# Northern Lake Champlain Direct Drainages

# Tactical Basin Plan

Burlington Waterfront, Lake Champlain

**FEBRUARY 2020 | Working Draft – This is a preliminary draft for review with partner to inform, develop and enhance strategies. It should be considered a work in progress.**

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

Approved:

---------- ----------

Peter Walke Commissioner Date

Department of Environmental Conservation

---------- ----------

Julie Moore, Secretary Date

Agency of Natural Resources

Cover Photo: Burlington Waterfront Photographed by Karen Bates

# Table of Contents

# List of Figures

# List of Tables

# Working Draft – This is a preliminary draft for review with partner to inform, develop and enhance strategies. It should be considered a work in progress.

## What is a Tactical Basin Plan?

Tactical basin plans (TBPs) are developed in accordance with the Vermont Surface Water Management Strategy (VSWMS) and the Vermont Water Quality Standards (VWQS) to protect, maintain, enhance, and restore the biological, chemical, and physical integrity of Vermont's water resources. The basin specific water quality goals, objectives, strategies, and actions described in the TBPs aim to protect public health and safety and ensure public use and enjoyment of Vermont waters.

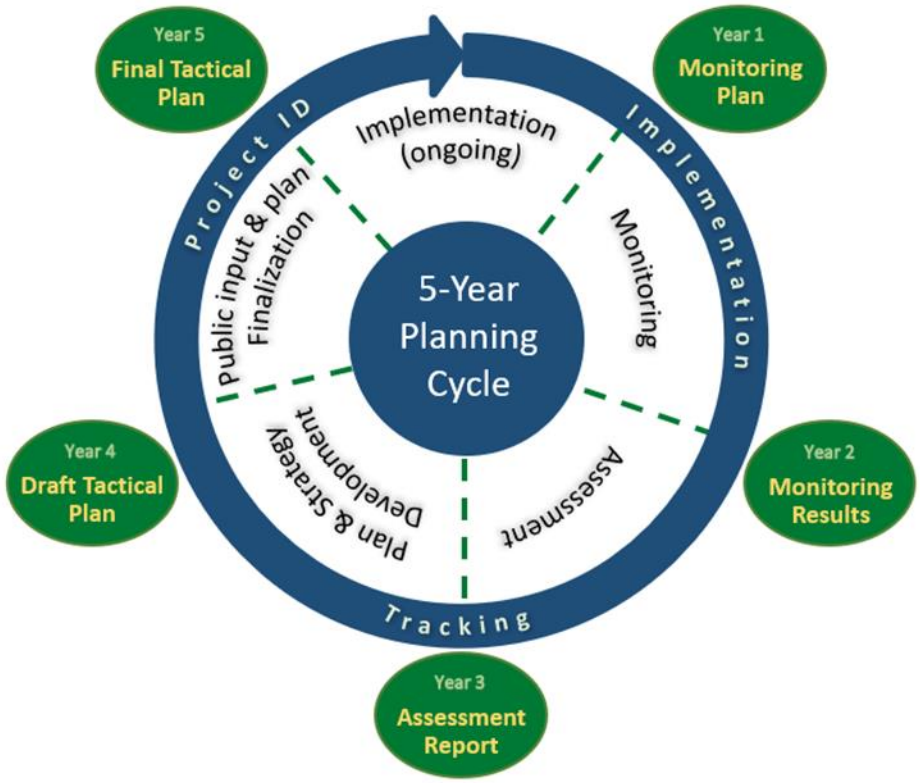



**Figure 1. Five-year tactical basin planning process and outcomes**

The TBPs incorporate the U.S Environmental Protection Agency's (EPA) 9-element framework for watershed plans (Environmental Protection Agency, 2008) and meet obligations of the Vermont Clean Water Act.

The planning process allows for the issuance of plans for Vermont's fifteen basins every five years, as required by statute 10 V.S.A. § 1253. Updating a basin plan includes the following steps, each resulting in a documented outcome identified in Figure 1:

1. monitoring water quality and summarizing existing information,

2. assessing and analyzing water quality data,

3. identifying strategies and projects to protect and restore waters; and

4. seeking public comment.

Throughout the entire five-year planning cycle, plan implementation, tracking, and project identification occurs.

Tactical basin plans serve as a guide to VANR and watershed partners for the protection and restoration of watershed resources. The plans identify opportunities for protection through outstanding resource water (ORW) designation, reclassification as well as conservation of the natural landscape. Plans identify opportunities for restoration through reduction of pollutants and stressors. The plans also set out the pollutant reductions needed to meet applicable TMDLs, (e.g., the Lake Champlain and Lake Memphremagog TMDLs), identifies education and outreach opportunities and recommends restoration actions that are eligible for federal and State funding.

Watershed partners assist the VANR in the development of the plan as well as implementation. The Northern Lake Champlain Direct Drainages (North Lake Basin) planning benefits from the participation of at least 9 groups. Their work augments the agency's assessment data with volunteer-collected data as well as strategies for their area of the basin (see Table 1). Their roles are further described in Appendix A.

Table 1. Watershed Partners in development and implementation of the North Lake TBP

| Subbasin | CCRPC | NRPC | WNRCD | FNRCD | Southern Chittenden River Watch | Lake Iroquois Assn. | South Hero Land Trust | St. Albans Areas Watershed Assn. | Friends of Northern Lake Champlain |
|---|---|---|---|---|---|---|---|---|---|
| **Shelburne Bay and Charlotte** | X | | X | | X | X | | | |
| **Burlington Bay** | X | | X | | | | | | |
| **Malletts Bay** | X | | X | | X | | | | |
| **Georgia Shoreline** | | X | | X | | | | | X |
| **Islands** | | X | | X | | | X | | X |
| **St. Albans Bay** | | X | | X | | | | X | X |
| **Swanton Shoreline** | | X | | X | | | | | X |

Projects completed to meet the Plan's strategies, described in Chapter 5's implementation table, are tracked via the online Watershed Projects Database (WPD). The WPD is continuously updated to capture project information from the planning process, projects identified by assessments or watershed partners, and emerging projects due to natural and/or anthropogenic events. The 2017 North Lake Basin Report Card in Appendix A provides the status and updated information for each of the objectives identified in the previous basin plan.

# Chapter 1 – Basin Description and Conditions

## A. The Northern Lake Champlain Basin

The Northern Lake Champlain Direct Drainages (North Lake Basin) includes the northern section of Lake Champlain, beginning at the Ferrisburgh and Charlotte town-line and ending at the Canadian border, and all Vermont surface waters excepting the three-major river watershed that drain directly into this section of the Lake (Figure 3 and 4). The Agency of Natural Resources (Agency) has completed separate basin plans for the other three river watersheds, the Lamoille, the Winooski and the Missisquoi.

The Northern Lake Basin is only about 37 percent forested, a much lower percentage than for other basins in Vermont (Figure 2). Historically, the Basin has been heavily farmed and agricultural land still accounts for a substantial portion of the landscape with approximately 35% of the land area in this use. Developed land, including transportation infrastructure, occupies approximately 13%, relatively large compared to other Vermont basins. The remaining 15% includes waterbodies.

The basin's landscape changes dramatically from north to south. Overall, the landscape in the northern half of the Basin (Grand Isle and Franklin counties) is predominantly agricultural, whereas the southeastern end of the Basin from Malletts Creek to the LaPlatte River watershed contains the highest percentage of forested land. In between and sitting along the western edge are the urbanized communities of Burlington, South Burlington, Colchester, Milton, Essex Junction and Shelburne. Forested landscape helps to protect water quality in the basin. Degraded waters are often adjacent to managed landscapes including, agricultural and developed land (Figures 2, 3, 4). Managing land use to reduce discharge of polluted runoff and allowing adequate space for treatment can both improve and protect water quality. A more detailed basin description is available in the WSMD's North Lake Basin assessments.

For planning purposes, the entire area is broken down into five subwatersheds identified in Table 2 along with associated streams and adjacent lake sections. The Pike and Rock Rivers and direct drainages the Missisquoi Bay, although part of the North Lake Basin, are addressed in the Missisquoi River tactical basin planning process[1]. The basin is also broken down into hydrologic unit code (HUC) 12's (Table 2) as the modeling completed to identify, detailed annual load (kg/yr) of phosphorus pollution and areal loading rate (kg/ha/yr) estimates are displayed by land use for each HUC12.

[1] see http://www.anr.state.vt.us/dec/waterq/planning/htm/pl_missisquoi.htm

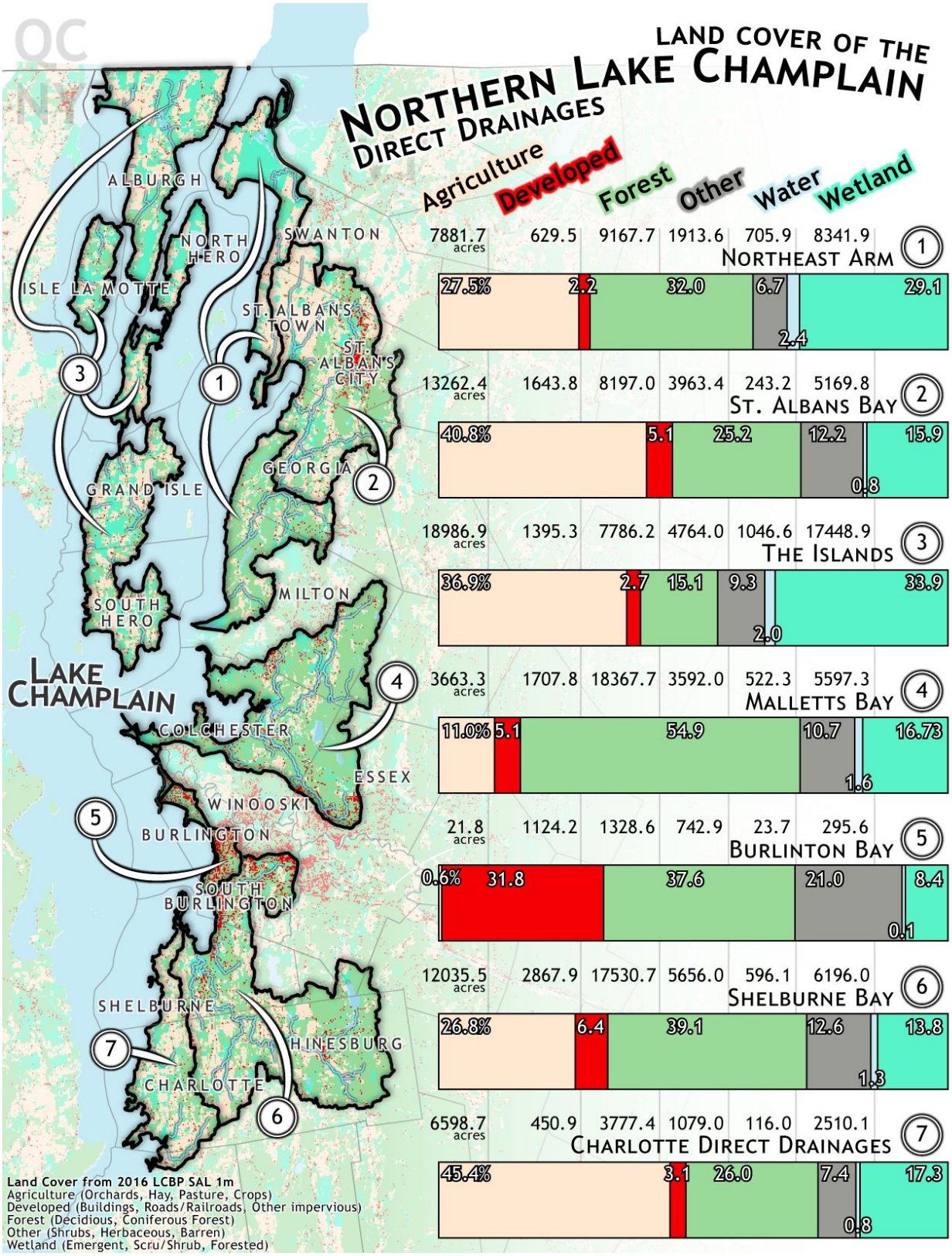



**Figure 2. The North Lake Basin Land-use map**

Table 2. Subbasins of the North Lake Basin

| Subbasin | Contributing Streams and Ponds | Towns | Adjacent Lake Segment | HUC12[2] |
|---|---|---|---|---|
| **St. Albans Bay, and shoreline north** | Jewett, Rugg, Stevens Brook, and Mill River; and St. Albans Reservoirs | St. Albans city and town, Fairfield, Georgia, Swanton | Northeast Arm | **St. Albans Bay – LC, Jewett Brook, Mill River** |
| **Malletts Bay** | Malletts Creek, Allen Brook, Indian Brook, Crooked Creek, Moorings Stream and Milton Pond and Indian Brook Pond | Colchester, Milton, Essex Junction, Westford | Main Lake, Northeast Arm | **Malletts Creek Malletts Bay** |
| **Burlington Bay** | Englesby Brook | Burlington | Main Lake | **Lake Champlain** |
| **Shelburne Bay (and shoreland south)** | Potash, Munroe, Bartlett, Thorp and Kimball Brooks, LaPlatte River, and Lake Iroquois | Burlington, Charlotte, Ferrisburgh, Hinesburg, Saint George, Shelburne, South Williston | Shelburne Bay, Main Lake | **Munroe Brook – Shelburne Bay, LaPlatte River, Hoisington Brook – LC, Lake Champlain** |
| **Champlain Islands and shoreline of Northeast Arm** | Stonebridge Creek, Trout Brook, Mud Creek | Alburgh, Isle La Motte, South and North Hero, Grand Isle, Georgia, Milton | Isle Le Motte, Northeast Arm, Main Lake | **Mud Creek, Carman Brook – LC, St. Albans Bay – LC, Malletts Bay, Lake Champlain** |

[2] The areas associated with the subbasin and associated HUC12 roughly correspond.

## Climate Change Implications for Water Resource Management

The changing climate is a consideration in the Agency's planning around the protection and restoration of Vermont's water resources. The new precipitation patterns seen in Vermont have led to an increase in pollutants washing into waterways, while increasing temperatures are altering aquatic habitat. In response, Agency plans acknowledge the need to intensify management activities that address sediment and nutrient loading from landuse. In addition, plans promote the protection as well as enhancement of natural communities that can help buffer impacts, including those related to increasing temperatures.

The recognition that the changing climate may result in increased pollutant loads is reflected in State analyses of expected pollutant loading to waterbodies, such as the Lake Champlain Phosphorus TMDL. A detailed explanation can be found in Section 5.2 of The Lake Champlain Phase I Implementation Plan.

In addition to reducing water quality as well as habitat, together, the increased nutrients and surface water temperature provide cyanobacteria a boost over other algal communities, leading to an increase in blooms. The toxic nature of the blooms has required additional efforts through a collaborative approach between the Agency and the Vermont Department of Health and partners to help community identify and avoid contact. Strategies that support these efforts in addition to strategies to improve surface waters are included in the basin strategies (Implementation Table).

# B. Surface Water Conditions

## Assessment Methodology

The VANR Watershed Management Division (WSMD) in the Vermont Department of Environmental Conservation (VDEC) uses monitoring and assessment data to assess the health of individual surface waters in relation to the Vermont Water Quality Standards per the 2016 VDEC Assessment and Listing Methodology (VDEC, 2016). Vermont's assessment approach is described in the Vermont Water Quality Monitoring Program Strategy 2011-2020, (VDEC, 2015).

The assessments that support tactical basin planning include, but are not limited to: biomonitoring, water quality monitoring, Road Erosion Inventories , Stream Geomorphic Assessments, Stormwater Master Planning and Illicit Discharge Detection and Elimination Infrastructure mapping, Lake Champlain Monitoring Program data and wetland bioassessment and monitoring

## *Volunteer Monitoring Programs*

The Agency's surface water assessments also benefit from surface water sampling by volunteers. The programs that support volunteer monitoring include DEC Lake Lay monitoring program and the DEC LaRosa Partnership Program. While the lake lay monitoring program focuses on identifying nutrient levels in lakes, the LLP supports sampling of streams for a number of chemical parameters. through a Volunteer monitoring program. The most common parameters tested include total and dissolved phosphorus, total nitrogen and total suspended solids. The volunteer groups and results are identified on an interactive map. In the North Lake Basin, the groups include the Southern Chittenden County Riverwatch ((LaPlatte River and tributaries, and Munroe, Thorp, Holmes and Kimball Brooks) and the Lake Iroquois Association (lake's tributaries). The results have helped to identify impairments and stressed waters in the Shelburne Bay watershed.

Over the last six years, the Chittenden County Stream Team has collected data at one or two sites on each of the Allen, Indian, Bartlett, Englesby, Potash and Munroe Brooks as well as Malletts Creek). Testing results for Chloride will help inform subsequent testing by the Agency to identify Chloride impaired streams.

In addition, the town of Colchester provided assessment data through an EPA-supported *Integrated Water Resources Management Study* (Town of Colchester, 2011) for Malletts Bay tributaries. Microbial source tracking was also conducted in two subwatersheds of Malletts Bay following E. coli testing. The results were used to support a Bacterial TMDL for Malletts Bay drainages.

The WSMD uses assessment results to determine if a surface water meets (attains) or does not meet (exceeds or violates) certain Vermont Water Quality Standards (VWQS) criteria. Waters identified as exceeding VWQS (Table 7) will be protected through the reclassification and protection strategies outlined in Chapter 2, while those that violate VWQS (Tables 4, 5 and 9), will be restored primarily through remediation and restoration strategies outlined in Chapter 3 and 4.

Surface waters that violated VWQS are divided into three categories: stressed, altered and impaired waters which are defined below:

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

**Altered waters** are affected by 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.

**Impaired waters** are those surface waters where there are chemical, physical and/or biological data collected from quality assured and reliable monitoring efforts that reveal 1) an ongoing violation of one or more of the criteria in the water quality standards and 2) that a pollutant of human origin is the most probable cause of the violation. Impaired waters are those that require pollution control efforts under one or more provisions of the Clean Water Act. The most common mechanism to address an impaired water is the development and promulgation of a Total Maximum Daily Load (TMDL), see Chapter 3, section B for more info on TMDLs in the North Lake Basin.

