to Bromley snowmaking water withdrawals. A tributary to Mill Brook (Trib. #6) has been on the Impaired Waters list but has recently met VWQS so has been removed from the list.

Ball Mountain Brook

Ball Mountain Brook and several tributaries have been tracked in detail due to impacts from development on Stratton Mountain.

The mainstem of Ball Mountain Brook above the confluence with the North Branch, along with Bear Mountain Brook, a tributary, are impaired for acid. Several tributaries along Ball Mountain Brook have ALS ratings of *Fair*. Aquatic habitat and aesthetics in Ball Mountain Brook are also stressed due to habitat alteration, turbidity/sedimentation from flooding and flood repair work, channelization, berming, and developed land runoff. Kidder Brook is a Class A(1) stream and yet above the Mountain Road crossing it too is impaired for acid.

The North Branch of Ball Mountain Brook runs through Stratton resort and ski mountain, the portion of it through Pikes Falls is an **Outstanding Resource Water**. Tributary 1 to Stratton Pond on the North Branch was impaired for a number of years but has recovered in the last three to four years. Tributary 2 to Stratton Pond is maintaining very good to good health of its aquatic biota.

The lower two miles of Styles Brook are impaired for sediment from land development activities, parking lots, streambank erosion and watershed hydrology changes. It has ALS ratings of *Good-Fair* or *Fair*. Brazers Brook rates *Good-Fair*, and Sunbowl Brook *Very Good-Good*.

Grassy Brook (*Ex-VG*), Turkey Mountain Brook (*Ex*), Cobb Brook (*Ex-VG*) and the Winhall River (*Ex-VG*) all join the West in this segment. Wardsboro Brook is not monitored.

Lower West River – mouth to Grassy Brook

The most downstream monitoring point on the lower West is at the Dummerston Covered Bridge where the ALS rating is *Good*. Concerns are for high temperatures impacting fishing and aquatic habitat, flow modifications caused by flood control dams and loss of riparian vegetation.

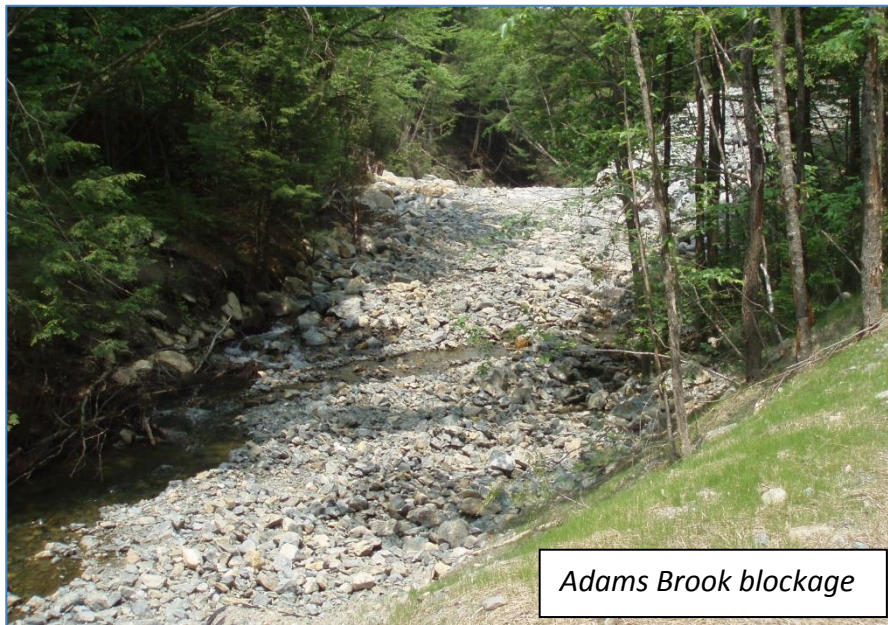
The West River up to the Wardsboro Brook has a high concentration of rare, threatened and endangered species with the highest density in the lower river. It is the only Vermont River to host the Brook Floater, a rare mussel, as well as six other mussel species.

The confluence of the West with the Connecticut River is inundated by the backwaters from the Vernon hydroelectric dam creating the Retreat Meadows, a rich and extensive wetland complex.

The largest tributary to the West River is the Rock River covering 57 square miles.

Rock River

The Rock River has not been monitored since the 1990's and is recommended for updated assessment. Having numerous swimming holes, the Rock is one of the most



heavily used rivers for recreation. It is however, Stressed due to sediment, temperature and physical alterations. It was devastated by Tropical Storm Irene and work continues to restore and repair the damage caused by emergency repairs following the storm. Adams Brook, a

tributary on the Newfane/Dover line, hard hit by the storm, road repair work has completely blocked flow and aquatic organism passage and altered aquatic habitat upstream of the blockage

Stickney Brook

Entering the West River 1.5 miles north of the Brattleboro line, Stickney Brook is listed as **Altered** for flow fluctuations due to its use as part of the Brattleboro water supply system. Its headwater is Sunset Lake and water is diverted from below the pond outlet and into Pleasant Valley Reservoir. There are no biomonitoring sites on Stickney Brook.

Williams River

Running for 25 miles from Andover through Chester and Rockingham, the Williams River watershed covers 117 square miles. The river drops over 2500 in elevation by the time it reaches Herricks Cove at the confluence with the Connecticut River. The two main tributaries are the Middle and South Branches. The Middle Branch follows Route 11 west out of Chester village while the South Branch, actually a tributary to the Middle Branch, runs along Popple Dungeon Road.

Upper Williams River – Middle Branch to headwaters

The upper Williams mainstem is monitored up to Gassetts where ALS rating is *Excellent*. However, encroachments from the road and loss of riparian vegetation from Chester village to Smokeshire cause the river to be listed as Stressed for temperature and sediment. Chase, Lovejoy and Wheaton brooks are tributaries to the upper Williams.

Lower Williams River – mouth to Middle Branch

In Chester, above the wastewater treatment facility (WWTF), the macroinvertebrate community is *Excellent to Very Good*, however, below the WWTF, macroinvertebrates were assessed as good and the fish community as poor. This reach is stressed for sediment, nutrients, and temperature due to encroachments and runoff from agriculture and development, and poor riparian condition. Aquatic life support returns to *Excellent* down at Parker Hill crossing.

Middle Branch

The Middle Branch has been monitored by SeVWA annually since 2011. The parameters tested, E. coli, total phosphorus, nitrogen, turbidity and conductivity all prove to be within the VWQS revealing good water quality. There are no biomonitoring sites on the river so no ALS rating is given. Loss of riparian vegetation and stormwater runoff are concerns causing elevated temperatures impacting ALS and fisheries. Several major mass bank failures occur along the Middle Branch which are significant sources sediment along with anthropogenic inputs. Due to in-stream work following TS Irene

the Middle Branch is Stressed due to the physical alterations caused by the dredging, berming and channelization that took place.

South Branch

The smaller South Branch was last monitored in 1993 at mile 1.3. At that time it received an ALS rating of *Excellent*. The lack of riparian buffer due to encroachment of the road and gravel road runoff are concerns, as are the numerous undersized culverts on Popple Dungeon Road. This river should be monitored again to obtain current information.

While the South Branch drains only 10.9 square miles of land the mainstem crosses roads 17 times. There are also a myriad of crossings on its many tributaries. Its steep valley drops 1400 feet in elevation over its course landing in the heavily developed residential community. These factors in combination have caused severe flood damage along its path and to the community at its base.

Saxtons River

Draining the eastern slope of Glebe Mountain into a large wetland in Windham at Lawrence Four Corners, the Saxtons River travels twenty miles discharging into the Connecticut River just south of Bellows Falls. The 78 square mile watershed drops over 2600 feet in elevation from source to outlet. The South Branch, meeting the mainstem in Grafton village is its largest tributary, itself draining 20 square miles. Bull Creek running south from Cambridgesport drains 11 square miles mostly in the town of Athens.

Upper Saxtons River – South Branch to headwaters

From the headwaters down to above Grafton village monitoring sites rate *Excellent to Very Good* for ALS. Sediment, turbidity, buffer loss and channel modifications are all of concern.

Lower Saxtons River – mouth to South Branch

From Cambridgesport to above Saxtons River village, ALS ratings continue at *Excellent*, however, just below Saxtons River village and the WWTF the rating drops to *Good to Fair*, but regains *Excellent* another mile downstream near Hall Bridge. Beginning in Grafton village and down to the mouth, the river is Stressed for sediment and temperature due to poor riparian conditions and channel modifications. Phosphorus levels increase below the WWTF causing this reach to be Stressed for phosphorus enrichment.

Water quality monitoring by the Southeastern Vermont Watershed Alliance (SeVWA) over the past five years reveals that phosphorus levels increase from just above the WWTF at Saxtons_5.6 to Saxtons_5.0.

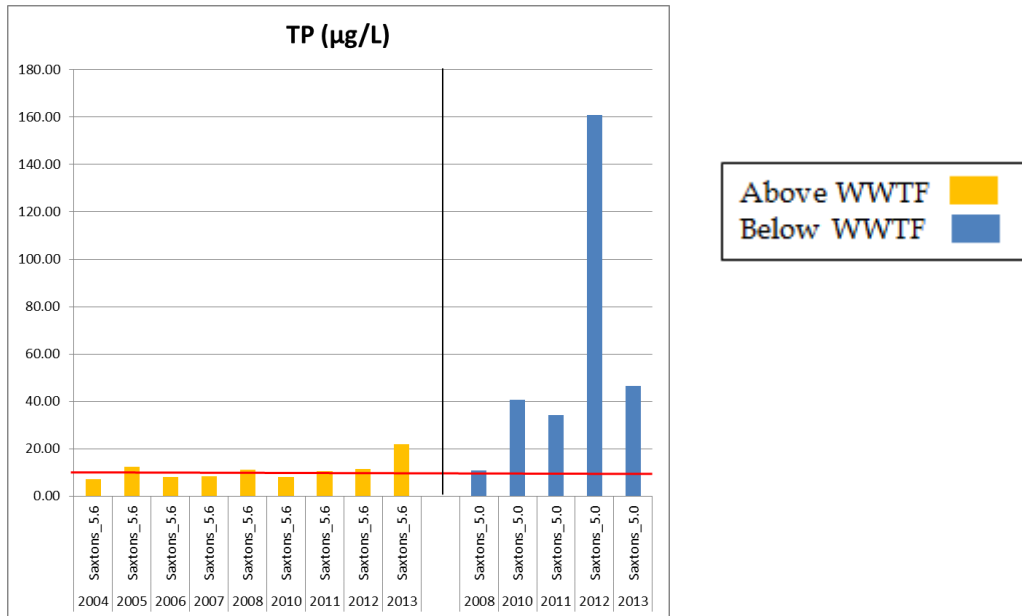


Figure 3. Total Phosphorus – Saxtons River, Saxtons River village

Other concerns include high temperatures, sedimentation erosion and channel modifications. Temperatures are so severe that fish surveys show few wild trout in the river.

Bull Creek entering from the south and Weaver Brook from the north meet the Saxtons River downstream of Cambridgesport. Bull Creek has large amount of agricultural lands and is impacted by sediment, turbidity and erosion.

Connecticut River

The mainstem of the Connecticut River covered in this plan reaches from the Springfield/Rockingham town line to the Dummerston/Brattleboro town line. This reach is minimally monitored by the Ambient Biomonitoring Program, due in part to its size, and also since much of the river is monitored with some regularity by the New Hampshire Department of Environmental Services. One site in Westminster was last monitored by Vermont in 2000. The tributaries that are monitored include Salmon,

Sacketts, East Putney, Chase, Fullam, Cobb, Commissary⁴ and Little Commissary brooks.

The Connecticut River is under a [Total Maximum Daily Load for nitrogen](#), the excess of which creates an area of low dissolved oxygen in Long Island Sound. The Connecticut River receives treated effluent from numerous wastewater treatment facilities, and also hosts significant agricultural production from vegetables to hay and livestock. All of which contribute nitrogen to the river. Vermont participates in the TMDL process as part of the Long Island Sound TMDL Workgroup and the Connecticut River Nitrogen Project. The [Vermont Enhanced Implementation Plan for the Long Island Sound TMDL](#) is the state's report addressing its agreements set forth in the nonpoint source (NPS) section of [Enhanced Implementation Plan for the Long Island Sound Total Maximum Daily Load](#).

Portions of the river are also under New Hampshire TMDLs for [mercury](#), pH and [bacteria](#). New Hampshire lists this reach as marginally impaired for fish consumption due to high levels of mercury found in fish tissue and the Vermont Department of Health posts a Health Alert for Fish Consumption for all Vermont waters recommending limits to fish consumption statewide.⁵

Vermont also lists this reach for altered flows and habitat conversion (impoundments) due to the effects of hydroelectric generation at the Bellows Falls and Vernon dams. The flow manipulations produced by peaking operations, which hold and release water based on electricity demand, cause water level fluctuations that impact water quality, fisheries, aquatic biota, assimilative capacity, recreational use, aesthetics, wildlife habitat and natural area values.⁶

The closed BFI landfill in the northern edge of Rockingham and approximately 600 feet from the Connecticut River is being monitored for volatile organic compounds and inorganics found in monitoring wells. River sampling revealed inorganics, lead and iron at various monitoring sites exceeding EPA criteria. One site had PAHs (polycyclic aromatic hydrocarbons) in low levels in the sediment.

⁴ Commissary and Little Commissary Brooks are included here with Basin 11-13 for ease of planning in the town of Rockingham.

⁵Health Alert: http://healthvermont.gov/enviro/fish_alert/documents/fish_alert.pdf

⁶ http://www.watershedmanagement.vt.gov/rivers/docs/rv_hydropowerinvermontvol1.pdf

Hydropower In Vermont, An Assessment Of Environmental Problems And Opportunities, Volume I, Summary Of Studies And Results May 1988, Third Printing, October 1993. By Alison M. Desmeules and Cynthia Parks

The Connecticut River Joint Commission's 2009 Water Resources Plan states that, "Studies of sediment by EPA showed that in general, sediments looked relatively clean, although results indicate that road runoff probably has an effect upon aquatic life. An exception is chrysene [a PAH] near Sackett's Brook, which exceeded the level at which ecological effects might occur. Copper and nickel exceeded this level here and below the West River. Breakdown products of the pesticide DDT were detected in low concentrations downstream of Sackett's Brook."⁷

The Connecticut River valley, especially in Rockingham and Brattleboro, hosts a high concentration of rare, threatened and endangered (RTE) species due in part to being at the northern edge of the range on numerous southern species. The river valley itself makes up the Middle Connecticut River Important Bird Area (IBA) for its recognition as an important flyway for migrating birds. Herricks Cove at the mouth of the Williams River is also an IBA. The Retreat Meadows and Herricks Cove are extensive wetlands created by the backwaters of large hydroelectric dams.

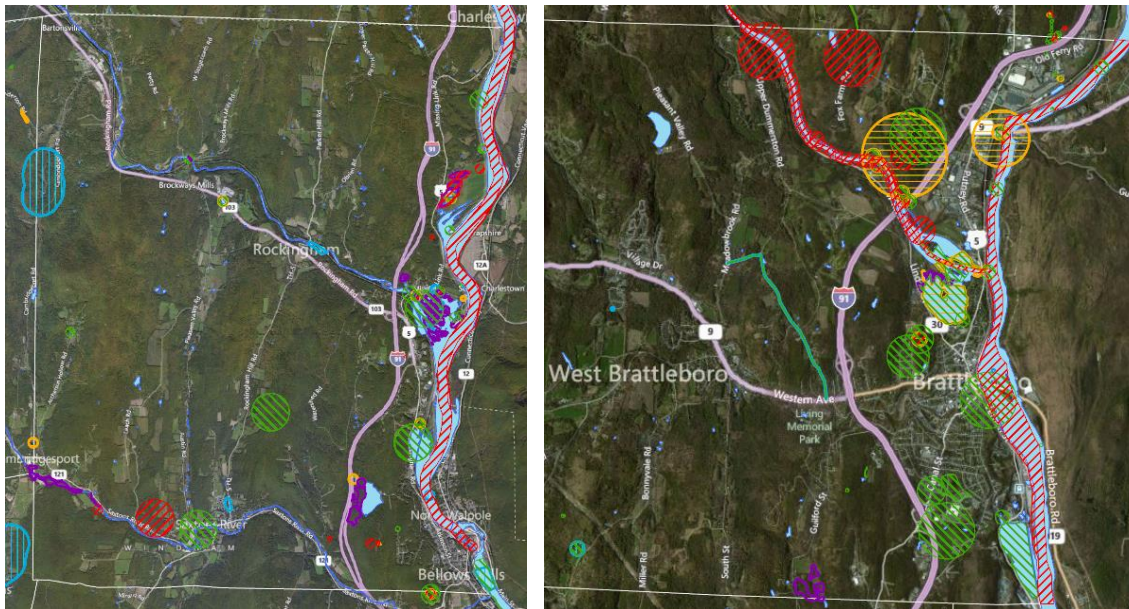


Figure 4. RTE Concentration along the Connecticut River in Rockingham & Brattleboro

Lakes & Ponds in the Basin

At 46 acres Minards Pond in Rockingham is the largest lake in the Connecticut direct (Basin 13) region. It serves as the water supply for the town of Bellows Falls. Due to its

⁷ <http://crjc.org/new%20WR5%20chapter/WATER.LRS5.execsumm.pdf>

protected status as drinking water there is no public access to the lake but the protected watershed land has numerous hiking trails.