Additional assessment results compiled by the WSMD for inland lakes (not Lake Champlain) can be found in the Inland Lake Scorecard (not Lake Champlain) and wetlands assessments (results?). As mentioned above, these results assist in characterizing surface water conditions as well as potential sources of degradation.

Assessment results can be viewed on the **Vermont Natural Resources Atlas.** For a more detailed description of monitoring results see the **Vermont Integrated Watershed Information System online data portal**.

## Assessment Results

The following is an overview of water quality conditions in the North Basin's lakes and ponds, rivers and wetlands. The North Lake Basin's stressed, impaired, or altered waterbodies are listed in Tables 5, 6 and 10 and the very high-quality waters identified in Figure 8. Additional monitoring and assessment needs are outlined in Table 21.

This overview lends context to tactical basin planning efforts, which address the stressors and pollutants degrading waters through spatially explicit actions listed in the **Ch. 5 Implementation Table** and the online **Watershed Projects Database.** The types of actions prescribed are based on the stressor specific practices outlined in the **Vermont Surface Water Management Strategy**.

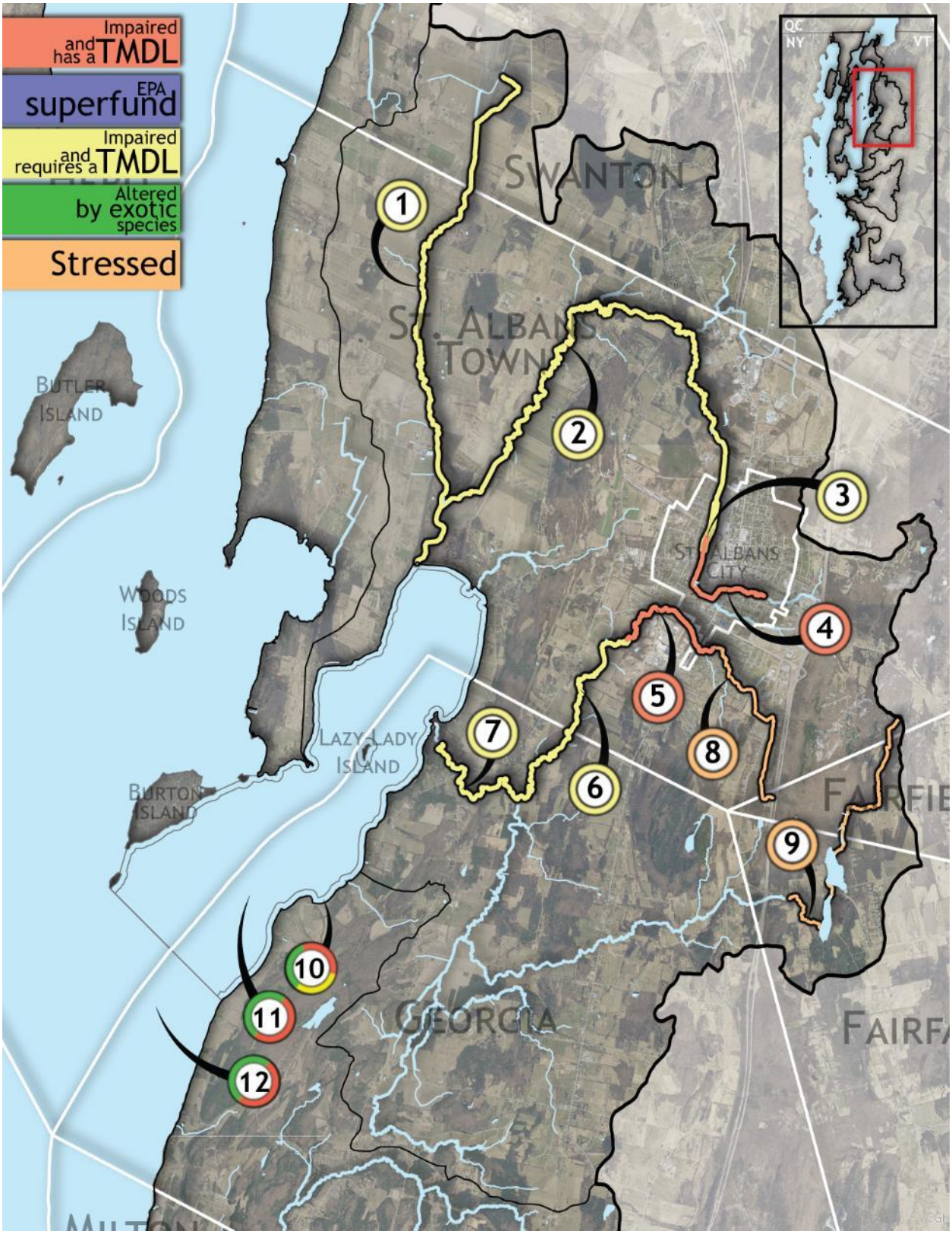



**Figure 3. Northern section of the North Lake Basin. See Tables 5, 6 and 10 for detailed information regarding listed waters.**

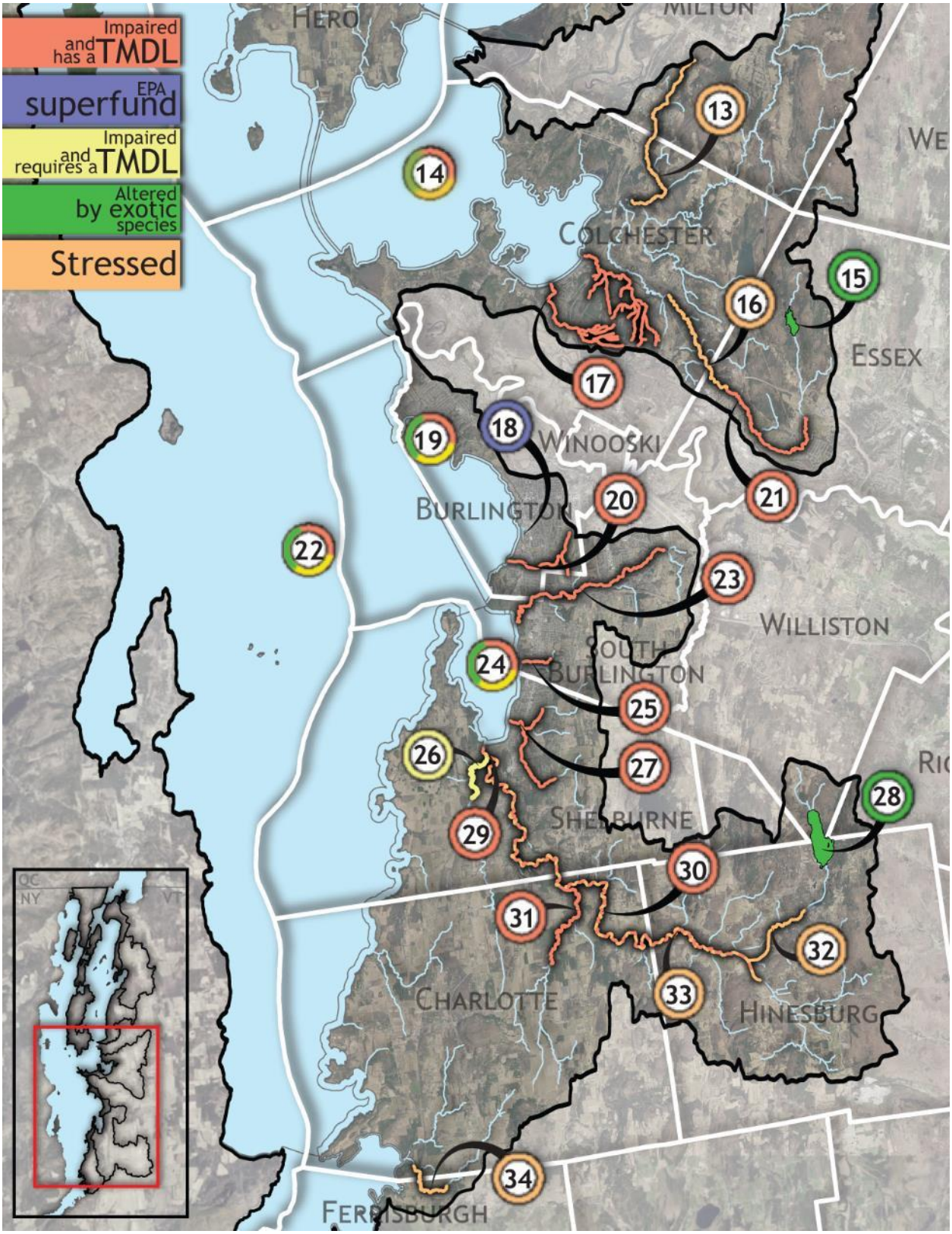



**Figure 4. Southern section of the North Lake Basin (numbers assigned to waters identified in Table 5, 6 and 10)**

## *Lakes and Ponds*

The North Lake Basin includes Lake Champlain and nine in-land'lakes or ponds that are above 10 acres in size. Agency assessments for inland lakes encompassed by the basin find that greatest threat to aquatic habitat and water quality include shoreline development and aquatic invasive species (Table 4). Additional problems include sedimentation and eutrophication due to nutrient loading. The nutrient loading has resulted in algal and cyanobacterial (also known as blue-green algae) blooms.

Encroachment through shoreland development is the greatest stressor to all Vermont lakes as well as the North Lake Basin lakes (USEPA, 2016); Figure 6). The North Lake Basin has a higher percentage of in-land lakes with poor shoreland conditions compared to lakes across Vermont. Out of 9 lakes assessed for shoreland condition in the basin, 2/3rds are threatened by development. Although nutrient levels are not increasing as they are in other lakes, about a third are in fair condition. Aquatic Invasive Species are present in at least 3 of lakes with Eurasian Water Milfoil, *Myriophyllum spicatum*, the predominant concern (see Table 4).

Lake Champlain is evaluated by segments and those associated with North Lake Basin are identified in Table 2. The State of the Lake Report ( Lake Champlain Basin Progran, 2018) includes status and trends in 4 of the basin's adjacent lake segments based on ecosystem indicators, which can be found here. In addition, all Lake Champlain segments are impaired for PCBs and all the North Lake Basin lakes are under a Vermont Department of Health fish consumption advisory for exceeding the USEPA mercury (Hg) limits in fish, see here regarding lake assessment information.

The North Lake Basin also includes notable lakes for their healthy ecosystems: within Vermont, Milton pond rises to the top 10% for water quality and the top 25% for all criteria assessed for the WSMD Lakescore card.

**Table 3. Conditions of Lakes and Ponds outside Lake Champlain in North Lake Basin from Lake Scorecard data. Scorecard provides evaluation (see color codes) of 5 criteria that are defined in the above link.**

Good Conditions | Fair Conditions | Poor Conditions | Insufficient Data

| Lake ID | Lake Area(acres) | Town | Water Quality Status with pollutant of concern | Water Quality Trend | Aquatic Invasive Species | Shoreland Condition | Watershed Condition |
|---|---|---|---|---|---|---|---|
| COLCHESTER | 191.4 | Colchester | Phosphorus | | | | |
| DUCK (SHELBN) | 4.3 | Shelburne | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EAGLE | 0.9 | Alburgh | | | | | |
| GEORGIA PLAINS; | 6.4 | Georgia | | | | | |
| INDIAN BROOK (ESSEX) | 57.5 | Essex | | | EWM | | |
| INDIAN BROOK; | 0.5 | Colchester | | | | | |
| IROQUOIS | 247 | Hinesburg | Phosphorus | | EWM, CLP | | |
| LONG (MILTON) | 81.2 | Milton | Phosphorus | | | | |
| LOST (GEORGA) | 8.2 | Georgia | | | | | |
| LOWER | 44.9 | Hinesburg | | | EF | | |
| MALLETT; | 5.9 | Milton | | | | | |
| MILTON | 29.8 | Milton | | | | | |
| MUD CREEK | 30.8 | Alburgh | | | | | |
| NORTH ST. ALBANS | 37.2 | Fairfax | Phosphorus | | | | |
| SOUTH ST. ALBANS | 24.8 | Fairfax | | | | | |

Table 4. Conditions of Lakes and Ponds in the North Lake Basin (VDEC, 2018).

| Waterbody (name and location) | Pollutant | Water Quality Problem | Sector | Remediation Approach |
|---|---|---|---|---|
| **IMPAIRED SURFACE WATER (List B- VDEC 2018)** | | | | |
| **Burlington Bay - Lake Champlain - Pine Street Barge Canal (18)** | Priority & Nonpriority Organics, Metals, Oil, Grease, PCBs | Coal Tar contamination of Sediments Barge Canal (Site #770042) | Legacy industrial activity | No TMDL is necessary for this impairment as authority and legal means are available and in place to address the source of impairment. The authority and legal means that are available to DEC and the US EPA are considered sufficient to attain water quality |
| **ALTERED SURFACE WATER (List VDEC 2018)** | | | | |
| **Champlain, Lake - Isle LaMotte** | Eurasian Water Milfoil (EWM)And Zebra Mussels | | NA | Some mechanical harvesting of all nuisance vegetation. ZM are ubiquitous. |

| Waterbody (name and location) | Pollutant | Water Quality Problem | Sector | Remediation Approach |
|---|---|---|---|---|
| | (ZM) Infestation. | | | |
| **Champlain, Lake - St. Albans Bay (11)** | EWM And ZM Infestation. | | NA | Some mechanical harvesting of all nuisance vegetation. ZM are ubiquitous. |
| **Champlain, Lake - Mallets Bay (14)** | EWM And ZM Infestation. | | NA | No active management. ZM are ubiquitous. |
| **Indian Brook Reservoir (15)** | Locally Abundant EWM Growth. | | NA | Herbicides previously used to control EWM. |
| **Champlain, Lake - Burlington Bay (19)** | EWM And ZM Infestation. | | NA | No active management. ZM are ubiquitous. |
| **Champlain, Lake - Main Lake (22)** | EWM And ZM Infestation. | | NA | No active management. ZM are ubiquitous. |
| **Champlain, Lake - Shelburne Bay (24)** | EWM And ZM Infestation. | | NA | No active management. ZM are ubiquitous. |
| **Lower Pond** | EWM | | | No active management. EWM is ubiquitous. |
| **Iroquois, Lake (28)** | Abundant EWM Growth. | | NA | Ongoing management plan that includes herbicides, dosh, benthic barriers, and hand-pulling. |
| **STRESSED SURFACE WATERS (VDEC 2018)** | | | | |
| **Long (Milton)** | Phosphorus | | Developed Land | See also Lake Champlain P TMDL |

| Waterbody (name and location) | Pollutant | Water Quality Problem | Sector | Remediation Approach |
|---|---|---|---|---|
| **Colchester Pond** | Depleted Oxygen in Hypolimnion | Phosphorus, Organic Enrichment | Legacy | See also Lake Champlain P TMDL |
| **Iroquois** | Phosphorus | | Legacy and Developed Land | See also Lake Champlain P TMDL |

## *Rivers*

The WSMD's state-wide assessment of streams (2013-2017 Probability Report on page 42 of 2018 Vermont 319 report) indicate that a vast majority of stream miles in Vermont maintain biological communities that are expected to be found in "very high quality" waters; showing qualities of the reference condition, or minimal changes thereto.

Invertebrates, as a measurement of health, may be more susceptible to stressors resulting from watershed land use change, as well as substrate habitat quality altered by loss of canopy and algae growth.

**Figure 5. A vast majority of stream miles in Vermont maintain biological communities that are expected to be found in "very high quality" waters. Deer Hollow Brook (Granville, VT)**

**Figure 6. The North Lake Basin's Stone Bridge Brook, meeting the VWQS, but the managed landscape in the watershed, keep it from meeting "very high-quality waters" criteria.**

Compared to national averages, Vermont has more sites in "least disturbed" condition for salinity, nitrogen and phosphorus than national or regional averages. However, total phosphorus appears to the be more predominant stressor of these three.

Although, the North Lake Basin, in relationship to rest of state, is more heavily developed, the majority of streams meet standards (see Figure 8). Those subwatersheds with higher percentages of forest cover do end up with a higher proportion of streams meeting standards (fully supporting uses,

e.g., Shelburne and Malletts Bay.