Basin 11 has 49 lakes and ponds covering 1030 total acres. Gale Meadows Pond (195 acres), Lowell Lake (109 acres), Townshend Reservoir (108 acres) and Ball Mountain Reservoir (85 acres) are the largest. All of these are in the West River watershed.

Sunset Lake (96 acres) in Marlboro is the water supply for the town of Brattleboro and is protected in the same way as Minards Pond although shore fishing is allowed.

Lake and pond water quality and habitat conditions are monitored through numerous study programs including the Spring Phosphorus and Lake Assessment Programs and by the Lay Monitoring Program among others. While many fully support the requirements of the VWQS, many other lakes and ponds are impacted by acidification, and several lakes and ponds exhibit high levels of mercury in fish. Both of these issues result from atmospheric deposition of pollutants from sources outside of Vermont.

This lake-specific information is compiled to create the [Vermont Lake Score Card](#), which has been developed to convey a large amount of data gathered and analyzed through these monitoring efforts. The Score Card rates Vermont lakes in terms of water quality, invasive species, atmospheric deposition, and shoreland condition. Table 3 provides an assessment of individual lakes from the Vermont Lakes Scorecard.

Only one lake, Cole Pond (41 acres) in Jamaica, is currently monitored through the Lay Monitoring Program.

Gale Meadows Pond is the only lake with known a population of invasive Eurasian watermilfoil.

Two lakes make the overall Best Lakes list which is based on evaluation of water quality, biodiversity, scenic quality, acid deposition and presence of invasive species. These are Lowell Lake, in the Top 5%, and Kenny Pond in the Top 20 %. Wantastiquet earns a Top 20% listing in the water quality category.

Figure 5. Map of Impaired Lakes.

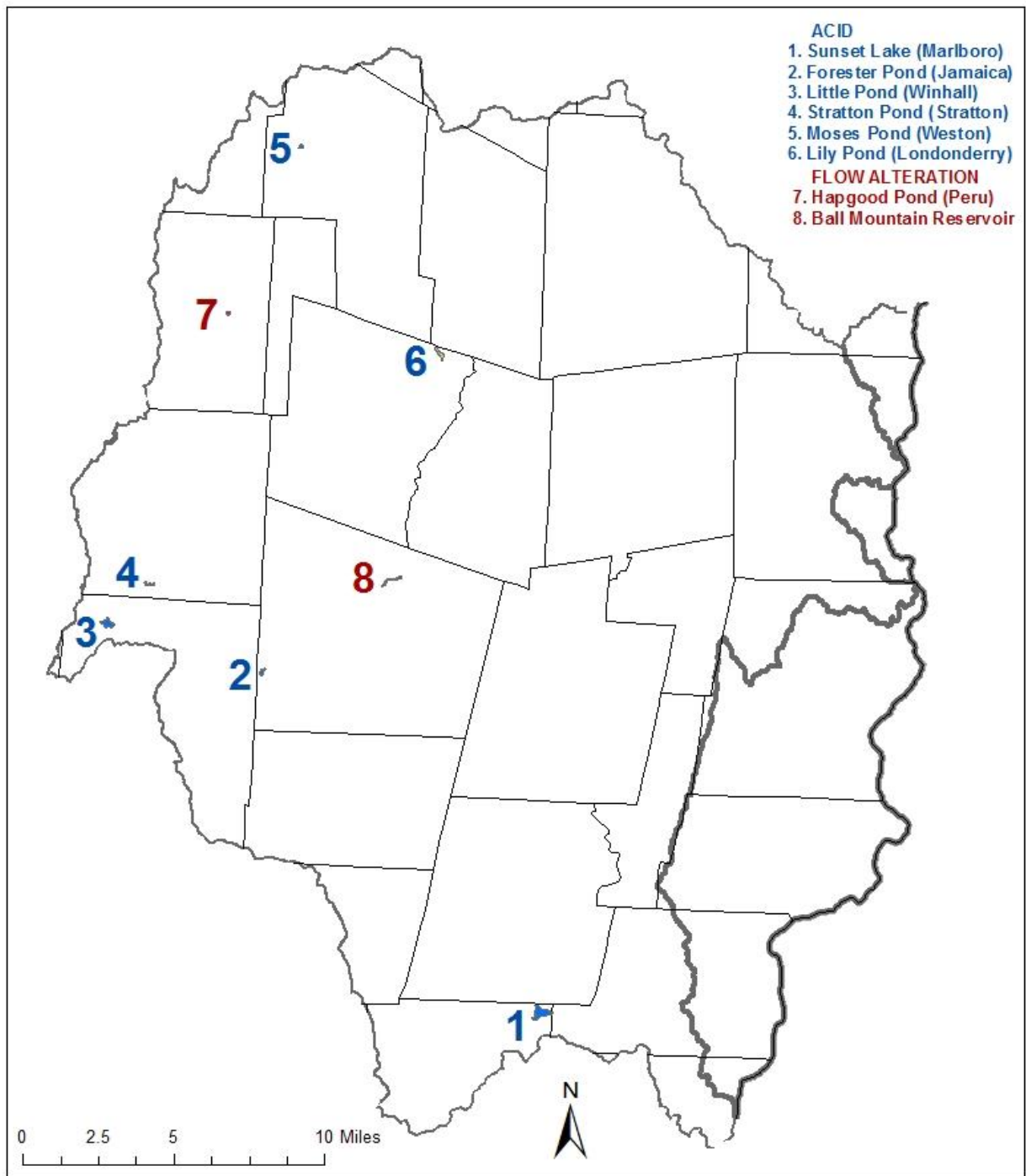


Table 3. Summary of Individual Lake Conditions from the Vermont Lakes Scorecard.

Lake Score Card

| | |
|--|----------------------|
| | = Good Conditions |
| | = Fair Conditions |
| | = Reduced Conditions |
| | = Unassessed |

| West River | Town | Shoreland | Invasives | Atmospheric | Water Quality |
|--------------------------|-------------|-----------|-----------|-------------|---------------|
| Ball Mountain Reservoir | Jamaica | | | | |
| Burbee | Windham | | | | |
| Cole Pond | Jamaica | | | | |
| Forester Pond | Jamaica | | | | |
| Gale Meadows | Londonderry | | | | |
| Kenney Pond | Newfane | | | | |
| Lily Pond | Londonderry | | | | |
| Little Pond | Winhall | | | | |
| Lowell Lake | Londonderry | | | | |
| Moses Pond | Weston | | | | |
| Stratton Pond | Stratton | | | | |
| Sunset Lake | Marlboro | | | | |
| Townshend Reservoir | Townshend | | | | |
| Wantastiquet Pond | Weston | | | | |
| Saxtons River | | | | | |
| Athens Pond | Athens | | | | |
| Connecticut River | | | | | |
| Minards Pond | Rockingham | | | | |

Acid deposition is rain, snow, fog or dust that is polluted by acid in the atmosphere and damages aquatic and terrestrial systems. Two common air pollutants acidify the water or dust particles: sulphur dioxide (SO₂) and nitrogen oxide (NO_x). When these substances are released into the atmosphere, they can be carried over long distances by prevailing winds before returning to earth as acidic rain, snow, fog or dust. When the environment cannot neutralize the acid being deposited, damage occurs. One of the most apparent features in the natural environment affected by acid precipitation is lakes and ponds. Due to weather patterns and topography two-thirds of the acid impaired lakes are in southern Vermont. There are six acid impaired lakes in this Basin.

Shoreline and Riparian Protection

The Vermont Legislature passed the Shoreland Protection Act for lakes and ponds, effective July 1, 2014, that regulates activities within 250 feet of the mean water level of lakes greater than 10 acres in size. The intent of the Shoreland Protection Act is to allow reasonable development along shorelands of lakes and ponds while protecting aquatic habitat, water quality, and maintaining the natural stability of shorelines. Standards for the creation of impervious surfaces (such as buildings and driveways) and cleared areas within the shoreland area are intended to preserve functioning lake ecosystems, protect water quality, bank stability, conserve aquatic and wildlife habitat, and further the economic benefits of lakes and their shorelands.

An additional method of evaluating surface waters is to look at their adjacent lands and the impacts these land uses have on water quality. The Windham Regional Commission undertook this analysis, presented in [Undeveloped Waters in Southeastern Vermont](#) and accompanying [Maps](#), to identify undeveloped surface waters in the region to “help aid in the preservation of these riparian and lacustrine buffer areas in order to support maintaining water quality, habitat values, and societal benefits.”

The analysis covered the lower West River watershed and reveals that so far there is minimal protection of shorelands. The largest protected areas are under federal authority, the US Army Corps of Engineers flood control lands at Townshend and Ball Mountain and the US Forest Service as part of the Green Mountain National Forest.

Opportunities exist to protect important headwater streams throughout the basin. The longest undeveloped and unprotected reach in the studied area is Baker Brook, and its unnamed tributary in Newfane, at 4.0 miles in length. On the larger rivers, 0.75 miles on the Rock River, also in Newfane, was the longest undeveloped and unprotected reach found.

The report encourages its usefulness reflecting that: “Given the important values of undeveloped buffers and the dwindling extent of them, it is important for stakeholders to work to protect those that remain. The information in this report is useful to municipalities, landowners, and conservation groups to inform planning for protecting the resources, and development and implementation of strong regulatory protective measures.”

Table 4. Second order and higher stream with undeveloped segments over 1.5 miles.

| | |
|---|--------|
| Baker Brook, and tributary Newfane | 4.0 mi |
| Tannery Brook, Townshend | 2.9 mi |
| Joy Brook, Townshend | 2.4 mi |
| Halladay Brook, Brattleboro | 2.0 mi |
| Unnamed tributary of Worden Brook, Marlboro | 2.0 mi |
| Unnamed tributary of Grassy Brook, Brookline | 1.8 mi |
| Rock River, Dover | 1.8 mi |
| Newfane’s Wardsboro Brook (upstream of Smith Brook), Newfane, Townshend, and Dover | 1.6 mi |
| Adams Brook, Marlboro | 1.5 mi |

Table 5. Conservation status of lakes and ponds with undeveloped shorelines.

| <i>Waterbody</i> | <i>Percent Undeveloped</i> | <i>Percent Conserved</i> | <i>Town</i> |
|---------------------|----------------------------|--------------------------|-------------|
| Lily Pond, Athens | 100 | 0 | Athens |
| Wetland, Brookline | 83 | 0 | Brookline |
| Sunset Lake | 70 | 91 | Marlboro |
| Townshend Reservoir | 25 | 100 | Townshend |
| Kenny Pond | 9 | 0 | Newfane |

The Implementation Table in Chapter 4 list numerous implementation projects recommended for Basin lakes and ponds. Appendix D - Lakes and Ponds Program Priority Activities in Basin 11 – 13, lists priority activities that should also be undertaken to improve lake monitoring and conditions.

General Fisheries Assessment

The Vermont Fish & Wildlife Department 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 and/or rainbow trout) at levels generally equal to or greater than 1,000 fish (≥ 6 inches in length) per stream-mile and/or 20 pounds per acre in small upland streams and greater than 200 fish per mile in larger

streams and rivers.⁸ 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 as Very High Quality Waters (VHQW) in the future.

Table 6. Fishes of the West River, Saxtons River and Williams River basins; the lesser Connecticut River tributaries: Salmon, Canoe, Sacketts, East Putney, Chase, Fullam, Mill and Morse brooks; and Connecticut River mainstem from Bellows Falls to Brattleboro. Abbreviations: indigenous or native species (I); naturalized, nonnative species (N); recently documented nonnative species, population status unknown (X); extirpated native species (Ex); vagrant species (V), i.e. a nonnative species that has been seen irregularly migrating up the Connecticut River into the VT-NH reach within the past 25 years.

| Fish species | West R. | Saxtons R. | Williams R. | Conn. R. tribs | Conn. R. main |
|------------------------|---------|------------|-------------|----------------|---------------|
| Sea lamprey | I | | | I | I |
| American eel | I | | | I | I |
| Gizzard shad | | | | | V |
| American shad | | | | | I |
| Blueback herring | | | | | I |
| Lake chub | | I | I | | |
| Common carp | N | | | | N |
| Eastern silvery minnow | | | | | I |
| Common shiner | I | I | I | I | I |
| Golden shiner | I | I | I | I | I |
| Spottail shiner | | | | | I |
| Mimic shiner | I | | I | I | N |
| Longnose Dace | I | I | I | I | I |
| Blacknose Dace | I | I | I | I | I |
| Creek chub | I | I | I | I | I |
| Fallfish | I | I | I | I | I |
| Longnose sucker | I | I | I | I | I |
| White sucker | I | I | I | I | I |
| Yellow bullhead | | | | | N |

⁸ Vermont Fish & Wildlife Department (VFWD). 1993. The Vermont management plan for brook, brown and rainbow trout. VFWD, Waterbury.

| Fish species (CONT.) | West R. | Saxtons R. | Williams R. | Conn. R. tribs | Conn. R. main |
|-------------------------|------------|---------------|----------------|-------------------|------------------|
| Brown bullhead | I | I | I | I | I |
| White Catfish | | | | | X |
| Northern pike | N | | | | N |
| Chain pickerel | I | | | | I |
| Rainbow trout | | | | N | N |
| Atlantic salmon | Ex | | | Ex | Ex |
| Brown trout | N | N | N | N | N |
| Brook trout | I | I | I | I | I |
| Banded killifish | I | | | | I |
| Slimy sculpin | I | I | I | I | |
| White perch | | | | | N |
| Striped bass | | | | | V |
| Rock bass | N | N | N | N | N |
| Redbreast sunfish | | | | | I |
| Pumpkinseed | I | | | I | I |
| Bluegill | N | | | | N |
| Smallmouth bass | N | N | N | N | N |
| Largemouth bass | N | | | | N |
| Black crappie | N | | | | N |
| Tessellated darter | I | | I | I | I |
| Yellow perch | I | | I | | I |
| Walleye | | | | | N |

Table 7. Sportfish species present in:

| Pond | Town | BKT | RBT | LMB | SMB | NRP | CHP | RKB | PMS | BLG | BLC | WHP | YLP | BRB |
|-------------------------|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ball Mountain Reservoir | Jamaica | | | | | | | | | | | | X | X |
| Chester Reservoir | Chester | | | | | | | | | | | | X | X |
| Coles Pond | Jamaica | | | X | | | | | X | | | | | X |
| Gale Meadows Pond | Londonderry-Winhall | | | X | | | X | | X | X | | | X | X |
| Haggood Pond | Peru | S | | | | | | | | | | | | |
| Kenny Pond | Newfane | | | X | | | X | | | | | | X | X |
| Lily Pond | Londonderry | | | X | | | X | | X | | | | X | X |
| Little Mud Pond | Winhall | | | | | | | | | | | | | X |
| Lowell Lake | Londonderry | | | X | | | X | | X | | | | X | X |
| Retreat Meadows | Brattleboro | | | X | | X | X | X | X | X | X | X | X | X |
| Stratton Pond | Stratton | S | | | | | | | | | | | | X |
| Sunset Lake | Newfane | | | | X | | X | | | | | | X | X |
| Townshend Reservoir | Townshend | | S | | X | | | | X | | | | X | X |
| Weston Mill Pond | Weston | S | | | | | | | | | | | | |

Abbreviations: BKT, Brook Trout; RBT, Rainbow Trout; LMB, Largemouth Bass; SMB, Smallmouth Bass; NRP, Northern Pike; CHP, Chain Pickerel; RKB, Rock Bass; PMS, Pumpkinseed; BLG, Bluegill; BLC, Black Crappie; WHP, White Perch; YLP, Yellow Perch; BRB, Brown Bullhead; S, stocked.

Rare, Threatened and Endangered Species



Dwarf wedge mussel (*Alasmidonta heterodon*)
Photo courtesy of U.S. Army Corps of Engineers

There are two federally endangered species residing in the Basin. The Dwarf wedgemussel (*Alasmidonta heterodon*) known to be in the Connecticut River in Rockingham and Springfield and in the lower reaches of some of the tributaries.

Northeastern or Barbed-bristle Bulrush (*Scirpus ancistrochaetus*), has been identified in Athens, Brookline, Chester, Dummerston, Grafton, Newfane, Putney, Rockingham, Townshend, and Westminster.

Other rare mussel species in the Basin include Eastern pearlshell (*Margaritifera margaritifera*), Brook floater (*Alasmidonta varicosa*), and Elktoe (*Alasmidonta marginata*).



Photo courtesy of Center for Plant Conservation

Dams and Dam Removal

There are currently 58 known dams in Basin 11-13. See Appendix B for a full list. All but three are *In Service* meaning they impound water behind them. Three have been breached and no longer hold back water.

Dams are classified as either High, Significant or Low hazard based on their potential for causing loss of life and property damage in the area downstream of the dam if it were to fail. The four High Hazard dams in the basin are the USACE Ball Mountain and Townshend dams, Wantastiquet dam in Weston and Mahoney Pond dam in Winhall.

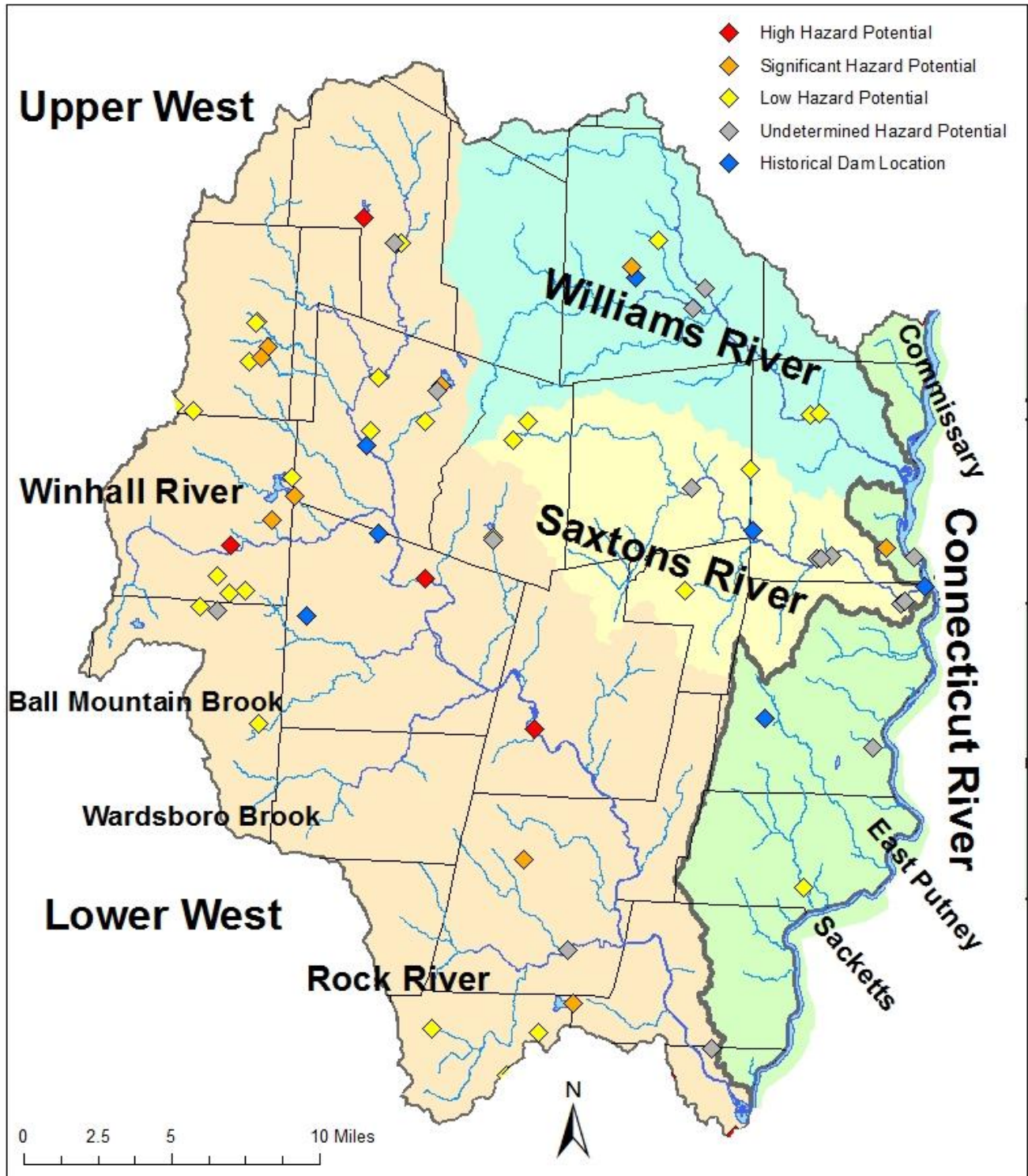
Some dams are in place for specific purposes including hydroelectric energy production, water supply reservoirs, recreation, flood control and fire protection. Numerous others remain in place but no longer serve any useful purpose. Some remain in place for historical or aesthetic reasons. However, many of these dams are old and are falling into disrepair, or are abandoned creating safety hazards and raising the potential for downstream ecological impacts in the event of failure. In addition, they continue to cause significant ecological impacts such as fluvial geomorphic and river function alterations, water quality degradation, temperature impacts, and blocked aquatic organism passage.

It is these dams – those that no longer serve a useful purpose, impose legal and financial burdens on their owners, create potential safety hazards and cause ecological impacts – that have been the focus of dam removal efforts in Vermont and nationwide.

Dams throughout the four state Connecticut River valley have been evaluated through a joint project by The Nature Conservancy and the US Army Corps of Engineers to determine their ecological impacts on the river.⁹ This has created a list of the dams where removal would have the greatest ecological benefit. Those in Basin 11-13 with the potential to be removed and that rank the highest are the Williams Dam in Londonderry and the Sacketts Brook dam in Putney.

⁹ [Connecticut River: Reconnecting Rivers and Streams](#)

Dams



Summary of impairments and stresses to the West, Williams, Saxtons and adjacent Connecticut River Basins

The Vermont Surface Water Management Strategy lays out the goals and objectives of the Watershed Management Division to address pollutants and stressors that affect the designated uses of Vermont surface waters.

The Strategy discusses the 10 major stressors that are managed to protect and improve surface waters. A **stressor** is defined as a phenomenon with quantifiable damaging effects on surface waters resulting from the delivery of pollutants to a waterbody, or an increased threat to public health and safety. Stressors result from certain activities on the landscape, although occasionally natural factors result in stressors being present. Managing stressors requires the management of associated activities. When landscape activities are appropriately managed, stressors are reduced or eliminated, resulting in the objectives of the Strategy being achieved, and the goals met.


Impairments and stresses to surface waters in this basin (Tables 8 - 11, Figure 6) are generally attributed to one of five major categories:

- 1) Atmospheric deposition of mercury or acid forming precursors resulting in fish mercury contamination, and acidification of surface waters. The majority of surface water impairments in this Basin are due to atmospheric deposition to naturally sensitive surface waters.
- 2) Flow alterations from impoundments and dam operations and water
- 3) withdrawals
- 4) Channel and land erosion from stormwater impacts due to poorly managed land development or poorly managed agricultural practices causing sedimentation.
- 5) Thermal modifications from lack of riparian vegetation and impoundments.
- 6) Pathogens from stormwater and agricultural runoff, failing septic systems and poorly maintained wastewater systems.

| Read more...Click to choose stressor | |
|---|---|
|  |  |
| Acidity | Channel Erosion |
|  |  |
| Flow Alteration | Encroachment |
|  |  |
| Invasive Species | Land Erosion |
|  |  |
| Nutrient Loading | Pathogens |
|  |  |
| Toxics | Thermal Stress |

Surface waters are organized by stressors as defined in the Vermont Surface Water Management Strategy.

Table 8. West River Watershed Stream and Lake Segments with Impacts Summary.

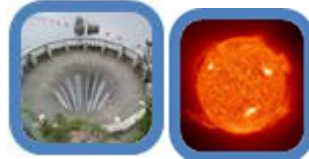
| Surface Waters Affected by Acidification and Atmospheric Deposition | | | | |
|---|---|-----------|------------------------|---|
|  | | | | |
| Stream or lake segment | Mileage & Status | Pollutant | Source | Use affected & other information |
| Ball Mountain Brook, above the confluence of the North Branch | 8.4 miles <i>Impaired</i> Part A list | acid | atmospheric deposition | aquatic life/habitat; chronic acidification |
| Bear Creek Brook, RM 0.7 to headwaters | 1.5 miles <i>Impaired</i> Part A list | acid | atmospheric deposition | aquatic life/habitat; chronic acidification |
| Forester Pond (Jamaica) | 9 acres <i>Impaired</i> Part D | acid | atmospheric deposition | aquatic life/habitat chronic acidification EPA approved a TMDL Sept. 30, 2003 |
| Kidder Brook, confluence of Sun Bowl Brook up | 2.2 miles <i>Impaired</i> Part A list | acid | atmospheric deposition | aquatic life/habitat chronic acidification |
| Lily Pond (Londonderry) | 26 acres <i>Impaired</i> Part D | acid | atmospheric deposition | aquatic life/habitat; episodic acidification; EPA approved a TMDL Sept. 27, 2012 |
| Little Pond (Winhall) | 17 acres <i>Impaired</i> Part D | acid | atmospheric deposition | aquatic life/habitat; episodic acidification; EPA approved a TMDL Sept 20, 2004 |
| Moses Pond (Weston) | 12 acres <i>Impaired</i> Part D | acid | atmospheric deposition | aquatic life/habitat; chronic acidification EPA approved a TMDL Sept. 30, 2003 |
| Stratton Pond (Stratton) | 46 acres <i>Impaired</i> Part D | acid | atmospheric deposition | aquatic life/habitat; episodic acidification; EPA approved a TMDL Sept. 30, 2003 |
| Sunset Lake (Marlboro) | 97 acres <i>Impaired</i> Part D | acid | atmospheric deposition | aquatic life/habitat; episodic acidification; EPA approved a TMDL Sept. 30, 2003 |

Surface Waters Affected by Land Development Activities:



| Stream or lake segment | Mileage & Status | Pollutant | Source | Use affected & other information |
|--|---|---|--|---|
| Styles Brook, | 2.0 miles Impaired Part D list | sediment | land development, hydrologic modification | aquatic life/habitat; EPA approved a TMDL 6/21/2002 |
| Rock River, mouth to Adams Brook | 7.5 miles Stressed | sediment, temperature, physical alterations | | Fishing (2cr), aquatic habitat |
| Wardsboro Brook, mouth to West Wardsboro | 7.0 miles Stressed | sediment, temperature | streambank erosion, road runoff, channel widening, etc. | |
| Winhall River, mouth to IPCo. bridge | 8.0 miles Stressed | sediment, temperature | channelization, road runoff, loss of riparian veg, erosion | |

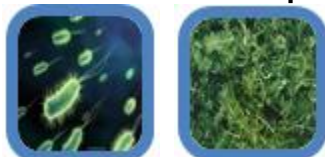
Surface Waters Affected by Flow Alteration:



| Stream or lake segment | Mileage & Status | Pollutant | Source | Use affected & other information |
|---|---|--|-------------------------------------|--|
| West River, below Ball Mtn dam to Townshend dam | 9.0 miles Impaired Part A list | temperature | impoundment | 2cr –fishery; affected by high temps |
| Stickney Brook | 2.5 miles Altered Part F list | flow fluctuations | Brattleboro water supply withdrawal | |
| Ball Mountain Reservoir | 85 acres Altered Part F List | water level fluctuation, fish passage | operation of USACE dam | |
| West River, Ball Mtn Dam down to Townsend Dam | 9.0 miles Altered Part F list | artificial flow regime – no minimum flow for biota | | Overlaps with the 9.0 miles impaired above |
| Mill Brook | 1.6 miles Altered Part F list | insufficient flow | Bromley snowmaking water withdrawal | |

| | | | | |
|--|--|--------------------------------|--|--------------------------------|
| Trib to Mill Brook | 2.2 miles Altered Part F list | insufficient flow | Bromley snowmaking water withdrawal | |
| Hapgood Pond | 7 acres Altered Part F list | | | |
| West River, mouth up to Grassy Brook | 12.0 miles Stressed | temperature, flow modification | wide shallow channel, dam operations | Fishing (2cr), aquatic habitat |
| West River, Grassy Brook up to Townshend Dam | 7.1 miles Stressed | temperature, flow modification | impoundment warms waters, flow mod from dam operations | Fishing (2cr), aquatic habitat |
| Flood Brook, mouth to 0.1 mile below dam | 2.5 miles Stressed | temperature | | |

Other Surface Water Impacts



| Stream or lake segment | Mileage & Status | Pollutant | Source | Use affected & other information |
|--|---|-----------------------|-----------------------------------|---|
| West River, about 1 mile below to ½ mile above So. Londonderry | 1.5 miles Impaired Part D list | E. coli | failing septic systems suspected. | contact recreation EPA approved a TMDL Sept 30, 2011 |
| West River, Retreat Meadows | 0.6 miles Altered Part E list | Eurasian watermilfoil | | |

CR – contact recreation; 2CR – secondary contact recreation, i.e. fishing, boating; RM – river mile

Part A – 303(d) List of Impaired Waters

Part B – Impaired waters for which a TMDL is not required

Part D – Impaired waters with an approved TMDL

Part E – Waters altered by aquatic invasive species

Part F – Waters altered by flow regulation

Table 9. Saxtons River and Tributaries Summary of Segments with Impacts

| Stream or Lake Segment | Mileage & Status | Pollutant | Source | Uses affected |
|--|---|--|---|--------------------------|
| Saxtons River, from upstream to South Branch | 12.8 miles – Stressed Part C list | temperature, sediment, channel alterations | channel modification, encroachment, erosion | aquatic habitat, fishing |
| Saxtons River, from mouth to SaxtonsR WWTF | 5.0 miles – Stressed Part C list | nutrients | both biomonitoring & phosphorus sampling indicate enrichment below WWTF | aquatic life |

Table 10. Williams River and Tributaries Summary of Segments with Impacts

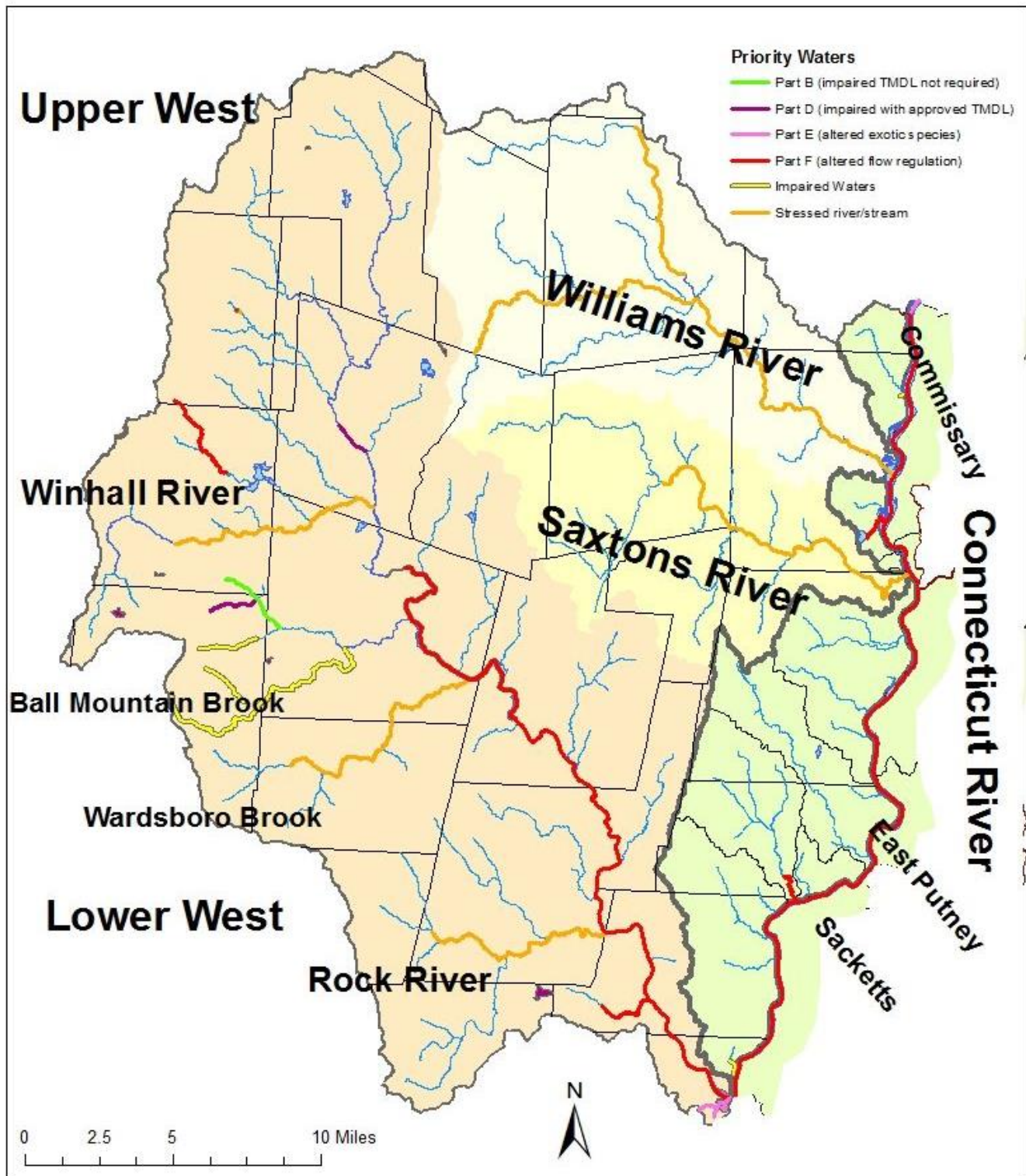
| Stream or lake segment | Mileage & Status | Pollutant | Source | Further information |
|--|----------------------------|-----------------------------------|---|---|
| Lower Williams River from mouth to confluence of Middle Branch | 11.8 miles Stressed | sediment, nutrients, temperature | encroachments from developed land (roads/RRs esp), ag land, small or lacking riparian buffers in some areas | this river system was hit hard by TS Irene also an impoundment above hydro dam that warms water |
| Middle Branch Williams River | 10.5 miles Stressed | physical alterations, temperature | dredging, berming, channelization, also diminished riparian veg | hit hard by TS Irene |
| Williams River, above Chester Village to Route 103 Junction/Smokeshire Road junction | 10.5 miles Stressed | temperature, sediment | loss of riparian vegetation, road encroachment | hit hard by TS Irene |

Table 11. Lower Connecticut River Direct Stream and Lake Segments with Impacts Summary

| Stream or lake segment | Mileage & Status | Pollutant | Source | Other Info. |
|---|---|--|---|--|
| Commissary Brook Trib, mouth of trib up | 0.2 miles <i>Impaired</i> Part A List | sediment | old quarried area eroding | long history of discharging and no remediation |
| Crosby Brook ¹⁰ , mouth up | 0.7 miles <i>Impaired</i> Part A List | sediment, stormwater runoff | instream erosion & alteration, highway & other developed land | |
| Ellis Brook to Minards Pond | 1 mile length <i>Altered</i> | possible lack of minimum flow | Bellows Falls water supply | |
| Farr Brook to Minards Pond | ? length <i>Altered</i> | possible lack of minimum flow | Bellows Falls water supply | |
| Sacketts Brook | 1 mile length <i>Altered</i> | artificial flow condition, insufficient flow below dam | Putney Paper water withdrawal | |

¹⁰ See the [Deerfield River Tactical Basin Plan](#) for information on Crosby Brook.