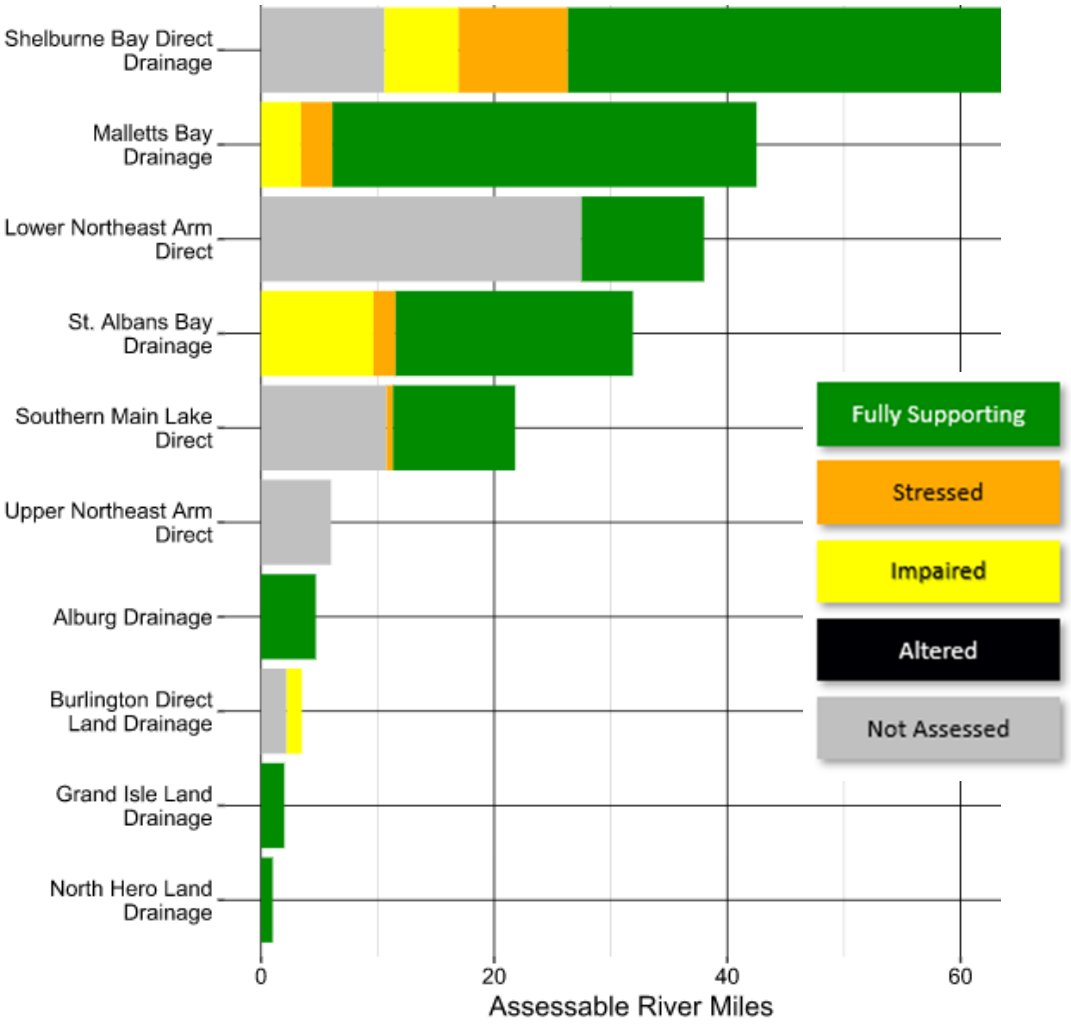



Figure 7

Based on river miles, sediment and nutrients are the most prevalent pollutants[3] in the North Lake Basin streams and rivers except at high elevations. Physical alterations are also present throughout the watershed, ranging from habitat alteration, general stream channel instability and encroachment into the flood hazard zone. Next prevalent as source of impairment or stress are pathogens. More isolated problems specific to particular reaches[4] include, thermal modification, toxic compounds from hazardous waste sites and flow alteration.

[3] Definition of these pollutants can be found in VSWMS http://dec.vermont.gov/sites/dec/files/documents/wsmd_swms_Appendix_B_Pollutants.pdf

[4] The waters and associated problems are listed in the EPA and state lists (see Table 2)

Although, high quality stream segments are limited in this basin, there are two (community status?) aquatic species that require high quality water quality, including the American brook lamprey in (trout brook?) and the Stonecat in the Upper LaPlatte River.

**Table 5. Rivers on the Vermont 2018 priority waters list (VDEC, 2018) and 2016 stressed water list (VDEC, 2016) for t**

| Waterbody Segment [5] | Pollutant | Water Quality Problem | Sector | Remediation Approaches |
|---|---|---|---|---|
| **IMPAIRED SURFACE WATER (Part A – VDEC 2018)** | | | | |
| **Rugg Brook, From Mouth to Approx 3.1 Miles Upstream (6)** | Nutrients, Sediment, E. Coli | Runoff | Agriculture | Lake Champlain P TMDL |
| **Jewett Brook 3.5 Miles (1)** | Nutrients, Sediment | Runoff | Agriculture | Lake Champlain P TMDL |
| **Mill River, From St. Albans Bay to 1.8 Miles Upstream (7)** | Nutrients, Sediment | Agricultural Runoff, Streambank Erosion | Agriculture, River | Lake Champlain P TMDL |
| **Stevens Brook, Mouth Upstream 6.5 Miles (2)** | Nutrients, Sediment, E. Coli | Agricultural Runoff; Morphological Instability, St Albans CSO | Agriculture, River, Developed land | Lake Champlain P TMDL |
| **Stevens Brook, Lasalle St Downstream 0.5 Mi (3)** | Metals (Cd, Ba, Cn, Zn) | Sediment Contamination from St Albans Gas and Light Haz Waste Site | Legacy from industrial activity | Continue monitoring ground and surface waters |
| **McCabes Brook, Mouth to RM 1.4 (26)** | Nutrients | Includes above and below WWTF; Possible Toxic Impact Below WWTF; Unstable Channel Above | Developed land, River | |
| **IMPAIRED SURFACE WATERS (Part C – VDEC 2018)** | | | | |
| **Rugg Brook, Rm 3.1 to RM 5.3 (5)** | Stormwater | Stormwater Runoff | Developed land | EPA APPROVED TMDL FEBRUARY 19, 2009 |

[5] Numbers refer to waterbodies identified in Figures 3 and 4

| Waterbody Segment [5] | Pollutant | Water Quality Problem | Sector | Remediation Approaches |
|---|---|---|---|---|
| **Stevens Brook, RM 6.5 at Pearl St to RM 9.3 (4)** | Stormwater | Stormwater Runoff, Erosion/Sedimentation, Morphological Instability | Developed land, River | EPA APPROVED TMDL FEBRUARY 19, 2009 |
| **Indian Brook, RM 5.8 (Suzie Wilson Rd) to RM 9.8 (21)** | Stormwater | Stormwater Runoff, Land Development, Erosion | Developed land, | EPA APPROVED TMDL AUGUST 21, 2008 |
| **Direct Smaller Drainages to Inner Malletts Bay (17)** | E. coli | Urban Runoff, Potential Failed/Failing Septic Systems; Includes Smith Hollow Brook & Crooked Creek | Developed land | EPA APPROVED TMDL SEPTEMBER 30, 2011 |
| **Englesby Brook (24)** | E. coli | Elevated E. coli Levels | Developed land | EPA APPROVED TMDL SEPTEMBER 30, 2011 |
| **Englesby Brook, Mouth to RM 1.3 (24)** | Stormwater | Stormwater Runoff, Blanchard Beach Closure | Developed land | EPA APPROVED TMDL SEPTEMBER 30, 2007 |
| **STRESSED SURFACE WATERS (VDEC 2016)** | | | | |
| **Laplatte River, From Lake Champlain to Hinesburg (33)** | Land Development with all Attendant Impacts | Turbidity, Sediment, Temp. | Developed Land, | See Lake Champlain P TMDL WNRCD supports Trees for Streams program in area |
| **Indian Brook, Mouth to RM 5.4 (16)** | Potential Impacts from Landfill Leachate, | Sediment, Toxics, Metals | Developed Land | |

| Waterbody Segment [5] | Pollutant | Water Quality Problem | Sector | Remediation Approaches |
|---|---|---|---|---|
| | Developed Areas, Hazardous Waste Site | | | |
| **Mill River, 3.5 Miles in Upper Reaches (8)** | Agricultural & Urban Runoff, Streambank Erosion | Sediment, Nutrient & Org Enrichment, E. coli | Agriculture, Developed Land, River | Monitor to confirm pollutants and stressors. See also Lake Champlain P TMDL |
| **Rugg Brook, Upstream from Route 7 (3)** | Land Development, Suburban Runoff | Flow Changes, Physical Alterations | Developed Land | See also Lake Champlain P TMDL |
| **Patrick Brook, From Laplatte R up to Lower Pond (32)** | Land Development, Channelization | Sediment, Physical Alterations | Developed Land, River | See also Lake Champlain P TMDL |
| **Kimball Brook, From Town Farm Bay up 1.1 Miles (34)** | Pasture, Barnyard, Lack of Riparian Vegetation | Turbidity, Nutrients | Agriculture | See also Lake Champlain P TMDL |

## *Wetlands*

The location of many of the wetlands in the North Lake Basin are identified on the Vermont Wetlands Inventory Map; however, up to 40% of Vermont wetlands may not be mapped. The USEPA's **National Wetland Condition Assessment 2011** of Eastern Mountains wetlands, including Vermont's, estimated that 52% of the wetland area is in good condition; 11% is in fair condition, and 37% is in poor condition.

Presently, the **WSMD Wetlands Program** conducts monitoring and assessment of vegetation, water quality, and other wetland metrics to discern wetland condition, function, and value (Vermont Rapid Assessment Methodology or VRAM) (. Compared to other basins, the North Lake Basin wetlands are moderately well sampled, with 59/625 VRAM plots and 11/200 vegetation plots. To date many the North Lake Basin wetland assessments have focused on poor condition systems and as such, an unbiased comparison of the North Lake Basin and state wetland condition is not possible. That being said, a look at the data implies wetlands with somewhat worse condition than

the state as a whole, which is to be expected given the high levels of human,caused disturbance in this basin.

The North Lake Basin wetlands include notable examples of significant natural communities; however, as is common throughout Vermont, the majority have been converted or degraded, thereby providing opportunities for wetland restoration and protection throughout the basin.

The wetlands with significant natural communities provide opportunities for protection. The extensive Lake Champlain shoreline and low-lying areas in the North Lake Basin leads to the abundance of wetlands that are dependent upon the seasonal water level fluctuations of the Lake and riparian areas for their existence and ability to support wildlife and fish. Notable wetlands include:

- Black Creek Marsh, located at the north end of St. Albans Bay is a 360-acre wetland complex that includes deep rush and cattail marshes and forest.
- Other wetlands at the river and lakeshore transitional zones including Thorp Brook (Charlotte), Mill River (Georgia), LaPlatte River (Shelburne), and Malletts Creek (Colchester).)
- The South Alburgh Swamp and associated sand beach at the Alburgh Dunes, is considered "one of Vermont's premier natural areas" by the Advanced Wetland Planning and Protection Project. It includes red maple-green ash, the unusual tamarack-red maple, white cedar, and black spruce swamps.
- Alburg's Mud Creek and Swamp, is a 1500-acre wetland complex that includes forested and shrub swamps, emergent wetlands and shallow open water areas. Although much of the swamp is protected by ANR as a wildlife management area, activity outside the area result in impacts to water quality and the habitat.

Based on incidental reports by ANR fisheries biologists and ecologists, a threatened wetland type may be Deciduous forested swamps, such as Red or Silver Maple-Green Ash Swamp, whose connection with the lake can be limited by undersized road culverts. During periods of low lake levels, this would reduce critical spawning habitat for fisheries as well.

# Chapter 2 – Protection of Surface Waters

## A. Protection of High-Quality Waters

The majority of waters in the basin support swimming, fishing and drinking water with treatment; however, other surface waters support additional uses that may depend on a higher quality of water that is closer to a pristine condition. The high-quality surface waters in the North Lake Basin (Table 8 and see storymap for wetlands) are identified through Agency-supported monitoring and assessments described in Chapter 1. Many of these waters are currently protected by predominantly forested watersheds where flows are filtered and regulated; however, anthropogenic activities threaten to degrade these waters. Specific threats include atmospheric deposition (acid rain and mercury) invasive species, forest fragmentation, increased flooding events, road and utility development, and residential development.

A goal of the Agency is to protect Vermont's high-quality waters by safeguarding these natural systems from deleterious change over the long term. Outside of atmospheric deposition, conservation of the natural landscape in the watershed of these waters will help address the threats. The tactical basin plans include strategies that support acquisition of conservation easements or purchase of land for recreation or resource management that protect the natural landscape. In addition, tactical basin plans identify and propose protection through appropriate legal mechanisms.

Legal mechanisms provided by the Vermont Water Quality Standards (VWQS) allow for the establishment of enhanced management objectives or augmented protections for specific waterbodies. The mechanisms for protecting high quality waters, as well as additional valuable uses, are explained in the next section. These legal mechanisms help to ensure that permitting processes can help direct new development to protect high quality waters. The North Basin's proposal for protecting high quality waters and specific uses through appropriate VWQS designations is located in Table 8. Priorities for protection are mapped in Figure 9.

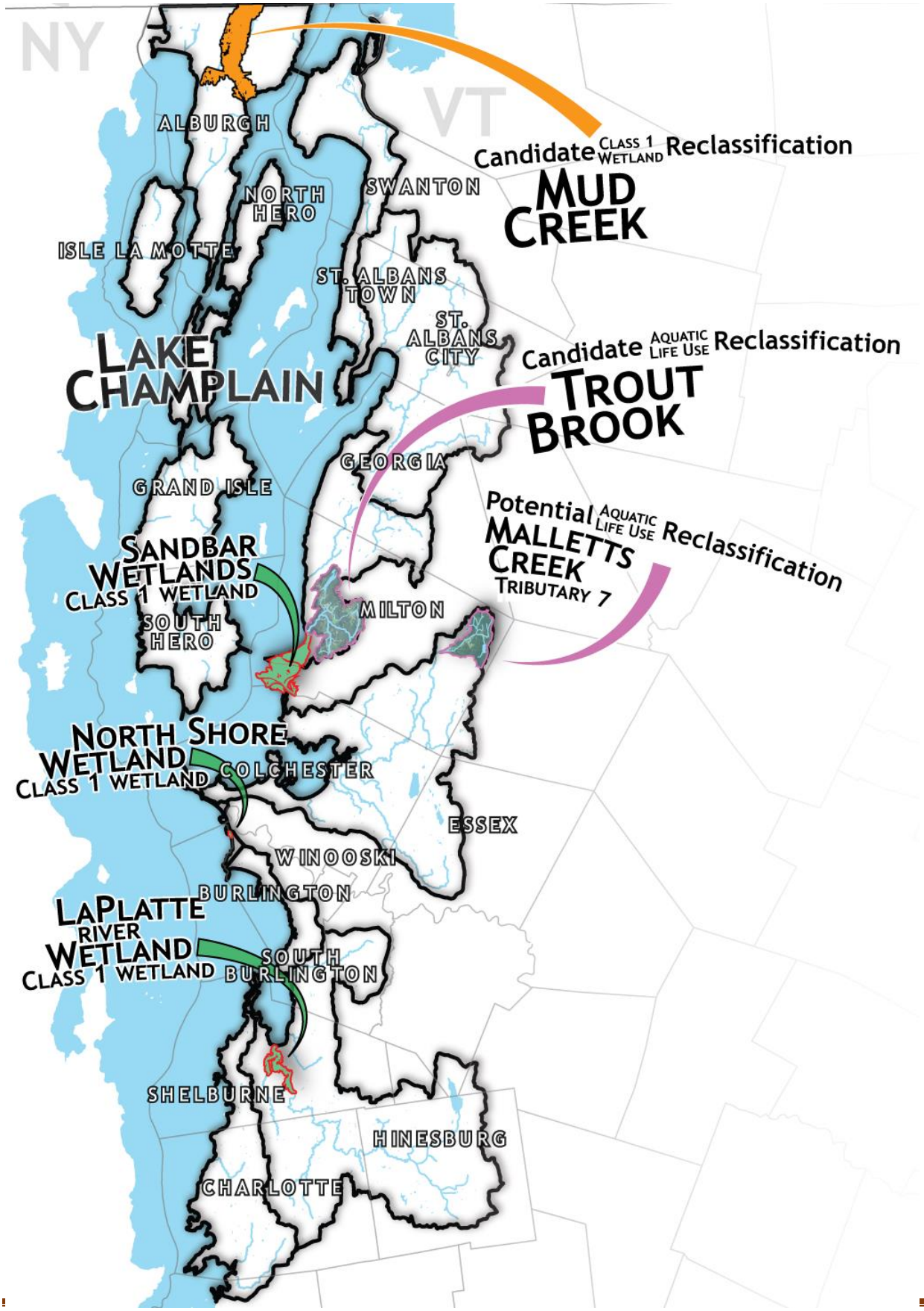

NY
VT
ALBURGH
NORTH HERO
SWANTON
ISLE LA MOTTE
ST. ALBANS TOWN
ST. ALBANS CITY
LAKE CHAMPLAIN
GEORGIA
GRAND ISLE
SANDBAR WETLANDS
CLASS 1 WETLAND
SOUTH HERO
MILTON
NORTH SHORE WETLAND
CLASS 1 WETLAND
COLCHESTER
ESSEX
WINOOSKI
BURLINGTON
LAPLATTE RIVER WETLAND
CLASS 1 WETLAND
SOUTH BURLINGTON
SHELBURNE
HINESBURG
CHARLOTTE
Candidate CLASS 1 WETLAND Reclassification
MUD CREEK
Candidate AQUATIC LIFE USE Reclassification
TROUT BROOK
Potential AQUATIC LIFE USE Reclassification
MALLETTS CREEK TRIBUTARY 7

**Figure 8. North Lake Basin rivers and ponds with protection or proposed protection of specific uses and wetlands with existing or proposed protection as Class 1 wetlands**

## B. Surface Water Reclassification and Designations

The Vermont Water Quality Standards serve as a foundation for protecting Vermont's surface waters. The VWQS are management goals, objectives, and regulations that establish designated uses (e.g. swimming and fishing) that must be protected, the classification to which the uses are managed (see Table 7), and set minimum chemical, physical and biological criteria that must be met to support each use at its classification tier.

As required by the Vermont Water Quality Standards[6], the tactical basin planning process includes the consideration of reclassifications and Outstanding Resource Water and Class I wetland designations that can protect high quality waters. In addition, the process also considers new protections for uses provided by specific surface waters, including existing uses and cold-water fish habitat (See Appendix B for the latter two). The legal mechanisms for protecting high quality waters, as well as additional valuable uses, are explained in their associated links:

- Reclassification of surface waters
- Outstanding Resource Waters designation
- Class I Wetland designation
- Designation of waters as cold-water fisheries
- Identification of existing uses

[6] Pursuant to the federal Clean Water Act, States are required to establish and implement water pollution control programs (see generally 40 CFR 131). Core to these programs are water quality policies, and guidance documents which establish baseline expectations for surface waters. These expectations are cast in terms of designated uses that are to be supported for surface waters in the State. As not all surface waters are alike, states establish classes of surface waters, each with a set of designated uses to be supported. These uses always include ecological integrity and recreational use (so-called "Fishable-Swimmable" waters), but also encompass other uses, specific to the State's designation. Accompanying these classes are specific ecological water quality criteria designed to protect the designated uses. In Vermont, the Act's requirement for this framework of classification, use, and criteria is expressed in Statute in Title 10 V.S.A. Chapter 47 (see 10 V.S.A. §1205 to §1253). Chapter 29 of the Vermont's Environmental Protection Rules, also known as the Water Quality Standards (WQS) presents the classes and specific criteria that protect the designated uses of each class.

Table 6. Criteia for surface water classifications

| Use | A1 | B1 | B2 |
|---|---|---|---|
| Aquatic Biota | Excellent - Natural Condition | Very Good - minor change | Good - moderate change |
| Aquatic Habitat | Natural Condition | Very Good - minor change | Good - moderate change |
| Aesthetics | Natural Condition | Very Good | Good |
| Boating | Excellent - maximum extent without degradation | Very Good - maximum extent with no more than minor degradation | Good - meets hydrological criteria |
| Fishing | Salmonid population in Natural Condition | Salmonid population in Very Good Condition | Salmonid population in Good Condition |
| Public Water Supply | (A2) Uniformly excellent character, highly suitable | --- | Suitable with treatment |
| Swimming | Excellent | --- | Good |

## The North Lake Basin Proposals

The North Lake Basin waterbodies listed in Table 8 could be reclassified to reflect current surface water conditions, uses or functions and values based on assessment and monitoring data. At this time, no surface waters have been identified as meeting Outstanding Resource Water criteria. The plan supports petitions that would lead to the appropriate reclassification or designations of these surface waters.

Table 7. High-Quality Waters and Agency proposal for reclassifications or Outstanding Resource Water Designations

| ID | Stream Name | Town | Proposed Legal Protective Mechanism (see above) | | |
|---|---|---|---|---|---|
| | | | *Reclassification of Use, see Table 6* | *Class 1 wetland* | *Outstanding Resource Water* |
| **1** | Colchester Pond | Colchester | A2 to B2 (all uses?) | | |
| **2** | Milton Pond | Milton | A2 to B2 | | |
| **3** | Mud Creek | Alburgh | | X | |
| **4** | Trout Brook | Milton | B2 to B1 for ? use | | |

The relatively small number of high-quality waters in the North Basin (Figure 8) compared to the rest of Vermont is based on the predominance of developed land or agricultural landuse in the basin. The protection of areas in the basin supporting a natural landscape become a priority where they contain surface waters that exceed those conditions met by the majority of VWQS compliant surface waters (Class B2).

Protection strategies include restoring, enhancing and protecting wetlands and forested land, including along riparian and shoreline as buffers. Protection of natural landscapes can be achieved through purchasing development use through conservation easements. Enhancement and restoration is supported especially through agricultural related programs and include wetland restoration and restoration of forested buffers adjacent to surface waters. These strategies are included in the Chapter 5 Implementation Table. Protection efforts over the last 5 years are summarized in the Natural Resource Project Outputs' table for the North Lake Basin in Appendix A of the Clean Water Initiative reports. An example of protection in the basin includes the Lake Champlain Land Trusts project to plant a forested buffer along a stretch of the LaPlatte River where current water quality (low sedimentation) is able to support Stonecat, an x species., Figure x.

Additional tools, assessments and resources are available to help identify waters that could be targeted for protection. These resources were developed by ANR and numerous partner organizations. More detailed information on each effort/tool can be obtained from the sources cited in (needs to be created or does this already exist)

**Figure 9. Stonecat habitat in the upper LaPlatte protected in part by buffers planted by the Vermont Lake Champlain Land Trust in xxxx (courtesy of the Lake Champlain Land Trust)**

## C. Expanding Protection through Municipal Action

Local zoning, bylaws, and town plan policies can provide community specific protections and guidance to maintain and enhance local water resources. Encouraging a community to use town ordinances as effective tools for protecting water resources from the impacts of development also results in engagement of the public. This community involvement in decision making processes can result in increased awareness of the importance of watershed protection. Protections may include requiring a buffer between surface waters and development activities, in addition, wetland, floodplain and river corridor protection can be extended to protect those resources beyond those afforded through State and federal wetland regulations.

The detailed review of ordinances in Appendix D completed by the Chittenden County and Northwest Regional Planning Commissions provides an overview of existing types of protection. The RPCs' have also identified opportunities for protection and potential timeframe for providing resources to help municipality address these gaps in Table 8. Identifying a timeframe is complicated by the fact that scheduled town plan updates are limited over the next 5 years, when most regulatory updates are often initiated.

Existing resources include templates to assist towns in development of language for ordinances, zoning or town plans that protects natural systems through the Vermont League of Cities and Towns, Vermont Planning Information Center and (others?).

**Table 8. Gaps in natural resource protection, timeframe and resources to facilitate Municipality protection of water resources.**

| Municipality | Water Resource Improvement | Time frame | Partner RPC | Comment |
|---|---|---|---|---|
| **Franklin County** | | | | |
| **Georgia** | River Corridor Update | | NRPC | Town currently pursuing adoption of river corridors into land development regulations |
| **Swanton** | Consider adoption of River Corridors during Town Plan Update | 2022-2023 | NRPC | Discuss river corridors during town plan update |
| **Grand Isle County** | | | | |
| **Alburgh** | Develop a Hazard Mitigation Plan | TBD | NRPC | Explore development of plan |

| | | | | |
|---|---|---|---|---|
| **Chittenden County** | | | | |
| **Burlington** | Could expand protections in SFHA | | CCRPC | Burlington |
| **Westford** | Consider adoption of RC model bylaws | | CCRPC | |

## D. State River Corridor Protection

The Flood Hazard Area and River Corridor Rule, effective in 2015, provides for state protection of the river corridor and flood hazard areas beyond what the municipalities and existing state regulations can provide. The Rule limits new encroachments from agricultural practices, state facilities, silvicultural practices, and public energy transmission projects that could reduce floodplain storage and/or contribute to stream channel instability. Prohibiting encroachments in the floodplain or flood hazard area (e.g., new infrastructure), also reduces the future need for protection of that infrastructure (e.g., rip rap or berms) and allow for more channel instability.

# Chapter 3 – Remediation and Restoration of Surface Waters

## A. Addressing Degraded Surface Waters

The Agency targets stressed, altered and impaired surface waters (Tables 5, 6 and 10) for remediation and restoration actions. Both the Agency of Natural Resources and the Agency of Agriculture, Food and Markets (AAFM) promulgated regulatory programs play a significant role in efforts to reduce pollutants and stressors responsible for degrading waterbodies. An overview of both agencies' regulatory programs associated with water resource remediation and protection is located in Appendix A of the Vermont Surface Water Management Strategy.

The most recent regulatory changes were advanced through the 2015 Vermont Clean Water Act (Act 64). Act 64 accelerates surface water remediation efforts through the engagement of all sectors of the community in appropriate landuse practices. The act provided additional resources to reduce sediment and phosphorus loading, including new regulations and funding (Clean Water Initiative funding). The Agency also supports voluntary efforts to meet permit deadlines sooner than required or to implement non-regulatory practices.

Pollutant reduction, primarily phosphorus and sediment, will be accelerated as Act 64 associated permitting programs are established and compliance dates met. The Act 64 regulations with date for adoption of permit program are listed below:

- Required Agricultural Practices (RAPs) – see page 84 for timeframe associated with Lake Champlain Farm inspections and Nutrient Management Plan.
- Town road permit by 2020- Municipal Roads General Permit (MRGP)
- VTrans road permit by 2020 - Transportation Separate Storm Sewer System (TS4) Permit
- Management of stormwater on under or un-treated 3-acre parcels by 2023- Operational Three-Acre Permit
- Acceptable Management Practices (AMP) for forestry operations - Updates

The new and existing regulations will be important tools that ensure Vermont Water Quality Standards are met. As appropriate, State Clean Water Initiative funding may provide municipalities and landowners with financial and technical assistance to develop and implement required management plans under the new permits. Chapter 4 includes a more detailed progress report relating to permit adoption and permittee compliance activities along with education and outreach efforts to facilitate compliance.

## B. North Basin Total Maximum Daily Loads

Focusing both regulatory and non-regulatory efforts to address degraded surface waters can be accomplished through the development of a Total Maximum Daily Load, (TMDL). State-wide, the Agency has developed four TMDLs to address specific categories of impaired waters to meet the federal Clean Water Act . The TMDLs establish reduction targets that become the goal for subsequent planning. The North Lake Basin encompasses surface waters with Total Maximum Daily Loads (TMDLs) for bacteria and stormwater. In addition, the basin drains to Lake Champlain, which is covered by a mercury (in fish tissue) as well as a Phosphorus TMDL (Table 10).

The term, Total Maximum Daily Load, refers to the maximum amount of a pollutant a water body can receive without violating water quality standards. The TMDL document specifies an acceptable level of pollutant in the water, identifies sources of that pollutant in the watershed, and sets an allowable allocation for each of the pollutant's sources so that cumulatively, they do not exceed the accepted level. When needed, Vermont develops implementation plans for each waterbody with a TMDL that provides reasonable assurance that the waterbody will meet target load reductions by a specific date. Tactical basin plans describe how these pollutant reductions will be achieved by outlining priority projects or actions based on monitoring and assessment data.

**Table 9. Status of TMDLs developed for the North Lake Basin by subbasin, pollutant, source.**

| Name | Pollutant | Problem | Status |
|---|---|---|---|
| **Malletts Bay Drainages; Mud Hollow** | E. coli | | EPA Approved TMDL September 2011 |
| **Rugg, Stevens, Indian, Englesby, Potash and Munroe Brooks** | Stormwater | Stormwater Runoff; Erosion | EPA Approved TMDL February 2009 |
| **Lake Champlain** | Mercury | Elevated Levels of Mercury in Walleye | EPA Approved regional Mercury TMDL December 2007 |
| **Lake Champlain** | Phosphorus | | EPA Approved Phosphorus TMDL June 2016. See annual status reports |

The Mercury TMDL will be met through the region's efforts to reduce sources as well as EPA's efforts to control atmospheric emissions. The other TMDLs for surface waters in the North Lake are addressed through implementation plans developed by ANR and approved by EPA. These TMDLs and associated implementation plans are explained in further detail below. The TBP strategies that describe how the agency and partners will meet TMDL goals are outlined by land use sector in Chapter 4 and summarized in the Implementation Table.

## Stormwater TMDLs and related regulations

Seventeen of Vermont's waters are listed as "impaired" due to stormwater runoff from impervious surfaces, including pavement and buildings. Twelve of these fall within urban areas, whereas the other five are associated with ski areas. These waters fail to meet the Vermont Water Quality Standards based primarily on biological monitoring data. Vermont's TMDLs use stormwater as it represents a combination of stressors. The use of this surrogate has the primary benefit of addressing the physical impacts to the stream channel caused by stormwater runoff such as sediment release from channel erosion and scour from increased flows. These physical alterations to the stream are substantial contributors to the aquatic life impairment. Also, reductions in stormwater runoff volume will help restore diminished base flow (increased groundwater recharge), another aquatic life stressor. For more information on the development of the stormwater TMDLs for these waters, see the Stormwater TMDL page.

Remediation of the twelve (seven in the North Basin) urban stormwater-impaired waters has commenced through a combination of permits issued pursuant to Vermont's federally delegated National Pollutant Discharge Elimination System (NPDES) permitting program. These permits include an enhanced NDPES permit for small municipal separate storm sewer systems (MS4s), that was last reissued in 2018. The latest reissuance includes requirements to meet the EPA-approved Lake Champlain total maximum daily loads (TMDLs) for phosphorus. This general permit also includes new road stormwater management standards, identical to those included in the Municipal Roads General Permit (MRGP), to provide traditional municipalities subject to this general permit the ability to develop Phosphorus Control Plans (PCPs) that simultaneously meet the statutory requirements for municipal road stormwater management in addition to the requirements for other developed lands within the municipality.

In the North Basin, Rugg, Stevens, Indian, Bartlett Englesby, Potash and Munroe Brooks are urban stormwater-impaired waters. All MS4 permittees in the North Lake Basin have completed Flow Restoration Plans (FRP), a permit requirement that includes 1) an identification of the required controls, 2) a design and construction schedule, 3) a financial plan, 4) a regulatory analysis, 5) the identification of regulatory assistance, and 6) identification of any third party implementation. The schedule shall provide for implementation of the required BMPs as soon as possible, but no later than 20 years from the effective date of the permit.

The MS4s are currently planning for and implementing FRP projects. Projects that are competitive for Agency Clean Water Initiative grant funds are based on phosphorus removal efficiencies and readiness for implementation. Th Northern Lake Champlain Watershed Summary on Page 64 of the Vermont Clean Water Initiative 2018 Investment Report includes a summary of stormwater projects completed with Clean Water Initiative funding.

## Statewide Bacterial TMDLs

Twenty-one of Vermont's waters are impaired at least in part due to bacterial contamination, associated with human health risk. Five of those are in the North Lake Basin and include:

- Smith Hollow Brook and Crooked Creek (Direct Smaller Drainages to Inner Malletts Bay )
- Englesby Brook
- LaPlatte River from Hinesburg to mouth (10.5 miles);
- Mud Hollow Brook, from mouth to 3 miles upstream
- Potash Brook

A Vermont Statewide Bacterial TMDL Report was designed to support bacteria pollution reduction and watershed restoration throughout Vermont, including the river segments listed above. The TMDL, which established bacterial load targets for each impaired waterbody, was completed in September 2011. The report's appendices include specific data monitoring and watershed information about each of the impaired waterbodies.

Agricultural land represents a significant portion of the watershed area of the LaPlatte River and its tributary Mud Hollow in the North Lake Basin streams and the SWAT modeling results described in the next section on the Lake Champlain Phosphorus TMDL supports directing agricultural resources here for nutrient removal as well. Although agricultural activity is limited in Smith Hollow Brook and Crooked Creek, site specific actions are needed based on visual inspection of watershed by Agency staff. The TMDL report supports the implementation of the following agricultural-related strategies to allow the streams to meet their targeted bacterial loads:

- Improve NMP and other land treatments that reduce runoff of animal waste into streams.
- convert grazing land in the riparian area into permanent livestock exclusion areas is recommended.

The remaining river segments, in addition to the majority of Crooked Creek and Smith Hollow Brook will be improved through the adoption of urban stormwater practices. Finally, the bacterial concentrations of each listed stream will need monitoring to show improvements (see Monitoring needs Table (or in Appendix?).

The bacterial TMDLs will be met in part by many of the regulations and actions that will be implemented to meet the Phosphorus TMDL for Lake Champlain, see below.

## Lake Champlain Phosphorus TMDL

The North Lake Basin flows into several Phosphorus-impaired segments of Lake Champlain (Figure 10). The State is currently implementing a 20-year phased restoration plan for the Lake and its

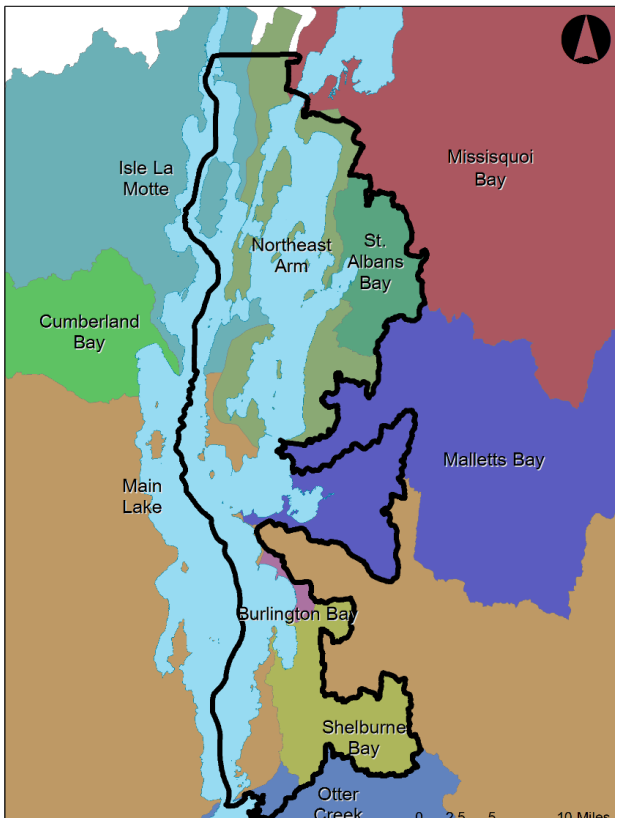



**Figure 10. North Lake Champlain planning basin (black line) relative to Lake Champlain TMDL lake segments (named), see also Table 2.**

tributaries to meet an EPA-approved Lake Champlain Phosphorus TMDL. The first two completed phases of the plan (Phases I and II) have provided phosphorus load reduction goals and a remediation plan that includes specificity relating to the North Lake Basin.

The 2016 Phosphorus Total Maximum Daily Loads (TMDLs) for Vermont Segments of Lake Champlain. (LC TMDL) addresses all major sources of Phosphorous (P) to the Lake and involves new and increased efforts from nearly every sector, e.g., agriculture, developed lands—stormwater and roads, wastewater, and natural resources. The State's "all-in" approach depends on federal and state government working with municipalities, farmers, developers, watershed organizations, and homeowners to improve water quality.

The majority of Phosphorus in the Lake is transported from land to waterways by rain or snowmelt in stormwater runoff. Impervious surfaces or eroding soil contribute to these nonpoint sources of phosphorus where landuses such as agriculture, forestry and developed land is not managed appropriately. The lesser contributor of P, point sources, include regulated stormwater discharges from both agricultural and developed land as well as wastewater treatment facilities (WWTF). The wastewater treatment facilities, which is included under the developed lands category, only generates about 3% of the overall Vermont phosphorus load to the lake. The relative P loading from each landuse sector for each of the 12 lake segments is shown in Figure 11.