Figure 6. Map of Impaired, Altered and Stressed Waters in the Basin.



Total Maximum Daily Loads

A TMDL or Total Maximum Daily Load is the calculation of the maximum amount of a pollutant that a waterbody can receive and still meet Vermont Water Quality Standards. In a broader sense, a TMDL is a plan that identifies the pollutant reductions a waterbody needs to meet Vermont's Water Quality Standards and develops a means to implement those reductions. TMDLs can be calculated for correcting water pollution from specific point source discharges or throughout a watershed and balance the location and amount of needed pollution reductions.

Under Section 303(d) of the Federal Clean Water Act, all states are required to develop lists of impaired waters. The list includes impaired lakes, ponds, rivers and streams that do not meet Water Quality Standards. For Vermont, impairment is substantiated by chemical, physical or biological data collected through monitoring and these waters are noted on the state's [303\(d\) List of Waters](#). The Federal Clean Water Act requires TMDLs to be developed for waters on the list; the list provides a schedule indicative of TMDL completion priority.

Other waters with completed TMDL or TMDL equivalents are listed in [2014 Priority Waters List](#).

TMDLs for Basins 11 – 13 include:

[**TMDL for 30 Acid Impaired Lakes**](#) (Forester, Moses, Stratton, Sunset)

[**TMDL for 4 Acid Impaired Lakes**](#) (Little)

[**TOTAL MAXIMUM DAILY LOAD for Waterbodies: 2 Acid Impaired Lakes: VT11-18L03 Lily \(Londonderry\) and VT13-16L01 Lily \(Vernon\)**](#)

[**Vermont Statewide Total Maximum Daily Load \(TMDL\) for Bacteria-Impaired Waters**](#)
[Appendix 15- West River](#)

[**Long Island Sound \(LIS\) Dissolved Oxygen TMDL**](#)

[**Northeast Regional Mercury Total Maximum Daily Load**](#)

Stratton Water Quality Remediation Plan

Water Withdrawals

Withdrawals of water for industrial and domestic uses can cause flow alterations or a change in the natural flow regime of a river or stream or water level of a lake or reservoir induced by human activities. The natural flow regime is recognized as

requiring protection to maintain healthy river and lake ecosystems. Table 12 lists water withdrawals and their purpose.

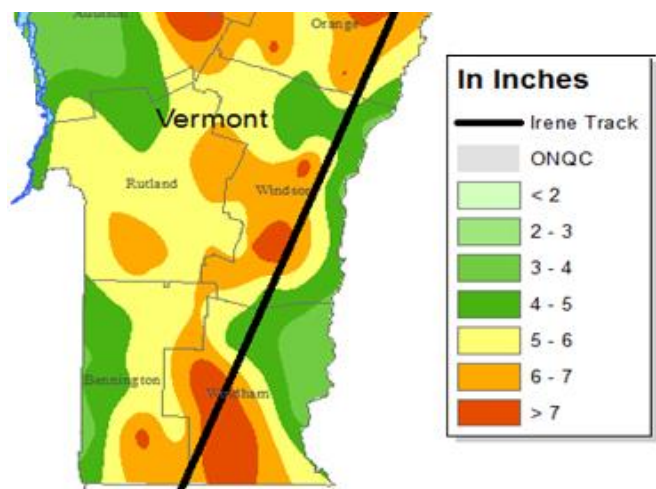
Table 12. Water Withdrawals

| APPLICANT | WITHDRAWAL TYPE | STREAM | TOWN | COMMENTS | Altered |
|------------------------------|-----------------|---------------------------------------|-------------|---|---------|
| Bromley Mountain | Snowmaking | Mill Brook Tributary | Peru | Staging Reservoir (Original Reservoir) | Y |
| Magic Mountain | Snowmaking | Thompsonburg Brook | Londonderry | Conservation flows required on mainstem and tributary below dam | N |
| Stratton Mountain | Snowmaking | North Branch of Ball Mountain Brook | Stratton | Conservation flows required - onstream pond (Stratton Lake) | N |
| Stratton Mountain | Snowmaking | Winhall River | Stratton | Conservation flows required | N |
| Brattleboro Water Department | Drinking Water | Langlie Brook | Dummerston | Diversion feeds an intake to Pleasant Valley | N |
| Brattleboro Water Department | Drinking Water | Kelly Brook | Dummerston | Diversion feeds an intake to Pleasant Valley | N |
| Brattleboro Water Department | Drinking Water | Stickney Brook | Dummerston | Diversion feeds an intake to Pleasant Valley | Y |
| Chester Water Department | Drinking Water | Pierce Brook / Pierce Brook Reservoir | Chester | Inactive Source | N |

Tropical Storm Irene

The summer of 2011 was an exceptionally wet season with higher than normal rainfall resulting in saturated soils and high water levels. On August 28 and 29 Tropical Storm Irene moved through the region following the Connecticut River valley through southern Vermont. Rainfall ranged between 4 and 11 inches throughout southeastern Vermont over the two days.

Damage from fluvial erosion and flooding devastated much of the region hitting the West, Williams and Saxtons River watersheds particularly hard.



Previous geomorphic assessment work on the Saxtons River led to a Fluvial Erosion Hazard (FEH) zone being mapped for the watershed. Post-flood imaging demonstrates

the usefulness of this planning exercise as the predicted areas of erosion hazards were an accurate forecast of actual conditions post-flood.

Determining river corridors, the land area needed for a river to move within its floodplain over time, for all waters in the state is underway. Using this information as a planning tool may reduce the loss of life and property from future severe flood events.

The Windham Regional Commission, with funding from VDEC, has produced a report and maps of Tropical Storm Irene damage in its region. These maps show the location and extent of damage caused by flooding and fluvial erosion.

<http://www.windhamregional.org/gis/irene-mapping>



Rock River in South
Newfane - Before and
After Tropical Storm
Irene



Direct discharges to surface waters in the Basin

Overview

There are four municipal and one industrial wastewater treatment facilities (WWTF) that are subject to NPDES discharge permits in the Basin (Table 13).

An overarching consideration for the issuance of permits in the 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 Connecticut 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 targeted for 2018.

Table 13. Wastewater Treatment Facilities and other Facilities Subject to NPDES Direct Discharge Permits

| Facility | Permit expiration date | Planned permit re-issuance year | Design flow MGD | IWC* 7Q10 /LMM | Treatment type | Receiving water |
|---------------|------------------------|---------------------------------|-----------------|-----------------|--|-------------------|
| Bellows Falls | 6/30/2008 | 2015 | 1.4 | 0.002 / 0.001 | Rotating biological contactor | Connecticut River |
| Chester | 3/31/2009 | 2018 | 0.175 | 0.082 / 0.024 | Sequencing batch reactor | Williams River |
| Putney | 12/31/2011 | 2018 | 0.08 | 0.093 / 0.033 | Extended aeration | Sacketts Brook |
| Putney Paper | 12/31/2012 | 2018 | 0.275 | 0.0004 / 0.0001 | Primary clarification / activated sludge | Connecticut River |
| Saxtons River | 3/31/2010 | 2018 | 0.105 | 0.042 / 0.012 | Oxidation ditch / clarifier | Saxtons 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

Chester

The Chester WWTF was last upgraded in 2006 when the treatment process was upgraded to SBRs followed by ultraviolet disinfection prior to the effluent being discharged to the Williams River. Sludge produced at the facility is wasted from the SBRs to a rotary drum thickener then stored in an aerated holding tank prior to being disposed of offsite.

Putney

The Putney WWTF provides secondary treatment using extended aeration activated sludge process followed by chlorination and dechlorination. Effluent is discharged to Sackett's Brook at the deepest section of stream. There are four pump stations within the collection system. Upgrades to the facility occurred in 2006 whereby an additional secondary clarifier was added, new chlorine contact chambers were constructed and the aeration system was upgraded.

Soundview Vermont Holdings, LLC (Putney Paper)

This facility is involved in the production of tissue and napkin grades with 100% secondary wastepaper deink process. Wastepaper is pulped with sodium hydroxide and the slurry goes through various stages of washing, cleaning and screening prior to the papermaking process. The treatment of process wastewater consists of primary clarification followed by a two-stage high activated sludge treatment process. Sludge from the two-stage aeration/clarification system from the primary clarifier is wasted to a belt filter press for dewatering and is disposed of offsite. Treated wastewater is discharged through a several thousand foot long, six-inch pipe to the Connecticut River.

Saxtons River

The Saxtons River WWTF has been in operation since 1972 and is in need of a major refurbishment. The trustees have contracted with an engineering firm to evaluate the options available. Currently, an entirely new WWTF is being designed replacing the oxidation ditch/clarifier with a Sequencing Batch Reactor (SBR). The cost of this new SBR facility is being compared to eliminating the WWTF and replacing it with a pump station, pumping the wastewater to the Bellows Falls WWTF. A decision on replacing the WWTF with an SBR facility versus replacing the facility with a pump station should be made sometime in 2016.

Chapter 3. Management Goals for Surface Waters in the Basin

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.



Protection

- Identification of existing uses
- Opportunities for designation of Outstanding Resource Waters.
- Opportunities for reclassification of waters.
- Reclassification 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 municipalities 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. Setting water quality management goals was the responsibility of the Vermont Water Resources Panel until these responsibilities were transferred to the

Agency of Natural Resources in 2013 year through Act 138. 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.

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 the WWS and adjacent Connecticut River Basin, three waters have been specially designated as Class A(1). The Cobb Brook, Kidder Brook, and the upper Winhall River. The management objective for A(1) waters is to maintain their natural condition. Class A(2) waters are designated drinking water supplies. All Class A water are listed in Table 14.

Table 14. Class A(1) and A(2) Waters

| Water | Location | Water Supply For | Class |
|-------------------------------------|-------------------------------------|---|-------|
| Cobb Brook | Londonderry, Windham, Jamaica | Cobb Brook and its tributaries beginning in the Town of Windham at an elevation of 2,500 feet and continuing downstream to its confluence with the West River in the Town of Jamaica. | A(1) |
| Upper Winhall River and tributaries | Winhall, Stratton | The upper reach of the Winhall River including the river's two principal headwaters, beginning at an elevation of 2,500' in the Town of Stratton, and continuing downstream a distance of approx. 7.4 miles to the point at which the river crosses the current boundary of the Green Mountain National Forest in the Town of Winhall | A(1) |
| Kidder Brook and tributaries | Stratton, Jamaica | Kidder Brook and all its headwaters, including named and unnamed tributaries, beginning in the Town of Stratton at an elevation of 2,500 feet and continuing downstream to its confluence with the North Branch in the Town of Jamaica | A(1) |

| | | | |
|---|--------------------------------------|--|------|
| Stratton Pond Gulf Brook Reservoir Little Pond | Stratton Stratton Winhall | Waterbody is above 2500' | A(1) |
| Sunset Lake, Stickney Brook and all waters above the intake in Marlboro, Newfane and Brattleboro | Marlboro, Newfane, Brattleboro | Town of Brattleboro | A(2) |
| Styles Brook, entire watershed above Styles Reservoir | Stratton | Stratton Corporation | A(2) |
| Chester Reservoir & outlet stream above water intake | Chester | Village of Chester (not in use) | A(2) |
| Signal Hill Brook and all waters above the intake (AKA Bolles Brook) | Rockingham | Village of Saxtons River and Vermont Academy (emergency use only) | A(2) |
| Ellis Brook, Farr Brook and Back Pond | Rockingham | Village of Bellows Falls - Minards Pond watershed | A(2) |
| Mill Brook and all waters above the intake in Westminster | Westminster | Kurn Hattin School (emergency use only) | A(2) |

The Department has documented a number of waterbodies that have the existing level of water quality that merit A(1) designation and proposes those listed in Table 15 for consideration as candidate A(1) surface waters.

Table 15. Candidate Surface Waters for Reclassification from Class B to Class A(1).

| Water | Location | Supporting Data |
|--|------------------------------|--|
| Greendale Brook & Jenny Coolidge Brook | Weston | Biomonitoring Exc to VGood, headwaters in GMNF |
| Saxtons River above village | Windham, Grafton, Rockingham | Biomonitoring Exc to VGood |
| Upper Sacketts Brook | Putney, Westminster | Biomonitoring Exc to VGood |
| Kenny Pond | Newfane | Best Lakes, Top 25% Overall |
| Lowell Lake and contiguous wetlands | Londonderry | Top 20-Best Lakes for WQ |
| | | Top 10-Best Lakes for Biodiversity |
| | | Top 5% Overall |
| Moses Pond | Weston | Long term acid research |

VDEC recognizes and supports the United States Forest Service’s consideration that all Class B surface waters occurring in designated wilderness areas below 2,500 ft. be reclassified to A(1). Insofar as designated wilderness areas are off-limits to all forms of development and mechanized activity of any kind, a management goal of “waters in their natural condition” is appropriate and supportable. In Basin 11-13 these streams could be included: Mount Tabor, Griffith, Jones, Styles, Flood, tributaries to the upper Winhall River.

Waters that are currently listed as Class A(2) but are no longer used as water supply purposes can be reclassified to Class B which is more protective regarding the natural condition of waters.

Class A(2) allows for greater alterations in the natural flow of the water in order to enable storage and withdrawals for water supply purposes. Class B ensures that *“any change from the natural flow regime shall provide for maintenance of flow characteristics that ensure the full support of uses and comply with the applicable water quality criteria.”*

Table 16. Candidate Surface Waters for Reclassification from Class A(2) to Class B.

| Water | Location | Supporting Data |
|--|-----------------|--|
| Chester Reservoir & outlet stream above water intake | Chester | Old Village of Chester water supply - not in use |
| Signal Hill Brook and all waters above the intake (AKA Bolles Brook) | Rockingham | Old Village of Saxtons River and Vermont Academy water supply - emergency use reconnect only |
| Mill Brook and all waters above the intake in Westminster | Westminster | Old Kurn Hattin School water supply - emergency use reconnect only |

Surface waters exhibiting very high quality biological integrity or fisheries

Tactical Basin Plans identify surface waters where monitoring data indicates conditions are significantly better than the water quality goals and objectives of the Water Quality Standards. This high-level of quality may be protected by site-specific application of the antidegradation policy of the Standards, or by reclassification. Data analysis of water quality and ecological integrity indicates that several waters in the Basin support very high quality conditions (Table 17). A similar analysis of lakes and ponds ranks lakes using long-term datasets for water quality, biological diversity and unusual or scenic natural features. Scores from these separate categories are combined to identify lakes with exemplary qualities in all three, of which there are four in the Basin.

Table 17. Surface Waters Exhibiting Very High Quality Status.

| Water | Location | Supporting Data |
|--|-------------------------------------|--|
| Williams River and tributaries above Rte 10 | Chester, Cavendish, Andover, Ludlow | Biomonitoring Exc at RM_18.7, Exc at Chase Brook |
| Andover Branch and tributaries above RM_4.8 | Andover | Biomonitoring Exc |
| Turkey Mountain Brook | Jamaica, Windham | Biomonitoring Exc |
| Grassy Brook and tributaries above Parker Road | Brookline | Biomonitoring Exc-VGood |

| Water | Location | Supporting Data |
|--|------------|-------------------|
| Salmon Brook | Dummerston | Biomonitoring Exc |
| All waters recommended for A(1) reclassification | | See Table 15. |

Existing Uses

There are many identified special uses, features, and values in the WWS and adjacent Connecticut River, and their 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 certain surface waters, however, the existence of uses is protected 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 development of this tactical basin plan, DEC has identified:

- The existing use of the waters for swimming;
- The existing use of waters for boating;
- The existing use of waters for public water supply;
- The existing use of the water for water supply; and,
- The existing use of water for recreational fishing,
- The existing use for aquatic life support (aquatic biota and habitat).

It is VDEC's long-standing stipulation that all lakes and ponds in the basin have existing uses of swimming, boating and fishing. 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.

Outstanding Resource Waters (ORW)

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. ORWs are waters which can be designated by the Agency of Natural Resources through a petition process. ORWs display outstanding qualities that are determined to deserve a higher level of protection. 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.

While there are presently no ORWs in Basin 11-13, several surface waters have been identified as prospective candidates for ORW, which are presented in Table 18. As part of the implementation of this tactical basin plan, the Department will evaluate the consistency of these surface waters with the features and values identified in prior ORW determinations. Surface waters that satisfy criteria for designation as ORW will be proposed for such designation through rulemaking.