The development of the load allocations included a Soil and Water Assessment Tool (SWAT) model analysis to establish target load reductions for each lake segment that include quantifiable "base" loads. As part of the LC TMDL development, EPA completed a "Reasonable Assurance" analysis at the basin scale and determined it was theoretically possible to obtain to necessary P reduction through appropriate application of BMPs across all sectors. However, there is no specific prescription as to where BMPs should be applied. It is through tactical basin planning that more precise opportunities for BMPs can be identified and prioritized for implementation

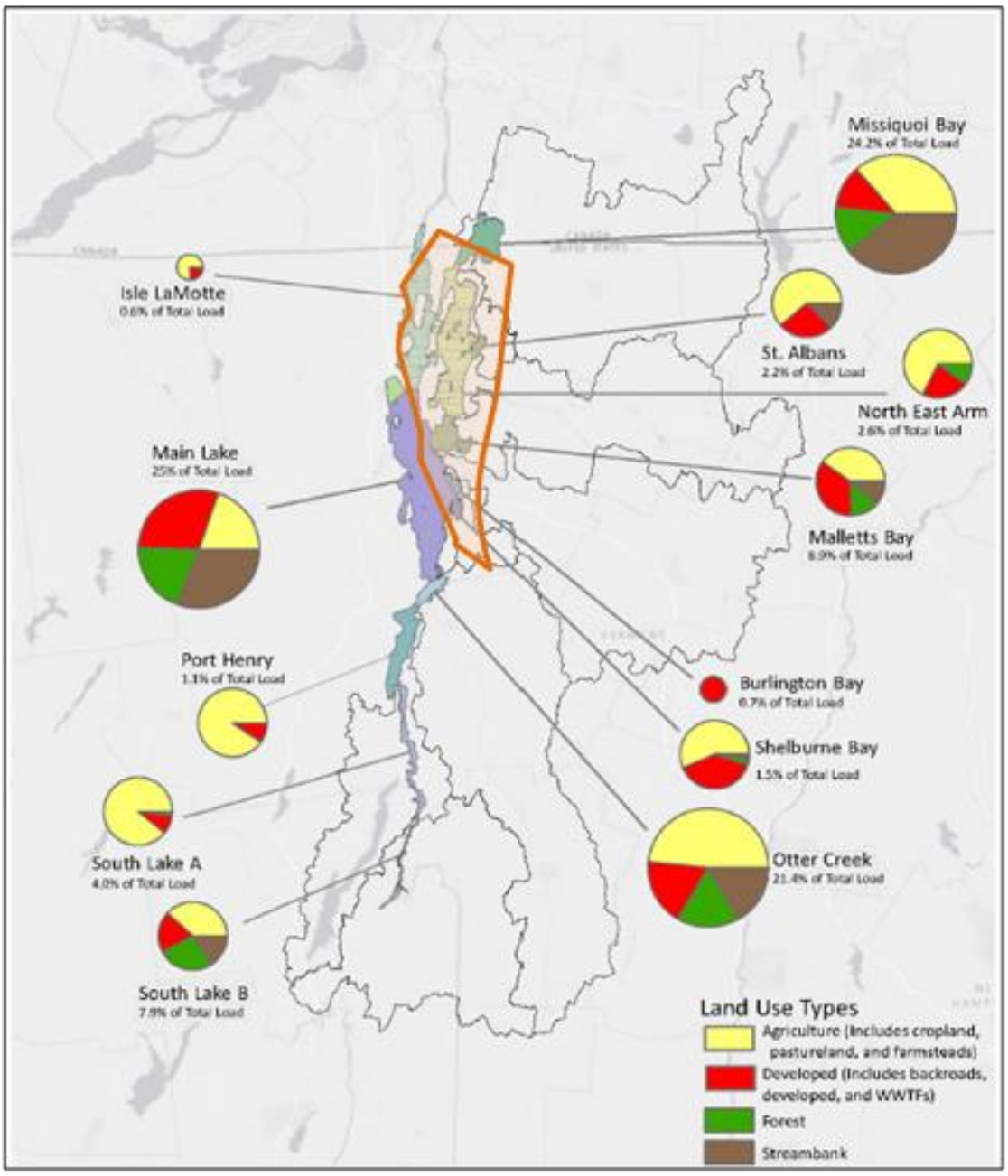



**Figure 11.** Vermont sources of Phosphorus loading to the 12 Lake Champlain segments by landuse: annual average of 2001-2010. The North Lake Basin is highlighted in the orange polygon, see also Figure 10. Vermont contributes about 69 percent (630.6 MT/yr) of the total phosphorus load per year to Lake Champlain in comparison to Quebec at 9 percent (77 MT/yr) and New York at 23 percent (213.8 MT/yr). (source: **USEPA, Region 1, New England. Phosphorus TMDLs for Vermont Segments of Lake Champlain, June 17, 2016, Table 4**

## *Phase I and II of the TMDL*

The Vermont Lake Champlain Phosphorus TMDL Phase 1 Implementation Plan, (Phase I plan) approved by EPA in 2016, sets the stage for the development of Phase II in each of the tactical

basin plans. The Phase I plan includes the State's policy commitments relating to regulatory changes or new programs that provide the platform for longer term success. The Phase II provides basin specific information including:

- division of the P allocations to the tactical planning basin scale[7],
- catchments prioritized for remediation based on highest modeled load reductions (Figure 14), and
- a progress report on newly enacted regulatory programs that address the policy commitments.

The 2017 North Lake TBP provides Phase II content. It included a downscaled version of the SWAT analysis that allowed for a quantifiable estimate of the load reductions required on the sub-basin scale (catchment) by each land use sector to effectively target load reductions by directing water quality projects to the most appropriate locations. Figure 12 provides a qualitative comparison of load reductions by catchments for all sectors. Similar maps created for each sector is included in Chapter 4.

**Table 10. Percent reductions needed to meet TMDL allocations from lake segments within the North Lake planning basin (adapted from 2016 Phosphorus TMDL, Table X)**

| Lake Segment | Total Overall | Waste-water[1.] | CSO | Developed Land[2] | Agricultural Production Areas | Forest | Streams | Agricultural Nonpoint |
|---|---|---|---|---|---|---|---|---|
| **Burlington Bay*** | 31.2% | 66.7% | 11.8% | 24.2% | 0.0% | 0.0% | - | 0.0% |
| **Isle La Motte*** | 11.7% | 0.0% | - | 8.9% | 80.0% | 5.0% | - | 20.0% |
| **Main Lake** | 20.5% | 61.1% | - | 20.2%% | 80.0% | 5.0% | 28.9% | 46.9% |
| **Malletts Bay** | 17.6% | 0.2% | - | 20.5% | 80.0% | 5.0% | 44.9% | 28.6% |
| **Northeast Arm*** | 12.5% | - | - | 7.2% | 80.0% | 5.0% | - | 20.0% |
| **Otter Creek** | 23.6% | 0.0% | - | 15.0% | 80.0% | 5.0% | 40.1% | 46.9% |
| **Shelburne Bay*** | 11.6% | 64.1% | - | 20.2% | 80.0% | 5.0% | 55.0% | 20.0% |
| **St. Albans Bay*** | 24.5% | 59.4% | - | 21.7% | 80.0% | 5.0% | 55.0% | 34.5% |

[1]Percent change from pre-TMDL permitted loads

[7] As the LC TMDL provides estimates for each lake segment and the North Lake Basin is comprised of portions of 7 lake segments, see Figure 11, the calculation to develop the P loading for the North Lake Basin is the sum of the percent of each lake segment's watershed contained in the North Lake Basin, see Table 11. This calculation was initially completed for the 2017 North Lake Tactical Basin Plan.

[2]Includes reductions needed to offset future growth*Lake Champlain segment drainage completely within North Lake Basin

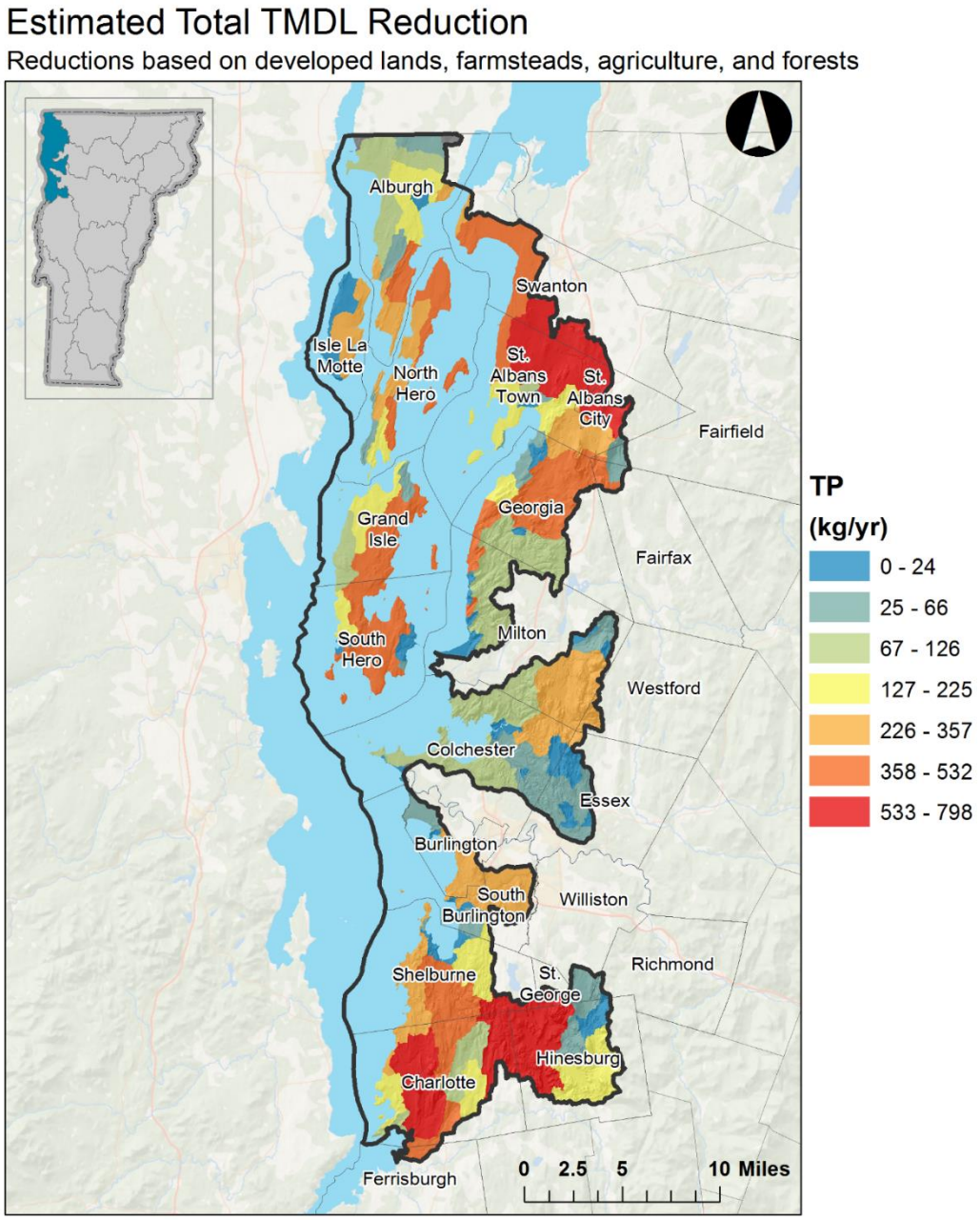



Figure 12. **Estimated total TMDL reductions from all land uses at the catchment scale**

## *Progress for the North Lake Basin*

The North Lake Basin contributes approximately 10% of the average total phosphorus delivered from the Vermont portion of the Lake Champlain in a given year. Table 11 sets out the reductions that would be needed to meet TMDL allocations by sector from each lake segment that the North Lake planning basin contributes too. This plan updates Phase II information regarding progress on

newly enacted regulatory programs that address the policy commitments. Chapter 3 of this plan identifies the regulatory programs initially outlined in the 2017 North Basin TBP and Chapter 4 of this plan describes by sector, progress made towards the development of the programs including permitees activity towards compliance and outcome of sector-based assessments. Chapter 4 also provides recommendations for delivery of financial or technical resources as well as additional geographic specificity to increase nutrient reduction. A summary of progress by sector is provided in Table 12. The status on progress towards meeting the phosphorus reduction goals is included in the Vermont Clean Water Initiative 2019 Performance Report. (can we add P reduction expected from MRGP or TS4 based on completed assessments before summer 2020?).

The LC TMDL, as well as being implemented through a series of permit programs, also includes identification of site specific BMPs outside the scope of specific programs. The tactical basin plans also identify projects that will provide the greatest return on investment for clean water. The plans identify and prioritize clean water projects across multiple sectors, including stormwater, rivers, roads, and wastewater treatment, based on monitoring data and assessment results.

While many programs are "self-implementing", in many instances, application follows a two-step process of first knowing "where to look" for opportunities followed by "what to do". Many P reduction programs require an initial assessment phase to identify what BMPs already exist on the landscape and where others are needed. After the assessment phase, associated program plans prioritize areas and identify practices to maximize use of state funding sources while also maximizing phosphorus reduction. The tactical basin plans summarize this information as well as identify funding sources and potential partners in the Implementation Table.

**Table 11. Outcome of sector-based assessment and anticipated compliance dates associated with Implementation Plan associated permits. The technical and financial assistance to facilitate accelerated compliance or voluntary efforts is report in Table. X.**

| Sector | TMDL Implementation Plan - Permit program | Assessment Tool/date completed | Assessment Progress | Implementation to address Assessment as of 6/01/2020 |
|---|---|---|---|---|
| **Agriculture** | CSF0 | AAFM Farm Inspection report; | X/X CSFO inspected with X needed BMP Identified | X BMPs implemented; |
| | CSFO | | | X/X CSFO NMP completed |
| **Roads** | Municipal Roads General Permit (MRGP) | Road Erosion Inventory/2020 | X/X towns with total of x lf of hydrologically connected road segments to address | X ft addressed |

| | | | | |
|---|---|---|---|---|
| | Transportation Separate Storm Sewer System (TS4) Permit | FRP and PCP/2020 | Complete (total of Phosphorus to be reduced?) | SF impervious surface managed for stormwater water |
| **Developed land** | Operational Three-Acre Permit | Stormwater management plans for x parcels/2023 | None to date. X Acres to be addressed | Not determined |
| | MS4 | FRP and PCP | Complete (total of Phosphorus to be reduced?) | SF impervious surface managed for stormwater water |
| **Forestry** | Acceptable Management Practices (AMP) Updates | Inspections/Ongoing based on complaints | | |

## *Subsequent TMDL Phases*

Subsequent plans will lay out the specific point source and nonpoint source measures and practices for meeting TMDL allocation targets in 5-year increments. Specifically, the next rendition of the North Lake Basin Plan (anticipated for development in 2025 per the Accountability Framework) will include Phase 3 content that provides estimates of load reductions from regulatory programs and then funding and load reduction targets for the non-regulatory sectors as a component of Act 76 of 2019. As part of that process, DEC will coordinate with other sector-based regulatory programs in state government (e.g., the agricultural and forestry sectors) to continually evaluate programmatic capacity to achieve the target loads established in the TMDL. Based on a gap analysis, as required by Act 76, natural resource restoration targets will be established to address gaps and systematically met through support of non-regulatory projects, including natural resource restoration.

## *Lake Champlain Phosphorus TMDL Phase II Accountability Framework*

The LC TMDL includes an Accountability Framework that establishes a process to ensure sufficient progress towards implementation of the TMDL (Figure 13). A major part of the Accountability Framework is VDECs development of basin-specific tactical plans. The tactical basin plans include Implementation Tables that lay out priority actions essential to implementation of the TMDL. It's through review of the Implementation Tables, and the progress made in accomplishing the tasks, that EPA intends to track implementation progress in each basin. Review will occur midway through and at the end of each 5-year planning cycle whereby EPA will develop a "report card" reflecting the sufficiency of progress made.

VDEC tracks progress relating to phosphorus reductions by sector and within those, specific categories of actions using the Clean Water Initiative Program's (CWIP) internal tracking system (i.e., BMP Accounting and Tracking Tool (BATT)). VDEC also uses the online **Watershed Projects Database**, an electronic extension of the basin plan's Ch. 5 Implementation Table to track progress towards completion of specific actions. Project tracking will primarily focus on projects implemented through state and federal programs and through water quality regulatory programs. Additional projects will be tracked on a voluntary basis where data are available.

Pollutant reductions achieved by State and federally funded projects will be reported in the Vermont Clean Water Initiative Annual Performance Report, as required by Act 64 (see the 2019 report). TMDL progress will be measured based on estimated phosphorus reduced by projects, increase magnitude of clean water project outputs, and changes in monitored phosphorus loads to Lake Champlain.

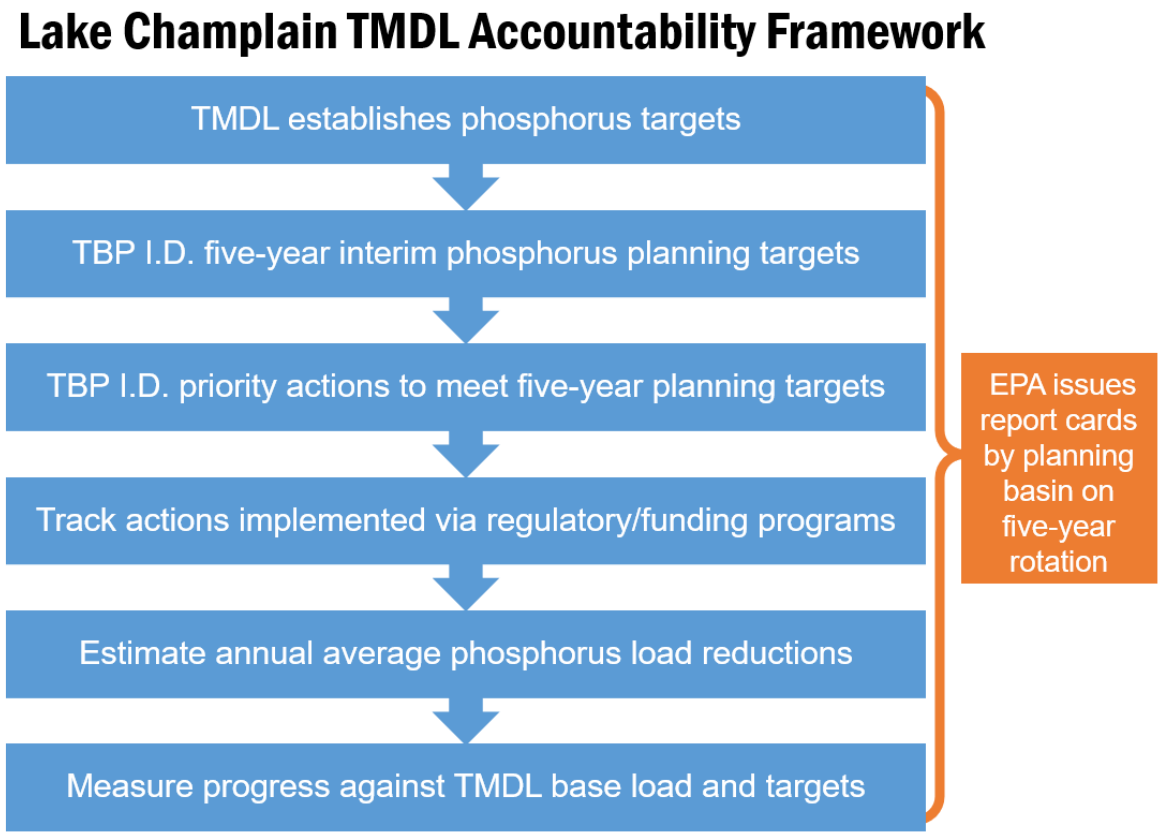



Figure 13. Accountability Framework

# Chapter 4 –Remediation Strategies by Landuse and Natural Resource Sector

The Agency's approach towards remediation of degraded surface waters includes both regulatory and non-regulatory tools with associated technical and financial assistance to incentive implementation[8]. Spelled out as objectives and strategies in Table 13 and 14, they are organized by land use and natural resource sectors. The natural resource sectors focus on voluntary restoration, while landuse sector improvements will also be achieved through regulatory compliance as well as voluntary remediation.

The Vermont Surface Water Management Strategies provide a detailed description of the Agency's approach and the strategies in the plan identify geographic focus areas and specific practices to help ensure that appropriate resources are directed to areas where pollution mitigation results in greatest efficiencies. Modeling results that identify high pollutant loading areas, as well as previous planning and assessment efforts assist with prioritization of areas and identification of effective tools. The natural resource sectors will also be able to benefit from additional funding through the Water Infrastructure Sponsorship program (WISPr).

The Agency and partners use the plan's strategies to identify, develop and find funding for specific actions. When specific actions associated with specific geographic location and practice are identified, e.g., bioinfiltration of stormwater at Shelburne Community School, the agency uploads them into the Watershed Projects Database and the Clean Water Project Explorer.

This chapter also reports on work accomplished to date within each sector to meet the LC TMDL goals. Progress relating to regulatory program development, permit compliance and outcomes as well as the technical assistance to facilitate compliance is included. Priority areas for focus as well as recommendations for effectively providing technical and financial resources. These are summarized in the Implementation Table.

The actual phosphorus reduction modeled to the end of 2019 in comparison with the Phase II goals by sector in the North Lake Basin is located in the Agency's Clean Water Initiative 2019 Performance report. The Agency coordinates funding, tracking, and reporting of clean water efforts for federal and state partners, including the Agencies of Agriculture, Food and Markets; Commerce and Community Development; Natural Resources; and Transportation – and the Lake Champlain Regional Conservation Partnership Program of the Natural Resources Conservation Service.

[8] The Vermont Surface Water Management Strategies provides a comprehensive list of actions taken by Agency to remediate degradation to surface waters from landuse activity as well as an overview of pollutants and sources.

Table 12. Summary of objectives by sector. Strategies for management of landscapes meet unique objectives unique to each sector that were initially set out in the 2016 LC P TMDL's implementation plan. Although, the TMDL focused on phosphorus and sediment reduction, many of the strategies will also provide co-benefits including flood resilience, bacteria reduction, and aquatic invasive species management. Additional strategies are also discussed that address additional stressors responsible for impairments or physical alterations to the water bodies identified in Tables 5,6 and 10


### *Agriculture*

- Conservation practices that reduce sources of pollution from farm production areas and farm fields.


### *Developed Lands--Stormwater*

- Practices that reduce or treat polluted stormwater runoff from developed lands, such as parking lots, sidewalks, and rooftops.


### *Developed Lands--Roads*

- Stormwater and roadside erosion control practices that prevent erosion and treat road-related sources of pollution.


### *Wastewater*

- Improvements to municipal wastewater infrastructure that decrease pollution from municipal wastewater systems through treatment upgrades, combined sewer overflow (CSO) abatement, and refurbishment of aging infrastructure.


### *Natural Resource Restoration*

- Restoration of "natural infrastructure" functions that prevent and abate pollution. Natural infrastructure includes: floodplains, river channels, lakeshores, wetlands, and forest lands.

## A. Priority Areas for Restoration

The following table organizes priority surface waters for restoration and protection by land-use or natural resource sector. Each land use sector is associated with an objective (see land use icon's associated objective in Table 13) and specific strategies (see last column). Priority areas are identified based on Agency's monitoring and assessment results and sources identified within the watershed as well as modeling results. Sector include Agriculture, Developed Lands—Stormwater, Developed Lands--Roads, Wastewater, and Natural Resources (see detailed sector descriptions in Chapter 4).

**Table 13. Focus areas for implementation of water quality projects by sector in the North Lake Basin to meet sector objectives in Table 13.**

| Sector | *Focus Areas (not to exclude work in other areas)* | *Strategies* |
|---|---|---|
|  | Jewett, Mill, Malletts Bay, LaPlatte and tributaries, Charlotte direct drainages, The Islands | Surveys of farm needs; modeling analysis to identify priority areas for BMP and most effective BMP, BMP implementation, Equine management and other non-dairy type education and outreach. |
|  | MS4 entities, towns with stormwater master plans | Assessments to identify projects. restoration plans, project implementation |
|  | MS4 entities and towns with road erosion inventories | See above |
|  | Stevens, Mill, LaPlatte, McCabes | Corridor protection<br>Riparian buffer/<br>Floodplain restoration, dam removal |

| | | |
|---|---|---|
|  | Mill River, Malletts Creek, LaPlatte, Mud Hollow | Protection including riparian forest, old logging roads and landings with high erosion potential, identification remediation. |
|  | Islands, Malletts Creek, LaPlatte and tributaries, Charlotte direct drainages. Also see the VDEC RCPP Wetland Restoration Site Prioritization Map) | Restoration, Reclassification, Protection |
|  | Lake Iroquois, Islands and other Lake Champlain shoreline | Shoreland protection, education and outreach about shoreland restoration practices, contractor certification through the Natural Shoreland Erosion Control Certification program |
| **Aquatic Invasive Species** | Lake Iroquois, Islands, Kimball and Thorp Brooks | Boaters education and outreach to reduce spread; |
| **Toxins** | Stevens Brook, Indian, Englesby, Potash, Munroe Brooks | Winter maintenance plans that reduce chloride use, toxin management and reduction, illicit discharge and detection studies |

*Project leaders and partners are identified in Chapter 5.


# B. Agriculture

Currently in development

## C. Developed Lands -- Stormwater

Stormwater runoff from developed land contributes bacteria, sediment, nutrients and chlorides to waterways as well as contributing to eroding streambanks. The North Lake Basin has the highest concentration of developed land in Vermont and subsequently, the highest number of stormwater-impaired streams.

Stormwater off developed area in the North Lake Basin may also contribute to sediment loads from gullies and landslides. A DEC landslide report of Chittenden County shows an association of gullies and landslides in developed areas with highly erodible soils, and suggests a close association with stormwater runoff from developed areas.

The following areas associated with stormwater-related stressors are a priority in this plan for remediation and restoration based on identified impairment or assessment data:

- Stormwater-impaired streams: x urban streams in Burlington, South Burlington, Shelburne and St. Albans (Table 5).
- Bacterial impaired streams with an urban component in their watersheds, like Smith Hollow and Crooked Creek (Table 5),
- Mapped areas for gullies and landslides: Smith Hollow, Crooked Creek, Indian, Bartlett, and Munroe Brooks, LaPlatte River (Mccabe included?), Georgia, Burlington Shoreline
- Streams where assessment data has indicated continued degradation from urban stormwater in an effort to keep streams from reaching level of impairment, including Allen Brook and upper Munroe (see Chapter 5 C).
- Modeling results showing high phosphorus loading from developed areas: Shelburne Village; Georgia village; South Hero Keeler Bay drainage, Alburgh village (see Figure X in 2015 Basin 5 plan)

Managing stormwater from parking lots, roofs and other impervious surfaces before it reaches surface waters will address nutrients and sediment as well as bacteria and metals. Ensuring that stormwater discharges avoid erodible slopes will reduce opportunities for erosion of sediment and associated phosphorus into water ways.

State and federal stormwater permits provide for stormwater management. Developed areas currently not under a stormwater permit are the focus of actions. Improved stormwater management will be carried out primarily through new regulatory processes. The appropriate BMP for each site will be identified through appropriate assessment processes to meet regulatory requirements.

In addition, the Agency supports landowners in voluntary efforts to address stormwater through development of stormwater master planning and grants for implementation. Green Stormwater Infrastructure is encouraged where possible in all of these assessment processes.

Stormwater impaired streams (Table 5) will be addressed through the Municipal Separate Storm Sewer System Permit (MS4 permit) as well as the TS4. MS4 entities are currently involved in implementing projects to reduce nutrient loadings, see annual report for P reduction to date, including rates of increase since 2016.

Other stormwater degraded streams (Table 5) will benefit from the implementation of actions to meet the new stormwater operational 3 acre permit, house-keeping components of the MS4 permit as well as voluntary action. The new Municipal Road General Permit, discussed in the next section, along with other strategies to address private roads will also benefit these streams as well as shoreline areas.

## Progress

Within the developed land sector, landowners are working towards regulatory compliance as well as adopting voluntary actions that will improve waterways degraded by urban runoff. A review of progress in each program is discussed in more detail below. A summary of work is located in Table 11 and Table 18.

### *Municipal Separate Storm Sewer Systems permit (MS4)*

The federal Municipal Separate Storm Sewer System permit covers municipalities with census designated urbanized areas and stormwater-impaired watersheds (see Table 18). A detailed description of the permit is included in the Stormwater TMDL section. The regional planning commissions assist municipalities in addressing permit requirements. Assistance has included facilitating education and outreach programs to encourage community involvement and voluntary adoption of practices. The programs include Smart waterways in Chittenden County and Franklin County Stormwater in Franklin County.

**Table 14. Municipality progress in addressing permit required or voluntary efforts to address stormwater**

| | Town | MS4/FRP[9] completed | Stormwater Infrastructure conveyance Mapping | SWMP[10] | IDDE[11] |
|---|---|---|---|---|---|
| Municipal Separate Storm Sewer System (MS4) | Burlington | Centennial, Englesby and Potash Brooks. | Yes | | 2018/ 7 illicit discharges, none have been corrected |
| | Colchester | Indian Brook | Yes | Water Tower Hill (10 Yr flood control SWMP), stormwater scoping report (2019) | 2019/ one found and corrected |
| | Essex Junction | Indian Brook | | | 2018/one found and corrected |
| | Milton | NA | | Yes | 2018/none found |
| | Shelburne | Munroe Brook | | | |
| | St. Albans City | Stevens and Rugg Brooks | Yes | No | 2018/uncorrected illicit discharge at outfall #37 at North Elm and Pearl |
| | St. Albans Town | Stevens and Rugg Brooks | Yes | Yes | 2018/no |
| | South Burlington | Potash Brook | | | |

[9] FRP – flow restoration plans
[10] SWMP – Stormwater Master Plans
[11] IDDE – Illicit Discharge and Detection Elimination program

| | Town | MS4/FRP[9] completed | Stormwater Infrastructure conveyance Mapping | SWMP[10] | IDDE[11] |
|---|---|---|---|---|---|
| | Williston | None in the North Lake Basin | None in the North Lake Basin | None in the North Lake Basin 8 | None in the North Lake Basin |
| Non – MS4 | Alburgh | NA | Yes | SWMP | Statewide study 2019/one found |
| | Charlotte | NA | | Part of LaPlatte SWMP | |
| | Fairfield | NA | Yes | Yes | Statewide study 2019/East Fairfield discharge |
| | Georgia | NA | Yes | Yes | |
| | Grand Isle | NA | | | |
| | Hinesburg | NA | Yes | Part of LaPlatte SWMP | Statewide study 2019/none, smoke and dye test recommended |
| | Isle La Motte | NA | | | |
| | North Hero | NA | | | |
| | South Hero | NA | Yes | Recommend variation for Keeler Bay drainage | Statewide #4 contract |
| | Swanton | NA | Yes | Yes | 2011/one found and corrected |

## *Operational three-acre impervious surface permit program*

Draft General Permit 3-9050 serves as the "Three-Acre General Permit" as required under the Vermont Clean Water Act. A "three-acre site" is an impervious surface of three or more acres that:

- has never had an operational stormwater permit, or
- was permitted to standards in place prior to the 2002 Vermont Stormwater Management Manual

To date, the DEC Stormwater Program has identified affected three-acre parcels and notified affected owners. The North Lake Basin parcels will need to apply for permit coverage by 2023. Strategies in the plan to promote voluntary actions will help to accelerate stormwater implementation effort..

Table 15. Estimated three-acre parcels and associated impervious cover by HUC 12 (by 6/2019).

| Subbasin | # of Parcels | Towns | Pre 2002 Permitted Impervious (acres) | Post 2002 Permitted Impervious (acres) |
|---|---|---|---|---|
| **Mill River** | 14 | Georgia | 54.99 | 2.39 |
| **Jewett Brook** | 29 | St. Albans Town, Swanton | 108.17 | 4.9 |
| **Malletts Bay** | 43 | Colchester, Milton and Essex Jct. | 116.53 | 38.18 |
| **St Albans Bay-Lake Champlain** | 15 | St. Albans City, Town and Georgia | 34.78 | 0.3 |
| **Munroe Brook-Shelburne Bay** | 65 | Shelburne | 378.59 | 9.94 |
| **Lake Champlain** | 61 | Islands, … | 157.93 | 27.89 |
| **La Platte River** | 32 | Hinesburg, St George, | 103.16 | 49.05 |
| **Malletts Creek** | 6 | Milton, Colchester | 12.98 | 3.06 |

In the North Basin, Table 16 provides an example of how stormwater degraded streams will benefit from additional treatment when expected acreage under the 3-acre permit is treated. Although not identified as stormwater impaired, monitoring data indicates that urban runoff is a factor in the degraded condition of the Table 16 streams.

Table 16. Expected new acres of treatment in watershed of stormwater degraded streams in urban areas

| Stream | Town | Impervious acres expected to receive additional treatment under GP - 3-9050[12] |
|---|---|---|
| **Allen Brook (from Milton town line)** | Milton | 48.74 |
| **McCabe Brook (to Shelburne town line)** | Shelburne | 30.58 |
| **LaPlatte Brook** | Shelburne, Hinesburg, Charlotte, St. George, Williston, Richmond | 69.84 |
| **Indian Brook** | Colchester, Essex | 89.908 |
| **Crooked Creek** | Colchester | 10.15 |
| **Smith Hollow Brook** | Colchester | 28.35 |

[12] Acreage based on parcels expected to fall under General Permit 3-9050 as of 1/24/20.

A number of interested MS4 municipalities have requested to take over three-acre permits and roll them into their MS4 authorizations. At that point they would no longer be subject to the three-acre permit, although the MS4 would have to achieve similar reductions under their phosphorus control plan. The Agency is currently reviewing these application.

It is anticipated that the "three-acre impervious surface" program will address the developed lands P reductions necessary to achieve the LC TMDL that are not addressed by other developed lands programs. Once the program is implemented, this projection will be verified by tracking P reductions achieved through implementation using the Agency's -BATT. If additional reductions are required to implement the LC TMDL, developed lands permitting requirements may be adjusted accordingly, including requiring projects with less than three acres of impervious surface to obtain post 2002 permit coverage.

### *Illicit Discharge Detection and Elimination (IDDE) Studies*

An illicit discharge to a municipal stormwater system includes any connection that is not predominantly stormwater. This can include the dumping of paint or oil down a street stormwater catch basin, a connection between a floor drain, wastewater pipe to the storm water system or a break in a pipe that causes contamination to reach the stormwater system. All regulated municipal separate storm sewer system (MS4) operators are required to develop IDDE plans and implement them. The plan requires monitoring, reporting, education, an ordinance and catch basin marking. State law encourages non-regulated MS4s to develop IDDE programs (Sec. 3. 10 V.S.A. § 1264 (b)(9)). Through these studies sewage and industrial wastewater discharges were detected and eliminated in the MS4 communities, (table 16). (the annual reports completed by the MS4 are available by contacting the xxx). DEC also supports IDDE studies for non MS4 communities, see Table 16 for list of those towns and findings for all towns. Eliminating an IDDE can address a 4 to 7 kg/yr contribution of P to waterways.