Table 18. Surface waters identified as prospective Outstanding Resource Waters

| Water | Location | Supporting Data | ORW Feature [†] |
|----------------------------------|---------------------|---|--------------------------|
| Jelly Mill Falls, Stickney Brook | Dummerston | Unique geological feature, recreation | 7, 8, 11, 12 |
| Rock River | Dummerston, Newfane | Unique geological feature, recreation | 7, 8, 11, 12 |
| Adams Brook, Bemis Brook | Newfane | Unique geological feature | 7 |
| Twin Falls* | Westminster | Unique geological feature | 7, 8 |
| Brockways Mills Gorge | Rockingham | Unique geological feature, recreation | 7, 8, 12 |
| Connecticut River, Great Falls | Rockingham | 1 st canal in USA, 1 st CT River bridge, petroglyphs, falls, high concentration of RT&E | 5, 6, 7, 8, 10, 11 |

* see cover photo

[†] see features list on p. 52

Native American petroglyphs and historic marker in Bellows Falls



Other High Quality Waters

Many of the Basin'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. 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 attest to the exceptional ecological quality or recreational uses of Vermont surface waters. A major new resource, the Agency's [BioFinder](#), provides a statewide application identifying surface water and riparian areas with a high contribution to biodiversity.

Class I Wetland Designation

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 a Class II wetland

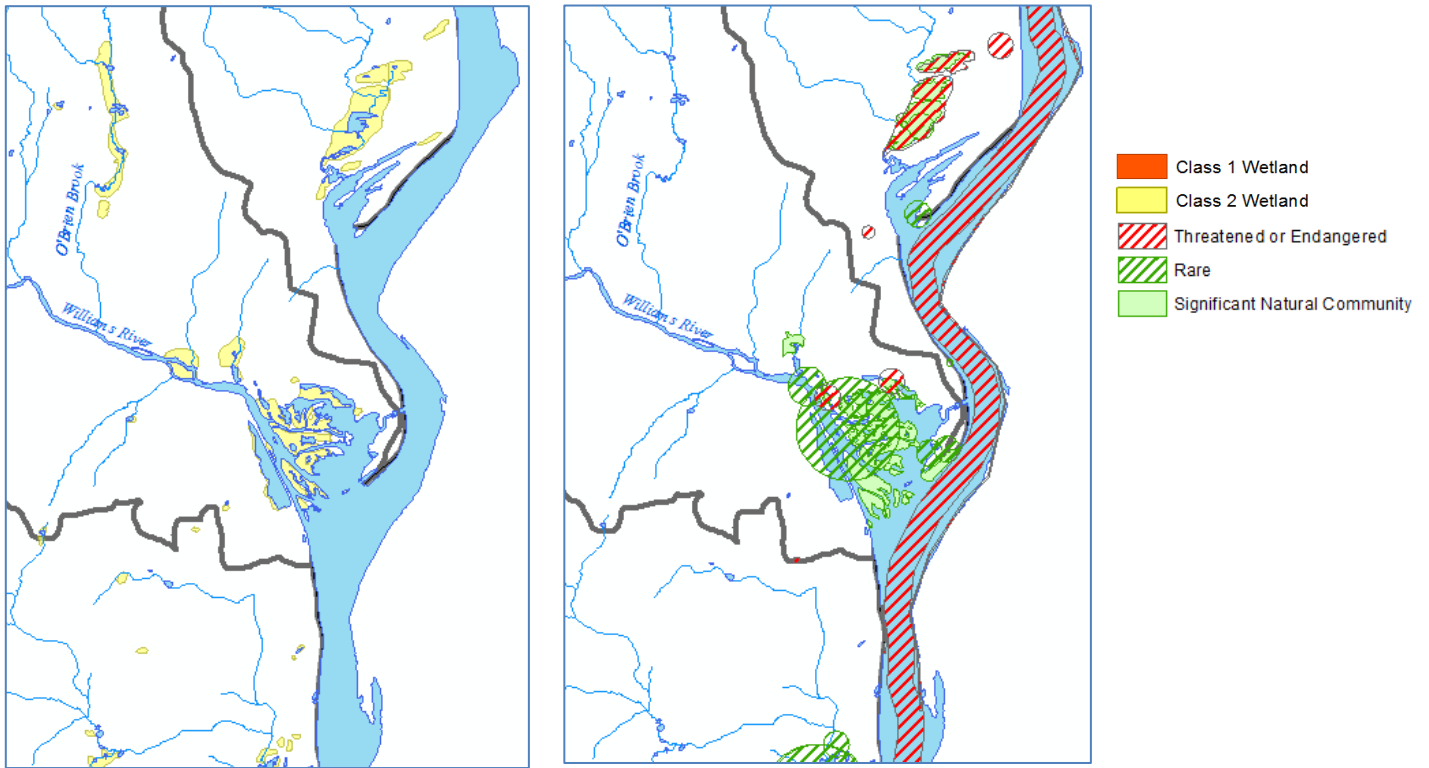
While there are currently no Class I wetlands in Basin 11-13, as part of the development of this tactical basin plan, several surface waters have been identified as wetlands to study for Class I potential. These are listed in Table 19 below. As part of the implementation of this tactical basin plan, the Department will develop and implement procedures and documents to enable submission, evaluation, and implementation of petitions to classify wetlands as Class I wetlands.

Table 19. Wetlands Proposed for Study to Determine Their Potential for Class I Reclassification or Restoration:

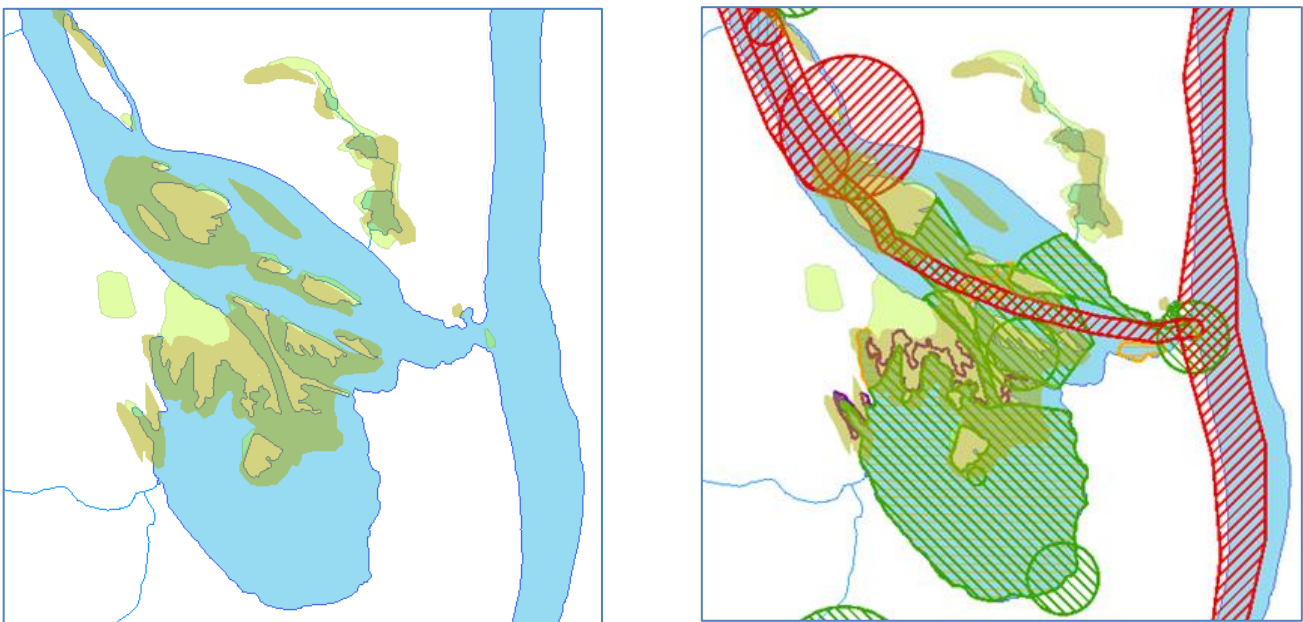
| Study for Class I Potential | | | |
|--|-----------------|---|--|
| Water | Location | | Supporting Data |
| Eddy Brook wetlands (>180 acres) | Peru, Winhall | | Large complex, headwater wetland, intact landscape, drains Bromley Mtn - area of resort development 43.20735, -72.90790 |
| Winhall River headwaters wetlands complex (>900 acres) | Winhall | | Class A(1) river, GMNF 43.10028, -72.98667 |
| Study for Restoration Potential | | | |
| Water | Location | Purpose | Needs |
| Upper Meadows (>125 acres) | Rockingham | Support & enhance RTE & NC, migratory bird stopover 43.202077, -72.448317 | Remove drainage ditches to restore hydrology |
| Herricks Cove (>300 acres) | Rockingham | SPA, IBA/ migratory bird stopover (215 sp.), RTE & NC, flood resiliency 43.179174, -72.452609 | Control invasive Eurasian watermilfoil |
| Retreat Meadows (>150 acres) | Brattleboro | SPA, IBA/ migratory bird stopover, RTE & NC, flood resiliency 42.864649, -72.563554 | Control invasive Eurasian watermilfoil |

Figure 7. Wetland / RTE Correlation at Herricks Cove and Retreat Meadows

Herricks Cove



Retreat Meadows / Lower West River



Chapter 4 - Watershed Improvement Actions and the Implementation Table

The heart of tactical basin planning is the implementation of targeted actions that work toward water quality protection and improvement. Actions are chosen that: address the ten stressors identified in the Statewide Management Strategy; have clear goals and objectives; and list tasks and benchmarks to track progress. Types of projects include assessment, monitoring, protection, restoration and planning. Each is laid out in the Implementation Table indicating the project objective, the actions required, the potential partners and funding sources and the focus area for the project.

Watershed Projects Completed by ANR and/or Partners since the 2008 Basin Plan

Tactical planning is an on-going, iterative process. Throughout this planning endeavor projects have been and are being implemented. Table 20 provides a sampling of these projects.

Table 20. Watershed Projects Completed Since 2008

| Project | Purpose | Partners | Investment (\$) |
|---|--|---------------------|-----------------|
| Herrick's Cove Habitat Enhancement - C | Trees and shrubs planted throughout floodplain for wildlife habitat enhancement | AMAS | 1,260 |
| Water Quality Monitoring - O | On-going water quality monitoring programs on West, Williams, Saxtons, Whetstone | SeVWA | 31,772 |
| Water Quality Monitoring Equipment - C | Water quality monitoring equipment | SeVWA | 233 |
| River walk survey - C | Londonderry - Conducted river survey, outreach to town & landowners, assisted with TMDL development, septic outreach program | SeVWA | 8,200 |
| Retreat Meadows Milfoil Control - C | Retreat Meadows aquatic invasive species control and public education seminars | Town of Brattleboro | 32,269 |
| Hill Road Culvert Replacement - C | Replace failing culvert | Town of Brookline | 2,900 |
| RCE - Bull Creek - C | River Corridor Easement Acquisition | VRC | 71,800 |
| Rock River Trail - C | Reconstruction of eroding walking trail | VYCC | 7,998 |
| Dalewood Brook Road Erosion Control - C | Bank stabilization on Rock River & Ball Mtn Brook | VYCC | 5,716 |
| Williams River SGA & Corridor Plan - I | Geomorphic Assessment & Corridor Plan | WCNRCD | 128,500 |
| Saxtons River SGA & Corridor Plan - C | Geomorphic Assessment & Corridor Plan | WCNRCD | 85,300 |
| Trees For Streams - O | Riparian Buffer Plantings | WCNRCD | 32,599 |
| Rock River Bridge Abutment Removal - C | Remove failed bridge abutments and restore banks | WCNRCD | 6,725 |

| | | | |
|--|---|-----------------------|------------------|
| Skidder Bridge Program - O | Construction of bridge, logger education on use, rental bridge program | WCNRCD | 3,214 |
| Ag Outreach - O | ARS & AOI programs providing outreach, horse workshops, etc. | WCNRCD | |
| Covered Bridge Raingarden - C | Install and maintain raingarden at Dummerston Covered Bridge | WCNRCD | |
| Training Workshops - O | Assist farmers, loggers, developers and landowners in complying with current AAPs, BMPs, AMPs and EPSCs | WCNRCD | |
| Invasives Outreach - O | Educational outreach on invasive plants, VIP training, lake surveys, river surveys | WCNRCD / WSMD | |
| Winhall Rv & Wardsboro Brk SGA & Corridor Plan - I | Geomorphic Assessment & Corridor Plan | WRC | 56,520 |
| Basin 11 Typing - C | Typing of Class B waters | WRC | 12,500 |
| Map undeveloped river & lake shorelands - C | Map undeveloped river & lake shorelands and provide outreach to towns on protection options | WRC | 7,272 |
| Planning for Low Impact Development - C | Work with towns on LID policies, develop LID educational materials for towns | WRC | 7,067 |
| West River mapping & info distribution - C | Create & distribute map of river and watershed with access sites and information | WRC | 3,673 |
| Road Infrastructure Survey - C | Evaluation and mapping for town culverts in poor environmental &/or physical condition | WRC | 3,636 |
| TS Irene damage analysis - C | Spatial analysis overlay of Tropical Storm Irene damages throughout the region | WRC | 1,818 |
| Dam Removal - O | Evaluate individual dams with potential for removal, site visits conducted, contacts underway | WSMD, VDFW, TNC | |
| Hydro Dam Licensing - O | Participate in FERC licensing and re-licensing process | WSMD, VDFW | |
| River Clean-Up - O | River clean-ups | CRWC, SeVWA, CRJC LRS | |
| Water Quality Outreach - O | Participate in ConnecticutRiver.us website posting bacteria data on-line | CRWC, SeVWA | |
| | | TOTAL INVESTED | \$510,972 |

C – Completed
I – In-progress
O – On-going

About Flood Resiliency

In 2011, Act 110 established a river corridor management program and a shoreland management program. Act 138 followed in 2012 expanding the state’s regulatory and technical assistance programs with respect to the management of rivers, river corridors, and floodplains. Financial incentives for municipalities have been



Resilience

established according to the requirements of 10 V.S.A. §§ 1425 and 1427 for the adoption and implementation of municipal zoning bylaws that protect and preserve river corridors, shorelands, and buffers.

Communities become eligible for financial incentives for river corridor and floodplain protection based on a rating system that considers a suite of mitigation activities, including implementation of Standard River Management Practices. Emergency Relief and Assistance (ERAF) rules now recognize towns that have increased river corridor and floodplain protection and provide an increased state cost share for emergency relief funding.

To date the only town in Basin 11-13 that has completed this process is the Town of Winhall.

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 into all future plans. 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 and minimize long term economic, social, and natural resource impacts. The effort has led to the creation of maps to identify local flood hazard areas, identifying specific areas that should be protected for their values of slowing down or attenuating 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 is providing resources and assistance to make flood resiliency an integral part of town planning including river corridor maps and model language for town plans. Numerous Tactical Basin Plan actions will assist communities in becoming more flood resilient.

The Emergency Relief and Assistance Fund (ERAF) provides State funding to match [Federal Public Assistance](#) after [federally-declared disasters](#) . Eligible public costs are reimbursed by federal taxpayers at 75%. For disasters after October 23, 2014, the State of Vermont will contribute an additional 7.5% toward the costs. For communities that take specific steps to reduce flood damage the State will contribute 12.5% or 17.5% of the total cost.

The four mitigation measures required to receive 12.5%:

1. National Flood Insurance Program (participate or have applied);

2. Town Road and Bridge Standards - (annually certify adopted standards that meet or exceed the standards in the current: 2014-2016 VTrans Orange Book: Handbook for Local Officials);
3. Local Emergency Operations Plan (adopt annually after town meeting);
4. Local Hazard Mitigation Plan - Adopt a FEMA- approved local plan (valid for five years). Or, a draft plan has been submitted to FEMA Region 1 for review.

To receive 17.5% - eligible communities also must:

5. Protect River Corridors from new encroachment; or, protect their flood hazard areas from new encroachments and participate in the FEMA Community Rating System.

After a declared disaster the damage to public infrastructure including roads and culverts may approach a million dollars. Adoption of these resiliency measures can mean significant savings for municipal taxpayers:









| | 7.5% ERAF Rate | 12.5% ERAF Rate | 17.5% ERAF Rate |
|-----------------|-----------------------|------------------------|------------------------|
| Federal Share | \$750,000 | \$750,000 | \$750,000 |
| State Share | \$75,000 | \$125,000 | \$175,000 |
| Municipal Share | \$175,000 | \$125,000 | \$75,000 |
| Total | \$1,000,000 | \$1,000,000 | \$1,000,000 |

From: http://floodready.vermont.gov/find_funding/emergency_relief_assistance

Another resiliency effort being undertaken is the Vermont Economic Resiliency Initiative (VERI). With funding from the US Economic Development Administration (EDA), the Vermont Department of Housing and Community Development, working with the Agencies of Natural Resources and Transportation and the Regional Planning Commissions, the Vermont Economic Resiliency Initiative (VERI) was launched to help ensure Vermont remains open for business when disaster strikes.

VERI will help the state and local communities by evaluating local flood risk to business and infrastructure, and identify the steps communities and the state can take to minimize rebuilding and recovery costs and ensure businesses stay open -- saving jobs and maintaining our economy. The Town of Brattleboro was selected for a more detailed analysis of the local flood risks to the community and businesses. This analysis provides the foundation for the team to develop community-tailored action plans to reduce the loss of jobs, inventory, revenue, as well as the cost to repair roads, bridges and other key infrastructure.