### *Stormwater Master Planning. Lake Wise and other Outreach Efforts*

The Agency supports voluntary efforts in the Basin, primarily through development and funding of DEC assessments that identify and prioritize projects. The assessment include stormwater master planning, Vermont Lake Wise certification program and Illicit Discharge Detection and Elimination (IDDE) studies for non-MS4 communities. Property owners who voluntarily manage stormwater, in some cases, may also receive assistance from Clean Water Fund-supported grant programs or technical assistance.

Partner organizations also play an important role in encouraging the adoption of voluntary practices within the community. They include the Chittenden County Regional Planning Commission, Friends of Northern Lake Champlain, Lake Champlain Basin Program, Lake Champlain Committee, Northwest Regional Planning Commission, Winooski Natural Resource Conservation District, Southern Chittenden County River Watch as well as municipalities and other entities working under

the federal Municipal Separate Storm Sewer System permit. These partners provide education and outreach as well as technical and financial resources.

Stormwater master plans (or reports) provide a list of prioritized projects that property owners could adopt to improve stormwater management voluntarily. In addition, the Town of Colchester completed a Malletts Bay Initiative Stormwater & Transportation Project that while it doesn't list specific projects does identify sources of stormwater needing treatment as well as discharge points, many directly to lake. Older stormwater pipes may also have illicit tie ins to wastewater pipes or inadvertent cross connections through leaking pipes. The direct discharge of stormwater to a lake could increase bacteria levels in receiving waters.

Towns with completed plans are located in Table 17 and Appendix D. No other towns require comprehensive stormwater master plans, although South Hero would benefit from a stormwater master plan focused on agricultural ditching as well as developed surfaces that drain to Keeler Bay. The TBP strategies support continued technical and financial assistance to private landowners, municipalities and schools to implement these projects.

The Lake Wise Program is focused on improving lake health and includes addressing stormwater. More about this program is addressed in Section 4 H, the Natural Resource restoration of lake shore.

Other outreach efforts supported in part by the Agency or partners with technical and/or financial assistance include:

- Raise the Blade campaign (DEC partner)
- Ahead of the Storm (Partner grants)
- Chittenden County Stream Teams (Partner grants)
- Resource for landslide or gully stabilization, Lake shore stabilization handbook led by NRPC (DEC and UVM Sea Grant assistance,); and The Landslide Handbook by USGS

## Recommendations

Actions in the Implementation Table to address stormwater runoff from developed lands reflect the Agency's commitment to continue to work with local, regional, and federal partners to accelerate adoption of stormwater-related BMPs by the community, often facilitating voluntary actions in addition to accelerated compliance with regulatory requirements.

Voluntary actions should be prioritized for funding primarily based on ability to reduce phosphorus and bacteria loads and cost effectiveness along with other criteria developed by the Agency.

Gullies and landslides should and will continue to be a consideration during a review and improvement of stormwater management practices near slopes with erodible soils. Municipalities

can also improve communities understanding of potential for landslides during development considerations. Including landslide locations, as a proxy for landslide prone areas, in Municipal Hazard Mitigation plans is a recommended step.

# D. Developed Lands--Roads

Runoff from roads is a source of sediment and nutrients to streams, lakes and wetlands as well as a driver of stream channel erosion, especially in headwater streams in the North Lake Basin. These road networks effectively serve as an extension of the stream network where they intersect (Wemple et al., 1996) if roads are not designed or maintained to shed stormwater.

The Agency's approach to addressing public road-related impairments is primarily regulatory with guidance and financial assistance provided through existing partnerships. To date, permitees, including municipalities as well as VTrans are prepared to meet permit deadlines, if not already exceeding established timelines. The regulatory programs include: the Municipal Roads General Permit (MRGP), the Transportation Separate Storm Sewer System Permit (TS4), and the Municipal Separate Storm Sewer System Permit (MS4).

Private roads can be a significant percentage of the road network in a town, for example, 50% of the gravels roads in Hinesburg are private. Addressing runoff from these private roads requires education and outreach to landowners to encourage them adopt effective maintenance practices.

Priority areas for focus are hydrologically connected roads. The Agency identified criteria and developed a methodology to prioritize these road sections based on level of road erosion expected (Road Erosion Inventories (link?)) for public roads as well as a variation that suits gravel or dirt road (link to app). The prioritization of public roads has been completed through the road assessments completed as part of the MRGP. For example, assessed road segments that "*Do Not Meet*" standards for road maintenance and have high erosion risk because of steep slopes (> 10%) and proximity to streams are very high water quality priorities.

## Progress

### *Municipal Roads General Permit*

The 2015 Municipal Road General Permit (MRGP) is a stormwater permit for non-MS4 Vermont cities and towns and is intended to achieve significant reductions in stormwater-related erosion from paved and unpaved roads. The permit requires each municipality to conduct a road erosion inventory (REI) of hydrologically connected roads by 12/31/2020 to determine if they meet MRGP standards. Hydrologically connected roads are those municipal roads within 100' of or that bisect a wetland, lake, pond, perennial or intermittent stream, or a municipal road that drains to one of these water resources. These road segments represent roughly 60% of municipal roads and can be viewed

using the "Municipal Road Theme" on the ANR Natural Resource Atlas. Road segments are assessed as *Fully Meeting*, *Partially Meeting*, or *Not Meeting* the MRGP standards.

MRGP standards include road crowning, stabilizing drainage ditches and turnouts, and upgrading drainage culverts and intermittent stream culverts. VDEC has established a timeline with milestones to guide towns through the MRGP requirements (Figure 18). As of December 2020 it is anticipated that all towns will have a completed REI. Towns will use the REI results to prioritize road upgrades with goal of all municipal roads meeting the MRGP standard by 12/31/2036.

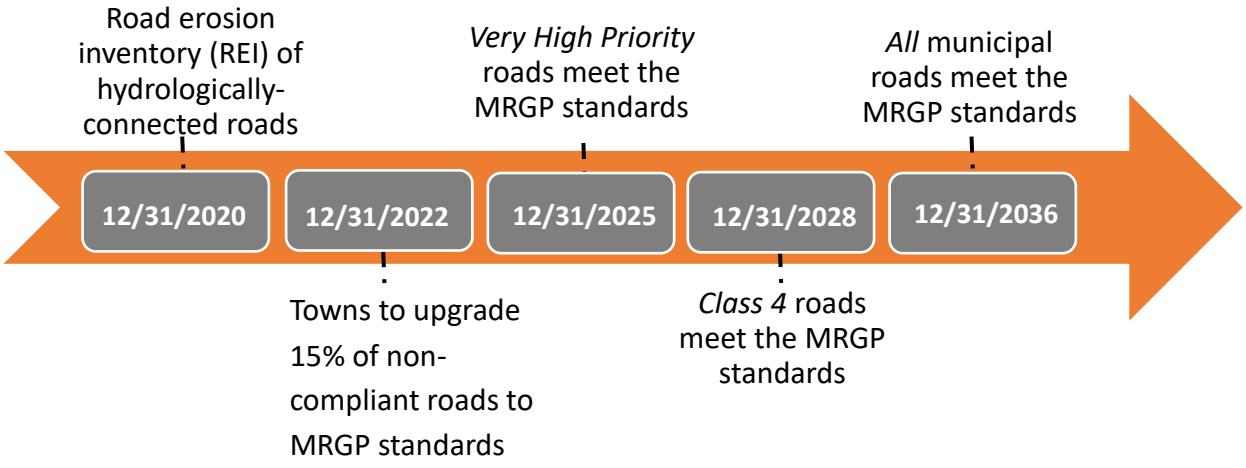



**Figure 14. MRGP timeline and milestones**

## *Training and financial assistance*

VDEC has partnered with regional planning commissions to offer training, technical assistance, outreach, and funding for REIs, road upgrades, and equipment purchases to assist municipalities with the MRGP requirements. Specifically, Clean Water funding through the VTrans Better Roads and the ANR's Grants-in-Aid programs support the development of municipal REIs and project implementation. For additional information see the VDEC Municipal Roads Program

By December 2020 all towns in the North Lake Basin will have completed a Road Erosion Inventory required under the MRGP. Results of REIs will also have been uploaded to the MRGP database at that time. The database can be viewed online by town. Towns are currently involved in addressing non-compliant roads by participating in workshops (Table 20) and implementing stormwater practices towards meeting permit compliance (Figure 18).

Table 20 shows an increase over years in town involvement in workshops as well as use of financial assistance in implementing projects. Improvements to hydrologically connected roads is expected to accelerate now that the REIs are completed (for almost) all towns. Many towns have already begun

utilizing State-funded grant programs to address non-compliant road segments. Of the 50 towns in the basin, in SFY 2018, 14 enrolled in Grants-in-Aid and in SFY 2019, 21 enrolled in Grants-in-Aid to receive financial support for addressing hydrologically connected roads. As a result, the miles of state-funded municipal road drainage and erosion control improvements increased nearly seven-fold from SFY 2017 to 2018.

A phosphorus reduction expected from roads addressed by the MRGP will be calculated at the finish of the MRGP assessment process at the end of 2020. The modeled calculation of P reduction will be tracked king the mileage of completed road improvements, VDEC will be able to calculate local P reductions.

The inventories completed to date show that the following towns have a high proportion of Very High Priority road segments and high modeled TP loading (Figure 29 to be developed): xxxx

**Table 17. Progress of the x Municipalities in watershed towards meeting MRGP as of July 2020**

| Strategies | % of Municipalities | Outcome as of ? (need?) |
|---|---|---|
| **Road Erosion Inventories completed** | About 100 | X lf of hydrologically road |
| **Grant in aid funding to address REI identified road erosion** | | X dollars received |
| **Participation in educational opportunities (road foreman meetings)** | | X hours |

(Create if easily pulled from submitted GIA data and CWIP reporting – NRPC will aim to input the REI data into state's tool by end of May 2020) Figure 15. Hydrologically connected roads, their MRGP status, and modeled TP loading by HUC12 watershed in Basin 5.

## *State Managed Roads (Transportation Separate Storm Sewer System General Permit – TS4)*

The 2017 TS4 General Permit is a stormwater permit for all VTrans owned or controlled infrastructure. The permit requires VTrans to develop comprehensive Phosphorus Control Plans (PCPs) for their developed land in each lake segment. This includes state roads, garages, park and rides, welcome centers, airports, and sand and gravel operations. The PCPs will require inventories of all regulated surfaces, establishment of baseline phosphorus loading per lake segment, and a prioritized schedule for implementation of BMPs to achieve the lake segment percent phosphorus reductions.

VTrans will address state roads under the TS4. The permit requires VTrans to reduce the discharge of pollutants from the TS4 to the maximum extent practicable (MEP) through compliance with the six minimum control measure requirements throughout the entire State.

On April 1, 2019, VTrans submitted an analysis of the P baseload from their owned and controlled land. A target of X kg/year was established for the North Basin, to be achieved by 2036.. As part of meeting permit requirements, VTrans has estimated that x  area (acreage or road miles) will need to be treated with BMPs types and (extent) as shown in Table x. to meet the entire phosphorus load reduction. By October 1st in 2020, 2024, 2028, and 2032 each, VTrans will submit a more detailed PCP that achieves on average 25% of the total reduction to Lake Champlain in each 4-year period

### *Private Roads Outreach*

The Agency as well as Partners support education and outreach efforts that includes providing technical assistance. Recently, the Agency has developed a road erosion inventory App for gravel roads that covers forest logging roads to private driveways. The DEC Vermont Lake Wise Program has supported the development and distribution of outreach materials as well as trainings that cover gravel road maintenance, from crowning roads to creating turnouts. Good maintenance practices lead to reduced maintenance costs over all and current outreach efforts have encouraged private landowners to implementing good stormwater management practices on their roads based on good economic sense as well as for water resource protection.

### Recommendations

Actions to address stormwater runoff from roads (see Implementation table) reflect the Agency's commitment to assist municipalities in meeting the MRGP. Providing technical and financial assistance to these towns to accelerate permit compliance as well as going above and beyond permit requirements would support the LC TMDL goals.

The continued support of private landowners in their maintenance of roads could be improved by ensuring that appropriate trainings are available to contractors as well as the landowner.

## E. Developed Lands--Other

### Chlorides

Chloride is a pollutant originating primarily from the use of deicing salts in winter management activities on roads and other developed areas. The north south crossing of a major transportation corridors across the basin, as well as the concentration of large parking lots for shopping plazas and businesses with large numbers of employee leads to high chloride inputs to the basin's streams. In the North Lake Basin, monitoring results from the Chittenden County Stream Team (see Appendix X), include exceedances of the State's chronic standards in Bartlett, Englesby, Potash Brook,

Munroe and Indian Brook with Englesby exceeding acute standards on one occasion in 2018. Elevated chloride levels in surface waters can negatively impact the health and reproduction of aquatic species

Over the six years of monitoring with biweekly grab samples, the majority of streams have shown an upward trend. DEC began use of in stream monitoring probes in urban streams to allow continual? data collection over a year to substantiate any impairments. In the North Lake Basin, x stream will be included?)

In an effort to control winter management costs, VTrans and municipalities have already adopted practices that reduce use of deicing salt. This may not be the case for businesses who are often dependent on contractors to decide appropriate application of salt to parking lots and walkways. Partners, including Winooski Natural Resource Conservation District and the UVM Sea Grant Program have supported education and outreach efforts to reduce the use of Chlorides on commercial parking lots as well as municipal properties as part of winter management practices.

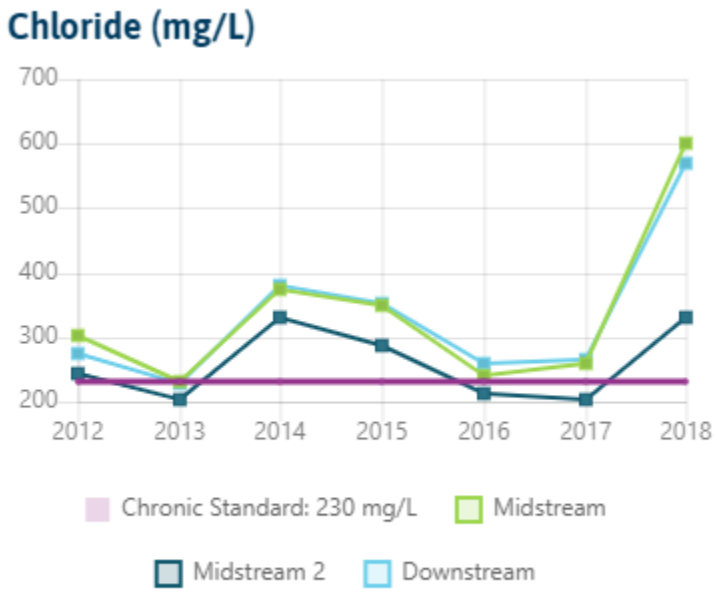



**Figure 16. Potash Brook sampling results (grab samples)from the Chittenden County Stream Team project (WNRCD, 2019)**

## Toxins – Legacy

The barge canal in Burlington Bay as well as Stevens Brook in St. Albans are degraded due to sediment contamination from industrial activity in the 20th century and earlier. The health risk to humans and aquatic biota keep these waters from meeting standards. Current strategies include

containing contamination. Monitoring ground water in surrounding areas help to identify movement outside of existing area. Recently, a new contaminate from industrial activity, known as PFAS has been identified in Vermont ground and surface water.

### *PFAS chemicals in Surface Waters*

PFAS, "Per- and poly-fluoroalkyl substances" is a large group of human-made chemicals that have been used in industry and in many consumer products since the 1950s because they are resistant to heat, water, oil, grease and stains. There is growing concern because some of these chemicals have been linked to health problems even at very low contamination levels. These chemicals are also very stable and persistent, meaning that past contamination will remain in the environment for a long time and will not breakdown. Some of these substances can also build up in people and in the environment. They are also water soluble and highly mobile, making groundwater vulnerable for contamination.

The Agency of Natural Resources is working to ensure drinking water as well as rivers, lakes, ponds and wetlands, fish and wildlife are safe from PFAS contamination. The Agency will develop a plan and undertake a rulemaking to adopt water quality standards for the five PFAS chemicals by January 15, 2020, which adoption expected by 2024.

The Agency is working with the Vermont Department of Health to investigate and address contamination from the release of PFAS chemicals into the environment. Efforts are summarized here

Updates can be found here.

## Recommendations

The Agency continues regulatory oversight of hazardous waste sites to ensure legacy toxins do not migrate (hazardous waste website), supports illicit discharge detection surveys. MS4s continue to meet housekeeping criteria for MS4 permit. Partners efforts to provide winter management strategies are supported.

Support of Lake friendly lawn care practices help to limit use of pesticides, for example, Raise the Blade program.

# F. Wastewater

## Controlling Phosphorus from Wastewater Treatment Facilities and Other Industrial Discharges

Municipal wastewater, originating from a combination of domestic, commercial, and industrial activities, is conveyed to centralized wastewater treatment facilities (WWTF) and treated to established standards identified in permits[13] before discharge into a receiving water.

The treated wastewater from the nine WWTF in the basin contribute x percent of The North Lake Basin's P load to the lake (see Table x). As of the issuance of this Plan, all facilities have been reissued permits in accordance with the 2016 Lake Champlain Total Phosphorus TMDL (2016 TMDL), except for Burlington Main. In addition to total phosphorus limits, the post-TMDL permits have several requirements regarding phosphorus discharge to ensure that the facilities remain within their phosphorus allocation and maximize their removal of phosphorus.

The DEC Wastewater Program maintains a tracking system for phosphorus loading from Vermont WWTFs so that a facility approaching, or over, 80% of the annual mass limit in its permit can be identified. The 80% threshold is calculated by comparing the individual annual mass limit to the actual phosphorus discharge load from the WWTF over the prior 12 months:

**WWTF Annual TP Load / Annual Mass Limit x 100**

WWTFs in the Lake Champlain watershed with existing discharged loads of phosphorus already at, or above, 80% of their current annual mass limits are identified in Table 21.