Tactical Plan Implementation Table

| | | | | | |
|---|---|---|--|---|---|
|  |  |  |  |  |  |
| Acidity | Channel Erosion | Flow Alteration | Encroachment | Invasive Species | Protection |
|  |  |  |  |  |  |
| Land Erosion | Nutrient Loading | Pathogens | Toxics | Thermal Stress | Resilience |





Stressor and Concerns Icons



Assessment and Monitoring Projects

ND – No Data, LM – Last Monitored, M&F – Macroinvertebrates & Fish

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|----------------------|---------------------------|-----------------------------------|--------------------|
| Objective 1: Monitor waterbodies with no, little or old data. | | | | |
| A) Monitor | VDEC – Lakes & Ponds | ANR | Adam Pond, Jamaica | ND |
| | | | Closson Pond, Rockingham | ND |
| | | | East & West Twin Ponds, Athens | ND |
| | | | Elwin Meadow, Newfane | ND |
| | | | Lily Pond, Athens | ND |
| | VDEC - MAPP | | WILLIAMS RIVER: | |
| | | | Upper Williams River mainstem | ND |
| | | | Middle Branch Williams River | ND |
| | | | Trout Brook | ND |
| | | | Lyman Brook | ND |
| | | | Upper South Branch Williams River | LM 1993 |
| | | | Hall Brook | ND |


| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|--------|----------|---------------------------|---|------------------------|
| | | | SAXTONS RIVER: | |
| | | | Lower Saxtons River | LM 1991 |
| | | | South Branch Saxtons | ND |
| | | | Howe, Willie & Stiles Bks | ND |
| | | | Bull Creek | ND |
| | | | Westminster West Rd. brook | ND |
| | | | WEST RIVER: | |
| | | | Stickney Brook | LM 1994 / Flow Altered |
| | | | Rock River | LM 1998 |
| | | | Baker Brook | ND |
| | | | Marlboro Branch (Newfane/Marlboro) | ND |
| | | | Hunter Brook | ND |
| | | | Smith Brook | ND |
| | | | Grassy Brook | ND |
| | | | Mill Brook (Townshend) | ND |
| | | | Wardsboro Brook | ND |
| | | | Dover Brook (Wardsboro) | ND |
| | | | Turkey Mtn Brook - upper | ND |
| | | | Utley Brook - upper | ND |
| | | | Griffith & Jones Brooks | ND |
| | | | Mount Tabor Brook | ND |
| | | | Mill Brook above Gale Meadows | ND |
| | | | Thompsonburg Brook (1990) | ND |
| | | | West Rv above Weston | ND |
| | | | West Rv above & below Ball Mtn & Townshend dams | temperature |
| | | | West River – N of Ball Mtn Res. | M&F |
| | | | CONNECTICUT RIVER: | |
| | | | East Putney Brook - upper | ND |
| | | | Canoe Brook | ND |
| | | | Sacketts Brook - upper | ND |




| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|--|--|----------------------------|--|---|
| Objective 2: Monitor and assess the temperature issues created by the Townshend, and Ball Mountain reservoirs and the Bellows Falls and Vernon Hydroelectric dams. | | | | |
| A) Monitor above and below each discharge & reservoir | USACE, EPA, TC | USACE, ANR, TC | Above and below dams |  |
| B) Assess fisheries above and below each discharge & reservoir | USACE, TC, VDFW | USACE, ANR/VDEC & VFWD, TC | | |
| Objective 3: Complete on-the-ground shoreline assessments of the lakes and ponds in the Basin. | | | | |
| A) Reference WRC shoreline maps & Lake Score Cards | VDEC – Lakes & Ponds | N/A | All un-assessed lakes |  |
| Objective 4: Monitor and assess to determine the location of <i>E. coli</i> sources in the West River in Londonderry. | | | | |
| A) Conduct bracketed biomonitoring & chemical assessment | VDEC – BASS lab, SeVWA | ANR, VWG | Impaired reach |  |
| Objective 5: Complete geomorphic assessment & corridor planning where these are lacking. | | | | |
| A) Conduct SGA | WCNRCD, WRC | CWIP, VWG | West River – Phase 2, Sacketts Brook | |
| B) Compile corridor plan and project development | | | West River, Sacketts Brook | |
| Objective 6: Expand volunteer monitoring on the major lakes in the Basin. | | | | |
| A) Continue support for lake monitoring efforts | VDEC – Lakes & Ponds, watershed assoc. | | Cole Pond | |
| B) Train and coordinate VIP monitoring program | VDEC – Lakes & Ponds, watershed assoc. | ANR, VWG, ANC Grant-in Aid | Connecticut River, Burbee, Gale Meadows, Lowell, Sunset, Townshend |  |

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|--|---------------------------|--|---|
| Objective 7: Document vernal pools in the Basin to fully protect wetlands. | | | | |
| A) Identify for protection vernal pools with the hydrology, habitat and structure to support diverse species presence in the face of climate change | Conservation commissions, watershed assoc., VCE, Arrowwood Env., NRCDs, VDFW | VWG | Full basin |  |
| B) Identify areas to prioritize vernal pool protection and possible consideration for Class I wetland complex | Conservation commissions, watershed assoc., VCE, Arrowwood Env., NRCDs, VDFW | VWG | Full basin | |
| Objective 8: Obtain baseline information on distribution and abundance of mussel species. (VTWAP*) | | | | |
| A) Conduct inventories of rivers and appropriate lake habitat to detect and gather information on new SGCN mussel populations | TransCanada, VDFW-NNHP, USFWS | TransCanada | Lower West River; Connecticut River – Springfield & Rockingham | |
| Objective 9: Conduct assessments of wetlands for potential Class I reclassification. | | | | |
| A) Conduct evaluation | Watershed assoc., VDEC – Wetlands | VWG | See Table 19. |  |





* VTWAP – [Vermont Wildlife Action Plan](#)

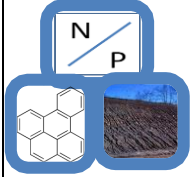



Protection Projects




| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|---|---------------------------|-------------------------|---|
| Objective 10: Work with partners to reclassify waters to the highest level of protection appropriate. | | | | |
| A) Submit reclassification proposals | NRCDs, RPCs, watershed assoc., conservation | VWG | See Tables 15 – 19. |  |



| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|---|------------------------------|--|---|
| Objective 11: Protect land and habitat along the Connecticut River to enhance survival of the high concentration of RTE species. | | | | |
| A) Work with landowners to enroll land in river corridor and conservation easement | USFWS – Conte Refuge, VRC, VDFW, TNC, VLT | USFWS, PFW, CREP, WHIP, CWIP | Rockingham & Brattleboro |  |
| Objective 12: Use Corridor Plans and the WRC <i>Undeveloped Shorelands Maps</i> to prioritize and protect areas on lakes, ponds, river and streams. | | | | |
| A) Set prioritization criteria and select sites | RPCs, watershed assoc., Municipalities | ANR, 604(b) | Basin-wide |  |
| B) Seek funding for purchase and easements | RPCs, Municipalities VRC | CWIP | Basin-wide | |
| Objective 13: Protect and restore habitats on which SGCN mussels are dependent through pollution abatement, riparian buffers, flow regulation, etc. (VTWAP) | | | | |
| A) Acquire conservation easements for the protection of critical SGCN mussel habitats and maintenance or restoration of ecological functions | | | Lower West River; Connecticut River – Springfield & Rockingham |  |
| B) Investigate the potential benefits of dam removal to SGCN mussel populations | | | Blake & Higgins(Westminster), Sacketts (Putney) | |



Restoration Projects - Basin-wide

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|---|---------------------------------------|---|---|
| Objective 14: Restore streambanks and floodplains and in the Basin. | | | | |
| A) Work with landowners to install buffers and protect shoreline and/or riparian areas through a combination of buffer plantings, land conservation, and incentive programs | NRCDs, NRCS, AAFM | T4S, CREP, WHIP, AAFM, CWIP, LIS RCPP | Watershed-wide |  |
| Objective 15: Remove dams that are no longer serving a useful purpose. | | | | |
| A) The Coop dam on Whetstone Brook | VDFW, VT Dam Task Force, USFWS | AR/NOAA, CWIP, USFWS-EBTJV | 42.850948, -72.557962 |  |
| B) Williams Dam, Londonderry | VDFW, VT Dam Task Force, USFWS | AR/NOAA, CWIP, USFWS-EBTJV | 43.226495, -72.807367 | |
| C) Prioritize dams in <i>Poor</i> condition and evaluate for removal potential | VDFW, VT Dam Task Force, USFWS | AR/NOAA, CWIP, USFWS-EBTJV | |  |
| D) Conduct training for staff and partners on dam removal and wetland restoration | VDEC-MAPP, USFWS, NRCS, VDEC - Wetlands | CWIP, PFW, WRP/DU, USFWS, VWG | | |
| E) Restore the functions of any remaining wetland | WRP/DU | AR/NOAA, CWIP | | |
| Objective 16: Ensure that all in-service dams have an Emergency Action Plan in place and up-to-date. | | | | |
| A) Work with towns on creating or updating EAPs. | RPCs, Municipalities | 604(b) | Priority: Wantastiquet Lake, Mahoney Pond |  |



| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|--|-----------------------------------|---------------------------|--|---|
| Objective 17: Restore degraded wetlands. | | | | |
| A) Repair damage from mass failure collapse into wetland. | NRCS, NRCDs | CWIP, USDA, LIS RCPP | Rockingham @ 43.20429, -72.50675 | |
| B) Prioritize and restore wetlands recommended by Wetlands staff | VDEC - Wetlands | CWIP, LIS RCPP | See Table 19. | |
| C) Provide assistance with installation of flow devices to protect wetlands and roads | VDFW | VDFW, USFWS | Basin-wide | |
| Objective 18: Encourage and implement green infrastructure practices to reduce stormwater runoff. | | | | |
| A) Work with municipalities to incorporate local regulatory approaches to encourage GSI and LID | RPCs, VDEC, watershed assoc. | CWIP, VAPDA | Bellows Falls, Brattleboro, Londonderry, Stratton, Winhall |  |
| Objective 19: Promote littoral habitat protection on lakes by control of shoreland erosion, nutrient loss and sedimentation. | | | | |
| A) Promote and initiate the Lake Wise program | VDEC – Lakes & Ponds, Lake Assoc. | | Burbee Pond, Sunset Lake |  |
| B) Conduct invasive species evaluation and protection programs on the lakes | VDEC – Lakes & Ponds, Lake Assoc. | | Burbee Pond, Gale Meadows, Lowell Lake, Sunset Lake, Townshend Reservoir |  |
| C) Establish a control program to reduce the levels of Eurasian watermilfoil | Lake Assoc. | ANS Grant-in Aid | Gale Meadows Lake |  |
| D) Build local knowledge of shoreland BMPs among contractors, landscapers and other shoreland site workers by offering the Shoreline Erosion Control Certification Course annually | VDEC – Lakes & Ponds, Lake Assoc. | VWG, CWIP | Basin-wide | |


| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|--|----------------------------|--|---|
| E) Recruit homeowners, recreation area managers and state parks to develop demonstration sites showcasing shoreland best management practices | VDEC – Lakes & Ponds, Lake Assoc. | VWG, CWIP | Basin-wide | |
| Objective 20: Prevent the further spread of Japanese knotweed in the Basin. | | | | |
| A) Conduct outreach on control and spread prevention | NRCDS, watershed assoc., RPCs | ANS Grant-in Aid, WG, | Basin-wide |  |
| B) Organize pulling events and outreach. | Conservation Commissions, NRCDS | ANS Grant-in Aid, WG, WHIP | Focus area: Saxtons River | |
| Objective 21: Dovetail continued post-closure monitoring programs of landfills with working on fixes for known water quality impacts following the end of the required monitoring in 2013. | | | | |
| A) Maintain water monitoring programs | VDEC - WMD | SWAG - CPP | Municipal landfills in Athens, Brattleboro, Dummerston, Grafton, Jamaica, Londonderry, Newfane, Putney, Rockingham, Townshend, Wardsboro, Winhall |  |
| B) Develop and implement clean-up projects at impacted locations | VDEC - WMD | SWAG - CPP | | |
| Objective 22: Reduce sand and sediment inputs from gravel roads throughout the Basin. | | | | |
| A) Provide more training and education for road agents on preventing erosion | VTrans-Local Roads, Municipal DPW's, RPCs, NRCDS | Local Roads | Basin-wide |  |
| B) Conduct BBR capital budget and road erosion inventories for AOP impediments, and river-road conflicts with an emphasis on flood resiliency | Municipal DPWs, VTrans-Better Backroads technician, RPCs, VDEC | BBR, CWIP | Andover, Athens, Brattleboro, Brookline, Chester, Dover, Grafton, Jamaica, Mount Tabor, Newfane, Peru, Putney, Rockingham, Springfield, Stratton, Townshend, Wardsboro, Westminster, Weston, Windham | |

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|---|---|---|---|
| C) Seek funding for regionally shared equipment for sand sweeping, catch basin sump cleaning and reduced use of sand & salt with possible conversion to brine | Municipal DPWs, VTrans-Better Backroads technician, VDEC | BBR, 319, VTrans | Brattleboro, Dover, Chester, Londonderry, Rockingham Stratton, Westminster, Winhall |  |
| D) Conduct an assessment of water quality impairments associated with Class IV town roads using the model developed for the White River Basin | VDEC, Municipalities, WRC, VDFPR, VTrans-Better Backroads, watershed assoc. | CWIP, BBR | Selected sites with High to Moderate Risk for Road Erosion |  |
| E) Reduce the amount of sediment and other pollutants associated with Class IV town roads | Municipal DPWs, WRC, VTrans-Better Backroads, VDEC, VDFPR, VYCC | CWIP, DREF, VYCC, Hazard Mitigation Grant Program | Selected sites based on D) | |
| Objective 23: Improve fisheries and fish habitat throughout the Basin. | | | | |
| A) Conduct AOP Stream Crossing assessments on unassessed waters | VDFW, TU, CRWC, watershed assoc. | VDFW | Williams River watershed, CT River tributaries | |
| B) Develop project implementation plan where above assessments indicate | VDFW, NRCs, TU, CRWC, watershed assoc. | VWG, CWIP, AOP | | |
| C) Implement habitat improvement projects | VDFW, NRCs, TU, CRWC, watershed assoc. | WG, CWIP, EBTJV, USFWS-AOP, Structures, USFS, PFW | Focus areas: lower West River, Rock River, CT River tribs | |




| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|---|--|--|---|
| D) Protect and restore forested riparian lands adjacent to all streams for WQ, temperature, riparian and instream habitat improvement | VDFW, NRCDs, TU, CRWC, watershed assoc. | VWG, CWIP, USFS, PFW, LIS RCPP | Focus areas: Lower Saxtons and lower Williams, upper West | |
| Objective 24: Reduce non-point source pollutants from farming operations by implementing BMPs on farms. | | | | |
| A) Conduct farm assessments and outreach visits to livestock farms in focus areas | NRCDs, AAFM, VACD | AAFM, WG, NRCS, LIS-RCPP | <p><u>West River:</u> Weston, Townshend, Newfane</p> <p><u>Williams River:</u> Mainstem in Chester/Rockingham & Middle Branch-Chester</p> <p><u>Saxtons River:</u> South Branch & Bull Creek</p> <p><u>CTR watershed:</u> CTR mainstem in Putney, Rockingham, Westminster; Sacketts Brook – Westminster Rd trib.</p> |   |
| B) Coordinate referrals of potential program staff | NRCDs, VACD, AAFM, NRCS, CRWC | NRCS, LIS-RCPP | | |
| C) Develop critical source areas for nitrogen and sediment | AAFM, NRCS | NRCS, LIS-RCPP | | |
| D) Implement BMP's on prioritized critical source areas | NRCDs, VACD, AAFM, NRCS | EQIP, CREP, AAFM, PFW, WHIP, WRP/DU, 319, LIS-RCPP | | |




Forestry

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|---|---------------------------|--|---|
| Objective 25: Reduce non-point source pollution associated with logging operations by implementing AMPs and by promoting the use of portable skidder bridges. | | | | |
| A) Continue the AMP Monitoring Program administered by DFPR | VDFPR, DEC Compliance and Enforcement Division, Vermont Forest Products Association | State General Funds | Basin-wide |  |
| B) Support the Portable Skidder Bridge Rental Program | NRCDs, VDFPR | CWIP | Basin-wide | |
| C) Promote Voluntary Harvesting Guidelines | VDFPR, NRCDs | VWG, USFS | Basin-wide | |
| Objective 26: Improve planning and management of the urban trees to improve stormwater retention. | | | | |
| A) Promote the planning and management of urban trees for stormwater mitigation to municipalities | NRCDs, RPCs, VDFPR , UVM Extension | VDFPR , USFS | Urban areas Focus: Bellows Falls, Brattleboro, ski resorts, No. Westminster |  |
| B) Inventory and assess urban trees for new & retrofit installation of stormwater mitigation strategies | Municipal Con. Comm. & Tree wardens | VDFPR , USFS | All municipalities | |
| C) Promote the benefits of trees and forests for water quality | VDFPR , UVM Extension, all natural resource partners | VDFPR , USFS | Basin-wide | |
| D) Encourage participation in the Stewardship of the Urban Landscape - Tree Stewards course | VDFPR , UVM Extension | VDFPR , USFS | Basin-wide | |

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|--|-------------------|---------------------------|--|---|
| Objective 27: Encourage and support smart growth development and compact village centers and downtowns to slow forest fragmentation. | | | | |
| A) Promote ACCD Community Revitalization programs | VDFPR, VDEC, RPCs | VDEC | Basin-wide, focus areas: resort development, Brattleboro, Stratton, Wardsboro, Winhall |  |
| B) Identify high-priority landscapes for conservation efforts | VDFPR, VDEC | | | |




Flood Resiliency



| | | | | |
|--|---|----------------|---|---|
| Objective 28: Incorporate river corridors, floodplain protection and flood resiliency strategies into local and regional development plans and zoning. | | | | |
| A) Focus on areas of highest risk identified in River Corridor plans | RPC's, Town Planning and Conservation Commissions, VLCT | MPG, 604(b) | Focus Towns: Brattleboro, Chester, Grafton, Jamaica, Newfane, Saxtons River |  |
| B) Prevent further encroachment into floodplains and wetlands | Municipalities | | Williams River and Middle Branch | |
| Objective 29: Update municipal plans and programs to incorporate ERAF standards. | | | | |
| A1) Focus on towns at highest risk identified in River Corridor plans | RPC's, Town Planning and Conservation Commissions, VLCT | MPG | Focus Towns: Chester, Londonderry, Jamaica, Newfane, Brattleboro |  |
| Objective 30: Reconnect agricultural land on floodplains for flood storage. | | | | |
| A) Identify lands disconnected from flooding access and landowners willing to re-establish natural hydrology | NRCS, NRCDs, | HMGP, LIS RCPP | |  |
| B) Restore wetlands that have been previously converted to agriculture for flood storage | NRCS, NRCDs, | HMGP, LIS RCPP | Chester, Putney, Rockingham, Westminster, Weston | |

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|---|---------------------------|--|---|
| C) Investigate creating a local and/or state-wide crop damage reimbursement program for farmers willing to allow reconnection of fields for floodplain access | NRCS, VT Legislature, Town select board | USDA, VT Legislature | | |
| Objective 31: Implement stormwater control projects and green infrastructure practices to reduce flows and sediment wherever possible. | | | | |
| A) Conduct stormwater surveys, IDDE investigations and develop stormwater master plans | VDEC - Stormwater | CWIP | Focus area priority: Bellows Falls, Chester, and No. Westminster villages Stratton/Winhall resort areas. |  |
| B) Prioritize and implement stormwater control projects | VDEC, Municipalities, Ski Resorts | CWIP, private | As determined by A) |  |
| C) Promote local regulatory and incentive approaches to encourage GSI and LID | VDEC | CWIP, VAPDA | Basin-wide | |
| Objective 32: Monitor and document impacts of TS Irene and other flood events. | | | | |
| A) Document erosion damage & mass failures | VGS, WRC, BCRC, SGA Consultants | 604(b) | Basin-wide |  |
| B) Document repeated infrastructure problems and concerns | WRC, BCRC, VTrans, SGA Consultants | 604(b) | Basin-wide | |
| C) Develop remediation projects where appropriate | WRC, BCRC, SGA Consultants | 604(b), BBR | Basin-wide | |
| D) Update delineated SGA and FEH corridors where river has migrated outside of boundary | VDEC – Rivers Program | ANR | Where applicable | |






Also see river-specific Objectives below.

West River

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|--|---------------------------------------|---------------------------|---|---|
| Objective 33: Work with USACE to address river impacts related to temperature and flow alterations below the flood control dams as listed in Part F. | | | | |
| A) Summarize and present data (see Obj 1.) | VDEC, USFS, TransCanada | TransCanada | Below the Harriman Reservoir |  |
| B) Develop & implement mitigation strategies | VDEC, TransCanada, USFS | TransCanada | Below the Somerset Reservoir(from fisheries) |  |
| Objective 34: Implement buffer restoration and planting projects in priority areas. | | | | |
| A) Conduct landowner outreach and recruitment for buffer projects. | NRCDs | AAFM, CWIP, LIS RCPP | 43.301105, -72.787006; 43.261901, -72.794620; 43.253064, -72.793215; 43.247106, -72.788805; 43.200300, -72.822687; 42.999219, -72.637658; 42.981301, -72.636954; 42.868542, -72.567420 | |
| B) Work with willing landowners to install buffers. | NRCDs | AAFM, CWIP, LIS RCPP | | |
| C) Work with towns to restore buffers on all FEMA Buy-out properties | NRCDs | AAFM, CWIP, LIS RCPP | | |
| Objective 35: Support SeVWA and other local watershed groups in their water quality monitoring work. | | | | |
| A) Assist with program development and implementation | VDEC-MAPP | | | |
| B) Assist with funding | VDEC-MAPP | VWG, CWIP | | |
| Objective 36: Work with Bromley Mountain Resort to address water quality impairments due to flow alterations to Mill Brook and tributary. | | | | |
| A) Complete an Needs and Alternative Analysis to determine an alternative for snowmaking | Bromley Mountain Resort | Private | Mill Brook and tributary |  |
| B) Work with resort to implement projects | Bromley Mountain Resort, Act250, VDEC | Private | | |

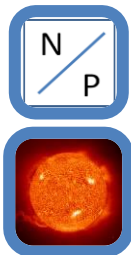
| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|----------------------------------|---------------------------|--|--|
| Objective 37: Work with the towns of Winhall, Londonderry, Jamaica and Wardsboro to address sediment and temperature impairments on the Winhall River and Wardsboro Brook. | | | | |
| A) Conduct road erosion and buffer assessments | WCNRCD, WRC | CWIP | Cohen Rd, Goodaleville Rd, Kendall Farm Rd, River Rd, Raspberry Hill Rd, Winhall Hollow Rd, French Hollow Rd |  |
| B) Prioritize these sites & develop implementation projects | WCNRCD, WRC, VDEC | CWIP | | |
| C) Implement projects | WCNRCD, WRC, VDEC | CWIP | | |
| Objective 38: Implement recommendations of the West River Bacteria TMDL to control high levels of bacteria in Londonderry. | | | | |
| A) Pursue and address failing or malfunctioning onsite septic systems | Town DPW, SeVWA, property owners | WG, CWIP, CWSRF | Londonderry village to below South Londonderry village |  |
| B) Pursue and address stormwater runoff from developed areas | Town DPW, SeVWA, property owners | CWIP, WG | | |
| C) Pursue and address illicit discharges | Town DPW | Town DPW | | |
| D) Expand citizen education about the negative impacts of stormwater, with a focus on the importance of picking up after one's pet. | SeVWA, WCNRCD | WG | | |
| E) Support programs that assist with the replacement or upgrading of failed onsite septic systems or expansion of the municipal wastewater system to reach more residences. | Town DPW | CWSRF | | |

Williams River

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|--------------------|---------------------------|---|--|
| Objective 39: Work with the towns of Chester and Rockingham to address sediment, nutrient and temperature impairments on the lower river. | | | | |
| A) Conduct road erosion assessments | DPWS, NRCDs, RPCs | BBR, VWG | Both Pleasant Valley Rds, Popple Dungeon Rd, Parker Hill |  |
| B) Conduct resource concern and AOI assessments of ag operations | NRCDs | AAFM, CWIP, LIS RCPP | |   |
| C) Develop implementation projects | NRCDs, RPCs | AAFM, NRCS, LIS RCPP | | |
| D) Seek funding | NRCDs, RPCs | AAFM, NRCS, BBR, LIS RCPP | | |
| E) Implement projects | NRCDs, RPCs | AAFM, NRCS, BBR, LIS RCPP | | |
| Objective 40: Work with the town of Chester to increase flood resiliency. | | | | |
| A) Identify flood damage-prone infrastructure and flood prone properties for evaluation of resiliency | Town, VDEC, SWCRPC | | Middle Branch |  |
| B) Work with FEMA Buy-out program | Town, SWCRPC | FEMA | Town-wide | |
| C) Work with town on zoning regulations for river corridor protection | VDEC | | | |
| D) Promote ERAF and NFIP programs | VDEC, SWCRPC | | | |
| E) Reduce stormwater inputs with GSI and LID | Town, VDEC, SWCRPC | | Chester village & Depot | |
| Objective 41: Preserve existing and restore impacted floodplains in the Williams River watershed. | | | | |
| A) Seek RCE opportunities | VRC | CWIP, LIS RCPP | South Branch & Middle Branch |  |
| B) Seek floodplain reconnection and restoration opportunities | NRCDs, RPCs | CWIP, LIS RCPP | Along Rte 103 S, Chester & Rockingham e.g. @ 43.23766 -72.55286; 43.29740 -72.60841 | |


| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|--|----------------------|---------------------------|---|--------------------|
| C) Preserve agricultural fields serving as flood storage | NRCS | CWIP, EQIP, LIS RCPP | Swett Rd, Rte 103N, Green Mtn Turnpike, Williams Rd | |
| D) Remove berms constructed in 1970's and post-TSI | NRCD, Municipalities | CWIP | Williams River, Middle Branch e.g. @ 43.269062, -72.621415; 43.262421, -72.598895 | |
| E) Work with willing landowners on flood proofing or buyouts | | HMGP, CWIP | 43.343536, -72.621205 | |



Saxtons River

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|-------------------|---------------------------|--|---|
| Objective 42: Work with the towns of Grafton and Rockingham to address sediment, nutrient and temperature impairments on the lower river. | | | | |
| A) Conduct resource concern and AOI assessments of ag operations | WCNRCD , AAFM | VWG, CWIP, LIS RCPP | Downstream of Hall Bridge Rd; Bull Creek; South Branch |  |
| B) Develop implementation projects | WCNRCD , AAFM | BBR, VWG, CWIP, LIS RCPP | | |
| C) Seek funding | WCNRCD , AAFM | BBR, VWG, CWIP, LIS RCPP | | |
| D) Implement projects | WCNRCD , AAFM | BBR, VWG, CWIP, LIS RCPP | | |
| Objective 43: Implement priority projects identified in the Saxtons River Corridor Plan. | | | | |
| A) Basin Farm corridor protection and buffer planting | WCNRCD, VRC, NRCS | CWIP, EQIP, LIS RCPP | M02 - 43.12145, -72.44610 | |
| B) Berm removal and corridor protection on mainstem above SR village | VRC, WCNRCD, NRCS | CWIP, EQIP | M07 - 43.13598, -72.51519 | |


| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|--|----------------------------|---------------------------------|---|--------------------|
| C) Dam removal and corridor protection at confluence with South Branch | Windham Foundation, WCNRCD | CWIP, AR/NOAA, EBTJV, GMNF, AOP | T6.01 - 43.168468, -72.607066 | |
| D) Corridor Protection upstream of Grafton Village | VRC | CWIP | M15 and above | |
| E) Stormwater Mgt. at Alpaca Farm north of Grafton Village | NRCS | EQIP, LIS RCPP | M15 - 43.18783, -72.61782 | |
| F) Culvert replacement on Mercy Lane | DPW, WCNRCD | Structures, AOP | M20 - 43.19901, -72.69727 | |
| G) Buffer Planting upstream of Mercy Lane | WCNRCD | CWIP, VWG | M20 - 43.19902, -72.69812 | |
| H) Bull Creek - CREP Buffer Easement and Planting east of Route 35 | NRCS, WCNRCD, VRC | CREP, CWIP, LIS RCPP | T4.01 - 43.14110, -72.56025 | |
| I) Willie Brook & Styles Brook - | WCNRCD, VRC | CWIP, LIS RCPP | T6.S2.01 -- 43.141975, -72.629411; T6.S2.01 -- 43.13172, -72.63880; | |
| <ul style="list-style-type: none"> Protect Corridor west of Townshend Road in Grafton | | | T6.04 -- 43.12670, -72.64075 | |
| <ul style="list-style-type: none"> Protect alluvial fan | | | | |
| J) Remove berms built post-Irene | WCNRCD, Town DPW | CWIP | Most brooks and South Branch | |



Ball Mountain Brook

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|--------------|---------------------------|-------------------------|---|
| Objective 44: Implement recommendations of the Corridor Plan. | | | | |
| A) Protect corridor; monitor head cut; remove berms | VDEC, WCNRCD | CWIP | T0805 |  |




| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|--|-------------------------------|---------------------------|--------------------------|--|
| B) Dalewood Rd. reduce sediment inputs; explore history & consider restoration to old channel beds | WCNRCD, DPW | BBR, CWIP | T08.04-S1.04-S1.01 |  |
| E) Protect corridor; remove berms and consider removing old abutments | WCNRCD, VRC | CWIP | T08.04-S1.01B | |
| F) Styles Brook remove berm and replace structure | WCNRCD, Municipal DPW | CWIP, Structures | T08.04-S1.10-S1.01 | |
| Objective 45: Continue working with Stratton Mountain Resort to implement the Water Quality Remediation Plan for sediment to address water quality impairments in the Brook and tributaries. | | | | |
| A) Conduct annual update meetings, planning and monitoring work | Stratton Resort, Act250, VDEC | Private | Stratton Mountain Resort |  |
| B) Work with resort to implement projects | Stratton Resort, Act250, VDEC | Private | As determined by WQRP | |

Rock River



| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|-------------------|---------------------------|-------------------------|---|
| Objective 46: Implement recommendations of Corridor Plan. | | | | |
| A) Protect corridor; possible restoration of channel to old bed | VDEC, WCNRCD, VRC | CWIP | T02.04 |  |
| B) Protect corridor | WCNRCD, VRC | CWIP | T02.05A; | |
| C) Protect corridor; manage invasives | WCNRCD, VRC | CWIP | T02.05-S1.01 | |
| D) Corridor Conservation & limited berm removal | WCNRCD, VRC | CWIP | T02.05-S1.02 | |

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|-----------------------|---------------------------|-------------------------|---|
| E) Replace 5 structures | WCNRCD, Municipal DPW | CWIP, Structures | T02.11-S1.01A |  |
| F) Protect corridor; buffer establishment at horse farm | WCNRCD | VWG, CWIP, LIS RCPP | T02.11-S1.01B | |
| Objective 47: Remove streambed armoring from Adams Brook to repair damage to aquatic habitat, cut sedimentation and remove impoundment. | | | | |
| A) Remove material and restore streambed and banks | VDFW, WRC, WCNRCD | VWG, CWIP | 42.95015, -72.75777 |  |


Winhall River




| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|-------------------|---------------------------|-------------------------|---|
| Objective 48: Implement recommendations of Corridor Plan. | | | | |
| A) Protect corridor and restore riparian buffer | VDEC, WCNRCD, VRC | CWIP, VWG, CREP | T11.04 |  |
| B) Move River Road embankment back to reduce encroachment | VDEC, WCNRCD, WRC | CWIP, VWG | T11.05-A |  |
| C) Remove windrowed berm and increase floodplain access | VDEC, WCNRCD, WRC | CWIP, VWG | T11.06-A |  |
| D) Protect corridor | VDEC, VRC, VLT | CWIP, VWG | T11.08-A & B | |




Wardsboro Brook



| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|---------------------------|---------------------------|--------------------------------------|---|
| Objective 49: Implement recommendations of Corridor Plan. | | | | |
| A) Protect corridor and alluvial fan | VDEC, WRC, VRC, WCNRCD | CWIP, VWG, CREP | T8.01-A & B |  |
| B) i. Assess potential impact of berm removals | VDEC, VTrans, WRC, WCNRCD | CWIP, VWG | T8.01 & .02 | |
| ii. Remove berms and increase floodplain access | | | | |
| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
| C) Restore Riparian Buffer | VDEC, WCNRCD | CWIP, VWG, T4S | T8.03 | |
| D) Protect corridor, restore floodplain | VDEC, WRC, VRC | CWIP, VWG | T8.03, .04 & .05 | |
| E) Arrest headcuts | WCNRDC, WRC | CWIP | T8.01-D, T8.02, T8.03, T8.04, T8.06A |  |
| F) Replace box culvert under Rt. 100 and Cross Rd | | | T8.S3.01 | |

Connecticut River

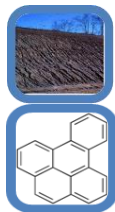
| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|---|---------------------------|-------------------------|---|
| Objective 50: Implement recommendations of the LIS-TMDL to reduce point source nitrogen (N) loads by 25%. | | | | |
| A) Identify sources and implement reduction practices | Municipal WWTFs, industrial N dischargers | CWSRF, LIS RCPP | See Section 3.7 |  |
| Objective 51: Implement recommendations of the LIS-TMDL to reduce non-point source nitrogen loads by 10%. | | | | |
| A) Educate ag producers on N reduction practices | AAFM, NRCS, NRCDs, ag producers | LIS RCPP | Basin-wide | |

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|--|----------------------------------|---|---|
| B) Implement appropriate practices including: | AAFM, NRCS, NRCDs, ag producers | EQIP, AAFM, VACD, CREP, LIS RCPP | Basin-wide |  |
| <ul style="list-style-type: none"> Increased soil testing | | | | |
| <ul style="list-style-type: none"> Nutrient Management Planning | | | | |
| <ul style="list-style-type: none"> Timed fertilizer application | | | | |
| <ul style="list-style-type: none"> Needs based N application rates | | | | |
| <ul style="list-style-type: none"> Use of cover crops & perennial grasses | | | | |
| <ul style="list-style-type: none"> Extended rotation periods | | | | |
| <ul style="list-style-type: none"> Install wood chip filter beds/trenches to treat drainage water | | | | |
| <ul style="list-style-type: none"> Increase riparian buffers | | | | |
| Objective 52: Implement projects from the Brattleboro Stormwater Mapping Project,*and the Putney Road Stormwater Study.† | | | | |
| A) Assess potential for an extended stormwater detention pond | VDEC-Stormwater, Town of Brattleboro | CWIP, CWSRF | Drainage Area #68 - Off Cedar St. at 42.858552, -72.569073 |  |
| B) Assess potential for extended stormwater detention pond | VDEC-Stormwater, Town of Brattleboro | CWIP, CWSRF | Drainage Area #152 - Behind Fairfield Shopping Plaza at 42.873814, -72.563598 |  |
| C) Reroute stormwater from Rte 9 to enlarged swirl separator and sand filter to CT River | VTrans, VDEC-Stormwater, VTrans, Town of Brattleboro | CWIP, AOT, CWSRF | Drainage area #173* - Before Rte 9 bridge to NH at 42.883878, -72.552804 | |
| D) Assess potential for extended stormwater detention pond | VDEC-Stormwater, Town of Brattleboro | CWIP, CWSRF | Drainage area #177* - End of Glen Orne Dr. at 42.890898, -72.543095 | |

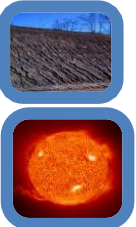
| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|--|---|---------------------------|---|---|
| E) Construct 2 stormwater detention ponds in series | VDEC-Stormwater, WCNRCD, landowner | CWIP, CWSRF | Site 1.1+ - private property south of Hardwood Way at 42.880367, -72.556635 | |
| F) Construct stormwater detention ponds – wet ponds and gravel ponds | VDEC-Stormwater, WCNRCD, landowner | CWIP, CWSRF | Site 1.4+ - private property along Rte 9 to NH at 42.884009, -72.555107 | |
| G) Retrofit swales for pre-treatment, infiltration and storage | VTrans, VDEC-Stormwater, WCNRCD, landowner | CWIP, CWSRF | Site 2.2+ - I-91 ROW at Black Mtn Rd. at 42.882846, -72.562209 | |
| H) Retrofit swales for pre-treatment, infiltration and storage | VTrans, VDEC-Stormwater, WCNRCD, landowner | CWIP, CWSRF | Site 2.4+ - I-91 ROW at Exit 3 - at 42.888234, -72.557671 | |
| I) Upgrade and extended stormwater detention pond | VTrans, VDEC-Stormwater, WCNRCD, landowner | CWIP, CWSRF | Site 1.10+ - C&S property at 42.892923, -72.550968 | |
| Objective 53: Work with the TransCanada, through the FERC relicensing process, to address river impairments related to flow issues on the Connecticut River listed in Part F -Waters Altered by Flow Regulation. | | | | |
| A) Above and below the Vernon Dam | TransCanada, FERC, USFWS, NHFG, TNC, CRWC, others | TransCanada | CT River, above and below the Vernon Dam |  |
| B) Below the Bellows Falls Dam | Same | TransCanada | CT River, below the Bellows Falls Dam | |
| Objective 54: Work with the TransCanada to improve riparian buffers along the river on TC held lands. | | | | |
| A) Monitor ag lands for buffer compliance | TransCanada | TransCanada | |  |
| B) Incorporate buffer requirements into ag land leases | Same | TransCanada | |  |

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|--|---------------------------|-------------------------|---|
| Objective 55: Preserve existing and create more floodplain along the Connecticut River. | | | | |
| A) Assess current floodplain quantity & capacity | TNC | WG | |  |
| B) Seek and purchase RCE opportunities | VRC, CRWC, CRJC | CWIP, LIS RCPP | | |
| C) Seek floodplain reconnection and restoration opportunities | TNC, CRWC, CRJC | CWIP, LIS RCPP | | |
| Objective 56: Work with regulators and dam operators/owners to reduce the impacts of dam operations on SGCN mussel populations. (VTWAP) | | | | |
| A) Identify sources and implement reduction practices | Municipal WWTFs, industrial N dischargers, TNC | CWSRF | See Section 3.7 |  |


Commissary Brook

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|--|----------------------|---------------------------|-------------------------|---|
| Objective 57: Reduce sediment inputs to the Connecticut River from mass failures and erosion on first tributary. | | | | |
| A) Assess geomorphic conditions | CRJC, RCC, landowner | CWIP | |  |
| 1) Work with Town and landowner to develop implementation plan | | VWG, CWIP | | |
| B) Implement plan strategies | | CWIP | | |





East Putney Brook

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|--|---|---------------------------------|---|---|
| Objective 58: Investigate replacing or retrofitting the perched culvert at the River Rd. crossing. | | | | |
| A) Work with NEC RR to assess culvert and develop plan | NEC RR, USFWS | | 42.985724, -72.468608 | |
| B) Seek funding for implementation | VTrans | Structures, USFWS-EBTJV | | |
| Objective 59: Conduct outreach and promote riparian buffers on agricultural and open lands in the watershed. | | | | |
| A) Conduct outreach and assessments with landowners for buffer compliance with RAPs | WCNRCD, NRCS, CRWC, TU, watershed. Assoc. | AAFM, CREP, VWG, CWIP, LIS RCPP | e.g.: 43.060461, -72.538313; 43.052700, -72.535406; 43.040210, -72.528446; 43.046200, -72.523092; 43.039100, -72.525149; 43.021123, -72.500464; 43.020178, -72.498007; 43.002523, -72.476460; 42.996662, -72.477093; 42.985605, -72.467162 |  |
| B) Work with landowners to install buffers | WCNRCD, CRWC | AAFM, CREP, VWG, CWIP, LIS RCPP | | |

Ellis Brook, Farr Brook

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|---|---|---------------------------|-------------------------|---|
| Objective 60: Develop a plan for addressing the insufficient flows in the lower brook caused by the Bellows Falls Water Dept. water withdrawal. | | | | |
| A) Coordinate with BFWD on plan development | VDWGPD, Bellows Falls Water Dept., VDEC | | |  |
| B) Implement plan strategies | Bellows Falls Water Dept. | CWSRF | | |

Sacketts Brook

| Action | Partners | Potential Funding Sources | Implementation Location | Stressor / Concern |
|--|--------------------------------|---------------------------|-------------------------|--|
| Objective 61: Develop a plan for addressing the insufficient flows in the lower brook caused by the paper mill water withdrawal. | | | | |
| A) Coordinate with paper mill on plan development | VDEC, permittee | private | Impaired reach |  |
| B) Implement plan strategies | | | | |
| Objective 62: Sand Hill Road / Wilson wetlands management | | | | |
| A) Assess wetlands to determine ways to re-establish natural hydrology post -TSI | VDEC – Wetlands & Rivers, VDFW | VWG | Sand Hill Road |  |
| B) Coordinate with Putney Con. Comm. on wetland management plan and beaver management | VDEC – WSMD, VDFW, WRC | | |  |
| C) Work with DPW on road erosion and stability issues | VDEC, DPW, PCC | BBR, Structures, HMGP | |  |

| Partners | | | | |
|------------|---|--|------------------|--|
| ACCD | Agency of Commerce and Community Development | | Town | Municipal Government body |
| BCCD | Bennington County Conservation District | | USDA | US Dept of Agriculture |
| BCRC | Bennington County Regional Commission | | USFS | USDA- Forest Service |
| Con. Comm. | Town Conservation Commission | | USFWS | US Fish & Wildlife Service |
| CRJC | Connecticut River Joint Commissions | | VANR | VT Agency of Natural Resources |
| CRWC | Connecticut River Watershed Council | | VAPDA | Vermont Association of Planning and Development Agencies |
| CTR.us | ConnecticutRiver.us | | VDEC | VT Dept of Environmental Conservation |
| DRWA | Deerfield River Watershed Association | | VDFPR | VT Dept of Forests, Parks and Recreation |
| FEMA | Federal Emergency Management Agency | | VDTF | VT Dam Task Force |
| FGR | Friends of the Green River | | VFWD | VT Fish and Wildlife Dept |
| FSA | USDA-Farm Service Agency | | VGS | VT Geographic Survey |
| NRCD | Natural Resources Conservation District | | VRC | VT River Conservancy |
| NRCS | USDA - Natural Resources Conservation Service | | VTrans | VT Agency of Transportation |
| SeVWA | Southeastern Vermont Watershed Alliance | | Watershed Assoc. | Local watershed associations |
| SVNHM | Southern Vermont Natural History Museum | | WCNRCD | Windham County Natural Resources Conservation District |
| TC | TransCanada Corp. | | WRC | Windham Regional Commission |
| TNC | The Nature Conservancy | | | |

| Potential Funding | | | | |
|-------------------|---|--|-------------|---|
| 319 | Clean Water Act Sec. 319 | | GI | Green Infrastructure Municipal Outreach Project |
| 604(b) | Clean Water Act Sec. 604(b) | | GMNF | Green Mountain National Forest - USFS |
| AAFM | VT Agency of Agriculture, Food & Markets cost-share programs | | LARC | Land Acquisition Review Committee - VDFPR |
| ANR | ANR budget | | LaRosa | Analytical Services Partnership grants |
| ANS Grant-in Aid | Aquatic Nuisance Species Grant-In-Aid Program | | LIS-RCPP | Long Island Sound Watershed Regional Conservation Partnership Program |
| AOP | US Fish & Wildlife Service - Aquatic Organism Passage grant | | Local roads | VT Local Roads Program - Vtrans |
| AR/NOAA | American Rivers/National Oceanic & Atmospheric Administration | | MPG | Municipal Planning grant |
| BBR | Better Backroads Program grant - VTrans | | PFW | USFWS - Partners for Fish & Wildlife |
| CDBG | Community Development Block Grant | | Structures | VTrans Structures grant |
| CREP | Conservation Reserve Enhancement Program | | SWAG - CPP | Solid Waste Assistance Grants - Community Pollution Prevention |
| CWSRF | State Revolving Loan Fund - Clean Water State Revolving Loan Fund | | T4S | Trees For Streams |
| EBTJV | US Fish & Wildlife Service - Eastern Brook Trout Joint Venture | | USFS | USDA- Forest Service grant |
| ECF | Environmental Contingency Fund | | VHCB | VT Housing & Conservation Board |
| Enhancement | VTrans Enhancement grant | | VRWA | Vermont Rural Water Association |
| EQIP | Environmental Quality Incentive Program | | VWG | Watershed (License Plate) grant |
| ERP | Ecosystem Restoration Program grant - DEC | | WHIP | Wildlife Habitat Incentive Program |
| FEMA HMG | FEMA Hazard Mitigation Grant | | WRP/DU | NRCS Wetland Reserve and DU funding |

Appendices

Under separate cover

Abbreviations List

| | |
|--------|--|
| 319 | Federal section 319 grants for NPS pollution abatement |
| 604b | Federal section 604b pass through funds |
| AAFM | Vermont Agency of Agriculture Food and Markets |
| ACCD | Agency of Commerce and Community Development |
| ALS | Aquatic Life Support |
| ANR | Vermont Agency of Natural Resources |
| ANS | Aquatic Nuisance Species Program |
| AOP | Aquatic Organism Passage |
| AR | American Rivers |
| BASS | Biological Assessment Studies Section |
| BBR | Better Backroads Program (VTrans) |
| BMP | Best Management Practices |
| CDBG | Community Development Block Grant |
| CREP | Conservation Reserve Enhancement Program |
| CRJC | Connecticut River Joint Commissions |
| CRWC | Connecticut River Watershed Council |
| CWIP | Clean Water Initiative Program |
| CWSRF | Clean Water State Revolving Fund |
| ENVY | Entergy Vermont Yankee Nuclear Power Facility |
| EPA | Environmental Protection Agency |
| EQIP | Environmental Quality Incentives Program |
| FEH | Fluvial Erosion Hazard |
| FEMA | Federal Emergency Management Agency |
| FERC | Federal Energy Regulatory Commission |
| GMNF | Green Mountain National Forest |
| GSI | Green Stormwater Infrastructure |
| HMGF | Hazard Mitigation Grant Program |
| IBA | Important Bird Area |
| IDDE | Illicit Discharge Detection and Elimination |
| LaRosa | LaRosa Analytical Partnership Program |
| LID | Low Impact Development |
| LIS | Long Island Sound |
| MAPP | Monitoring, Assessment and Planning Program |
| MGD | million gallons per day |
| MPG | Municipal Planning Grants |
| NECRR | New England Central Railroad |
| NFIP | National Flood Insurance Program |
| NOAA | National Oceanographic and Atmospheric Administration |
| NC | Natural Community |
| NPS | Nonpoint Source Pollution |
| NRCD | Natural Resources Conservation District |

| | |
|---------|--|
| NRCS | Natural Resource Conservation Service |
| ONRCD | Ottauquechee Natural Resource Conservation District |
| ORW | Outstanding Resource Water |
| PFW | Partners for Fish and Wildlife Program |
| RAP | Required Agricultural Practices |
| RM | River Mile |
| RMP | River Management Program (Agency of Natural Resources) |
| RPC | Regional Planning Commission |
| RTE | Rare, Threatened and Endangered species |
| SeVWA | Southeast VT Watershed Association |
| SGA | Stream Geomorphic Assessment |
| SPA | Source Protection Area for drinking water supply |
| T4S | Trees For Streams |
| TMDL | Total Maximum Daily Load |
| TNC | The Nature Conservancy |
| TU | Trout Unlimited |
| USF&W | United States Fish and Wildlife Service |
| USFS | United States Forest Service |
| USGS | United States Geological Survey |
| UVM Ext | University of Vermont Extension |
| VAPDA | Vermont Association of Planning and Development Agencies |
| VDEC | Vermont Department of Environmental Conservation |
| VDFPR | Vermont Department of Forest Parks and Recreation |
| VDFW | Vermont Department of Fish and Wildlife |
| VDOH | Vermont Department of Health |
| VHCB | Vermont Housing and Conservation Board |
| VHQW | Very High Quality Water |
| VIP | Vermont Invasive Patrollers |
| VLCT | Vermont League of Cities and Towns |
| VRC | Vermont River Conservancy |
| VTC | Vermont Technical College |
| VTrans | Vermont Agency of Transportation |
| VTWAP | Vermont Wildlife Action Plan |
| VWQS | Vermont Water Quality Standards |
| VYCC | Vermont Youth Conservation Corps |
| WCNRCD | Windham County Natural Resources Conservation District |
| WHIP | Wildlife Habitat Enhancement Program |
| WMA | Wildlife Management Area |
| WQRP | Water Quality Remediation Plan |
| WRC | Windham Regional Commission |
| WSMD | Watershed Management Division |
| WWTF | Wastewater Treatment Facility |

Glossary

A full glossary is available in the [Vermont Surface Water Management Strategy Glossary](#). Terms not listed there are included below.

Altered -Waters where a lack of flow, water level or flow fluctuations, modified hydrology, physical channel alterations, documented channel degradation or stream type change is occurring and arises from some human activity, OR where the occurrence of exotic species has had negative impacts on designated uses. The aquatic communities are altered from the expected ecological state.

Anoxic - an aquatic system totally depleted of dissolved oxygen.

Aquatic Life Support (ALS) - the ability of an aquatic community or communities to meet a certain level of biological integrity that complies with Class Standards in state Water Quality Standards.

Equilibrium or Dynamic equilibrium or Equilibrium condition - the width, depth, meander pattern, and longitudinal slope of a stream channel that occurs when water flow, sediment, and woody debris are transported by the stream in such a manner that it generally maintains dimensions, pattern, and slope without unnaturally aggrading or degrading the channel bed elevation.

Head Cut (stream geomorphology) - an erosional feature of some intermittent streams and perennial streams where an abrupt vertical drop, also known as a knickpoint in the stream bed occurs. The knickpoint, where a head cut begins, can be as small as an overly-steep riffle zone or as large as a waterfall. When not flowing, the head cut will resemble a very short cliff or bluff. A small plunge pool may be present at the base of the head cut due to the high energy of falling water. As erosion of the knickpoint and the streambed continues, the head cut will migrate upstream. (<http://en.wikipedia.org>)

Outstanding Resource Water - waters of the State designated by the Secretary as having exceptional natural, recreational, cultural, or scenic values.

Reach - a segment of river displaying similar characteristics throughout.

River Corridor - the land area adjacent to a river that is required to accommodate the dimensions, slope, planform, and buffer of the naturally stable channel and that is necessary for the natural maintenance of natural restoration of a dynamic equilibrium condition and for minimization of fluvial erosion hazards, as delineated by the Agency of Natural resources in accordance with river corridor protection procedures.

Stressed - Water quality and/or aquatic habitat at risk or somewhat diminished, but standards are met.

Stressor - a phenomenon with quantifiable damaging effects on surface waters resulting from the delivery of pollutants to a waterbody, or an increased threat to public health and safety.

Water Quality Remediation Plan - a TMDL alternative in which pollutant sources stressing a waterbody (normally non-point sources) are identified and remediation actions believed sufficient to alleviate the problem are rapidly installed. Actions are usually tied to a completion timeline as well as follow-up monitoring to track improvement and success. WQRPs have been instituted as part of Act 250 permit requirements and 1272 Orders and are usually sufficient to preclude the development of a TMDL according to EPA regulations (i.e. 4b alternative). Oftentimes WQRPs are preferable to TMDLs because much of the modeling and loading estimate work, which can be complex and time consuming, is skipped to enable rapid assessment and deployment of BMPs.