To ensure that all facilities are operating as efficiently as possible, all reissued wastewater discharge permits under the 2016 TMDL will require facilities to develop or update a Phosphorus Optimization Plan (POP) to increase the WWTF's phosphorus removal efficiency by implementing optimization techniques that achieve phosphorus reductions using primarily existing facilities and equipment. Facilities will be given 12 months following permit issuance to engage in optimization techniques for the removal of TP.

In addition to the POP, all permits will require facilities' phosphorus discharge to be evaluated by the ANR Secretary relative to the 80% threshold after the optimization period and based on the

[13] National Pollutant Discharge Elimination System (NPDES) Permits

prior 12 months. The 80% evaluation continues on a rolling 12-month basis thereafter. If a facility is at, or reaches, 80% of its annual mass limit, the permittee must develop a Phosphorus Elimination/Reduction Plan (PERP) to ensure that the facility will comply with its annual mass limit.

Burlington and St. Albans City in the North Lake Basin (see Table 21) utilize combined sewers where stormwater and wastewater are directed to and flow together through the sewer system to the treatment facility. Occasionally, as a result of precipitation events that surpass the capacity of the sewer collection system, combined sewer overflows (CSOs) may occur. Communities with CSOs have been issued 1272 orders directing them to prepare a Long-Term Control Plan (LTCP). A guidance document that provides additional detail beyond the existing EPA guidelines and the requirements of the CSO Rule is being developed and the LTCPs prepared by municipalities will be evaluated against it. Due to the schedule in preparing this guidance document, DEC will work cooperatively with the communities to ensure that comprehensive plans with a high probability of success will be created.

**Table 21. Summary of permit requirements for the wastewater treatment facilities in the North Lake Basin.**

| Facility permit ID | Permit expiration | Design flow MGD | 5/01/2018 – 4/30/2019 Flow (MGD) / Percent of Design Flow | TMDL WLA MT P/yr. | 2018 % of WLA | IWC* 7Q10 /LMM | Treatment type | # of CSOs | Receiving water |
|---|---|---|---|---|---|---|---|---|---|
| Alburgh 3-1180 | 2022 | 0.130 | 0.164 MGD 126% | 0.108 | 5.4% | N/A | Aerated lagoons and spray field | 0 | Lake Champlain |
| St Albans City 3-1279 | 2022 | 4.000 | 2.49 MGD 625% | 2.76 (until upgrades completed or July 1, 2020) | 47.7% | 0.97/.061 | Rotating biological contactor | 1 | Stevens Brook Wetlands contiguous with Lake Champlain |
| St Albans Northwest Correctional 3-1260 | 2022 | 0.040 | 0.0207 MGD 52% | 0.028 | 46.1% | 0.024/0.014 | Tertiary treatment | 0 | Stevens Brook |
| VT Fish & Wildlife – Ed Weed Fish Culture Station 3-1312 | 2022 | 11.500 | 3.65 MGD 35% | 0.914 | 20.8% | N/A | Clarifier w/ alum | 0 | Lake Champlain |
| Burlington Main 3-1331 | 6/30/2010 | 5.300 | 3.94 MGD 74% | 1.464 | 26.4% | N/A | Activated sludge | 3 | Lake Champlain |
| South Burlington - Bartlett Bay 3-1284 | 2022 | 1.250 | 0.6175 MGD 49% | 0.345 | 22.4% | N/A | Extended aeration | 0 | Shelburne Bay |
| Shelburne 1 (Crown Rd) 3-1289 | 2022 | 0.440 | 0.258 MGD 58% | 0.122 | 48.4% | N/A | Sequencing batch reactor | 0 | Shelburne Bay |
| Shelburne 2 (Harbor Rd) 3-1304 | 2022 | 0.660 | 0.35 MGD 53% | 0.182 | 80.5% | 0.897/0.576 | Sequencing batch reactor | 0 | McCabes Brook |
| Hinesburg 3-1172 | 2022 | 0.250 | 0.147 MGD 59% | 0.069 | 62% | 0.554/0.162 | Aerated lagoon | 0 | LaPlatte 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*

### Alburgh

Treated wastewater is dispersed via spray irrigation on two land application areas that are underdrained. Treated wastewater that infiltrates into the soil and groundwater is collected in the underdrain system and discharges to the lake.

### St Albans City

The St Albans City WWTF is considered advanced treatment of wastewater. Following primary clarifiers, trickling filter and rotating biological contactors, the effluent is treated in flocculation tanks with alum and polymer for phosphorus removal. Effluent then flows to secondary clarifiers and sand filters followed by chlorination/dechlorination for disinfection. An upgrade project is currently under construction that will improve the ability of the facility to remove Phosphorus and to repair/replace other equipment.

Associated with the collection system for the WWTF is the presence of one active combined sewer overflow (CSO). This overflow occurs near Weldon Street and flows to Stevens Brook. The Agency has issued a §1272 Order, which requires ongoing abatement work to achieve compliance with CSO Policy. The City is in the process of developing a Long-Term Control Plan for their CSOs.

### St Albans Northwest Correctional

This treatment facility consists of four aerated lagoons and tertiary filtration followed by ultraviolet disinfection.

### VT Fish and Wildlife – Ed Weed Fish Culture

Wastewater flowing through the raceways is sent directly to the 1.3 acre polishing pond while wastewater from the cleaning of the raceways is directed to a clarifier and then to the finishing pond for treatment. While in the clarifier, the wastewater is treated with alum to facilitate solids settling. Effluent discharged from the pond flows down a stabilized channel to Lake Champlain.

### Burlington Main

This treatment facility is designed for an average daily flow of 5.3 MGD during dry weather conditions; however, the secondary treatment process has the hydraulic capacity to treat peak flow rates of 13 MGD of combined dry and wet weather wastewaters during storm events. Wet weather flows exceeding 11 MGD are treated through mechanical screening, vortex separation and disinfection to avoid discharge of waterborne human pathogens. This process also provides a high level of treatment for the "first flush" that typically contains the highest level of pollutant concentration. The City is currently (2014) monitoring to determine compliance with the CSO Policy. Burlington is currently studying integrated planning for the stormwater and the three Burlington wastewater facilities. The plan is scheduled to be completed in December 2019.

### South Burlington – Bartlett Bay

This facility provides advanced treatment of wastewater including rotary screening, extended aeration for secondary treatment and nitrification, chemical precipitation for phosphorus removal, a cloth disk filter for effluent polishing, and UV disinfection.

### Shelburne 1 – Crown Rd.

This facility provides advanced treatment of wastewater using sequential batch reactors for secondary treatment and nitrification, chemical precipitation for phosphorus removal, a cloth disk filter for effluent polishing and chlorination/dechlorination for disinfection.

### Shelburne 2 – Harbor Rd.

This facility provides advanced treatment of wastewater using rotary screening, sequential batch reactors for secondary treatment, nitrification, biological phosphorus removal, chemical precipitation for added phosphorus removal, filter for effluent polishing and ultraviolet light disinfection.

### Hinesburg

This treatment system consists of three aerated lagoons, chemical addition for phosphorus removal and chlorination/dechlorination for disinfection. The facility's current discharge permit includes a compliance schedule that requires an upgrade of the treatment system by December 31, 2022. The town is currently in the design phase of this upgrade.

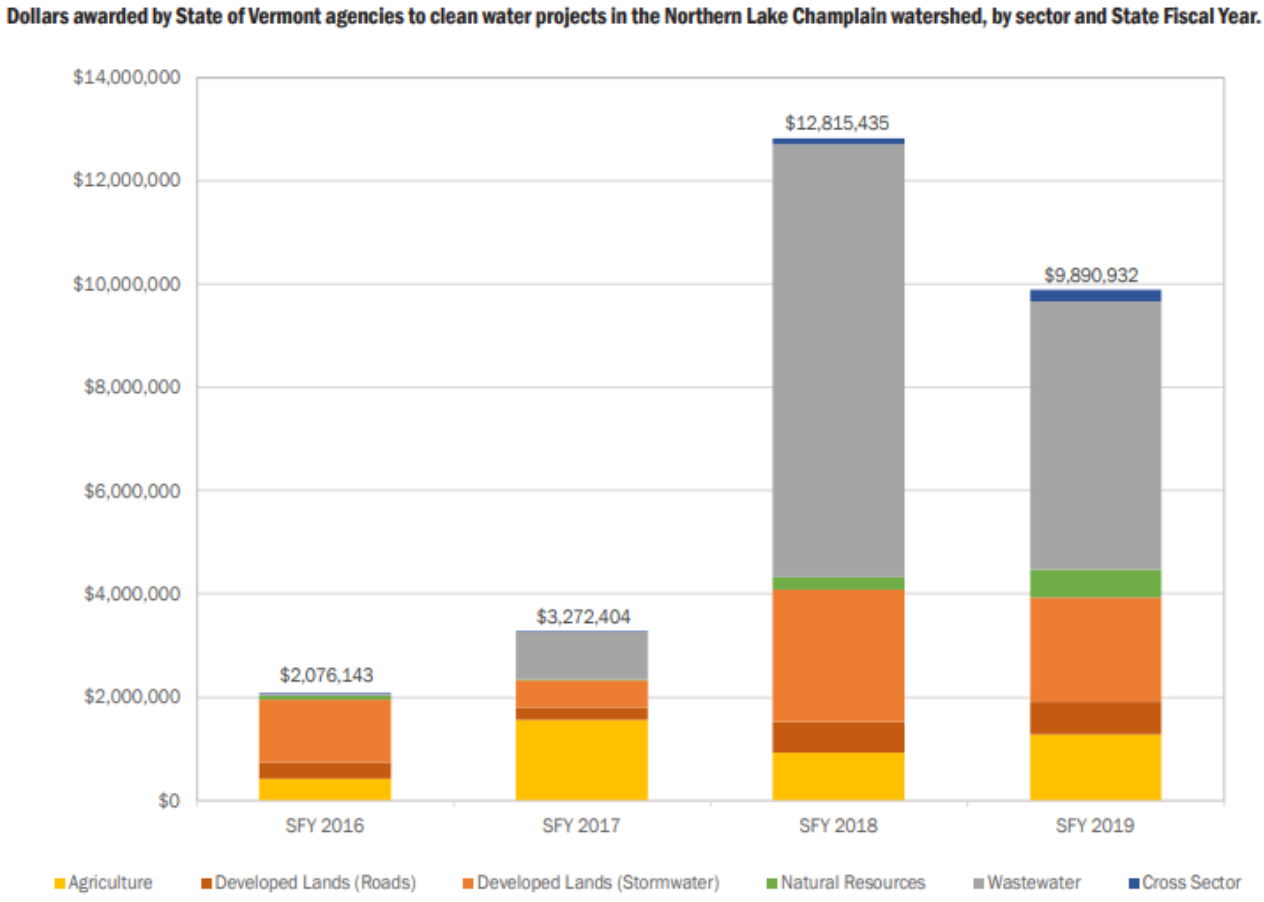



Figure 17.. Dollars awarded by State of Vermont agencies to clean water projects in the Northern Lake Champlain watershed, by sector and State Fiscal Year. (NEED MORE NARRATIVE TO SUPPORT THIS FIGURE – discussion of improvements o WWTF compared to other sectors?)

Municipalities have and will continue to upgrade WWTFs to meet the TMDL and optimize performance with assistance from State and federal loan and grant programs. Figure x indicates a significant increase in spending on these facilities since 2018 based on funding awarded by State agencies. The increase in funding coincides with permit approvals.

Most permit updates occurred in 201x. The Agency expects that future funding requests from municipalities will increase as efforts to update and improve facilities as required by permits progress. The DEC WSMD Wastewater Management Program's TMDL page provides additional information to assist municipalities with permit compliance, including a list of grant and loan opportunities.

To minimize the financial impact on communities of meeting 2016 TMDL targets for WWTF, DEC will employ flexibility by:

- Expressing effluent P limits in permits as total annual mass loads.
- Providing a period of time for optimization to be pursued and the corresponding load reduction results to be realized, and then commencement of the process to upgrade P treatment facilities will be required when actual P loads reach 80% of the TMDL limits.
- Establishing P compliance schedules in discharge permits that allow adequate time for planning, engineering, and municipal budgeting.
- Providing other forms of flexibility that support achieving the wasteload allocations in an optimally cost-effective manner, including P trading and integrated planning and permitting.

## G. Natural Systems/Resource Restoration--Forests

Forest lands, like many natural systems, support the health of surface waters and are often the predominant landcover in the watershed of a high-quality surface water. Trout Brook, a high-quality surface water in the basin benefits from x percent forested landcover.

Silviculture and sugaring provide the economic return that allow a landowner to keep their property forested. Management practices that focus on reducing stormwater runoff and river channel protection lead to continued protection of surface waters. The Agency supports appropriate practice through regulations as well as financial and technical resources to ensure the integrity of the forested landscape is protected.

Based on watershed TP modeling in support of the LC P TMDL, Figure XX identifies areas where forest TP export is highest. While TP loading rates are generally low in forested areas, areas with steep slopes and thin soils could be

**Reforestation on challenging sites**

The LaPlatte Headwaters Town Forest (LHTF) is a 301-acre conserved property, owned by the Town of Hinesburg, featuring forests, floodplains and wetlands on the headwaters of the LaPlatte River. The northern 100+ acres of the LHTF, which were historic floodplain and wetlands, was recently managed as pasture and hayfield, and was ditched, drained, and largely planted into reed canary grass. Shortly after acquiring the property in 2007, Hinesburg received grant funding to plug some of the ditches on this portion of the property and to do some tree and shrub planting, with varied success due to intense deer browse and interference from reed canary grass (RCG). Tree planting continued sporadically with funding from VYCC's watershed program, and the Trees for Streams program with the help of the Winooski NRCD, but it was clear that a more holistic management approach was needed to address the restoration of this area. With the help of Ethan Tapper, the Chittenden County Forester, Hinesburg reached out to The Nature Conservancy (TNC) and the Partners for Fish and Wildlife program of the US Fish and Wildlife Service (USFW). TNC was able to leverage internal funding for restoration, including through their Elm Project, to plan some innovative restoration work for 2020, including installing deer exclosures and clustered tree and shrub planting. USFW was able to use areas intensely infested with RCG to establish an experimental area, testing the response of RCG to different

problematic for forest road building and harvest activity. These areas should receive the most oversight to control downstream effects of erosion

Vermont Department of Forest, Parks, and Recreation (VDFPR) oversees programs and regulatory programs that work towards reducing runoff and erosion of forest lands, including, Acceptable Management Practices for Logging Jobs, Vermont Voluntary Harvesting Guidelines to protect forest health and Sustainability, local skidder bridge programs, information minimizing water quality impacts from maple sugaring operations, and forest land conservation efforts.

The VAAFM also assists with sugaring operations that are not part of a forest management plan. The benefit of a forest management plan includes increased technical assistance from the VDFPR.

The VDFPR, the VDEC, and partner organizations are offering training, technical assistance, outreach, and funding to maintain forest lands for water quality as well as many other benefits.

## Progress and Recommendations

### *Regulatory updates - Acceptable Management Practices*

The Acceptable Management Practices (AMP) program update was the most significant regulatory modification to address forestry practices and phosphorus loading as outlined in the 2016 Lake Champlain TMDLs Phase I Implementation Plan.[14] The AMPs are required for about 60% of the forest land in Vermont – land that is in the Use Value Appraisal Program, forest legacy program, or under state or federal ownership. The Heavy cutting rule is another state regulatory program associated with silvicultural activity.

The VDFPR updated the Accepted Management Practices (AMPs) for maintaining water quality and minimizing erosion on logging jobs in Vermont effective as of August 11, 2018. The AMPs provide measures for loggers, foresters, and landowners to utilize, before, during, and after logging operations to comply with the VWQS. Specifically, their intent is to prevent any mud, petroleum products and woody debris (logging slash) from entering the waters of the State and to otherwise minimize the risks to water quality. Updates in 2018 include standards for permanent crossing on intermittent streams. Key modifications are found here. The DFPR provides regular trainings on these practices.

### *Bridge Program: Skidder bridges and permanent bridges*

To reduce erosion in stream channels, the VDFPR is promoting and demonstrating the use of portable bridge designs on timber harvesting operations throughout Vermont. When properly installed, used, and removed, skidder bridges minimize stream bank and stream bed disturbance as

[14] 2016 Lake Champlain TMDLs Phase I Implementation Plan available at: https://dec.vermont.gov/watershed/cwi/restoring/champlain.

compared with alternative devices, such as culverts or poled fords. Although, rentals are available through the WNRCDs, the VDFPR is currently focusing on helping loggers obtain their own bridges in response to loggers' preferences of ownership over rental.

DFPR also helping with larger bridges for logging trucks?

### *Funding to address erosion from roads and log landings*

The Regional Conservation Partnership Program (RCPP funding is available to close out old logging roads or improve more permanent stream crossings required on sugarbush roads. In addition, Clean Water Funds have also been available. Prioritization of projects will be improved with following studies and inventory tools.

### Study: Estimating Phosphorus and Sediment Reduction Potential

The ANR is supporting work to identify priority areas to target forestland BMPs in the Lake Champlain and Lake Memphremagog basins. The final produce will also support estimating phosphorus and sediment reduction potential associated with forestland BMPs driven through regulatory and non-regulatory means, which will be used to inform interim phosphorus reduction targets, as well as estimate phosphorus reductions associated with BMP/ project implementation.

### Forest Road App

The Agency has developed an App to identify and prioritize erosion issues along hydrologically connected gravel or forest roads. Downloadable to smart phones and smart screens, field assessments will become possible by contractors and volunteers with minimal training requirements. The final prioritization of road segments will allow partners to prioritize assistance based on contribution of erosion features on logging or sugarbush roads to surface waters. Landowners may also use to prioritize their own efforts as well as support funding requests.

## H. Natural Resource Restoration--Lakeshore Restoration

Naturally vegetated lakeshore or shoreland is necessary to prevent water quality degradation, maintain healthy habitat, and promote flood resilience. The conversion of forested shoreland to

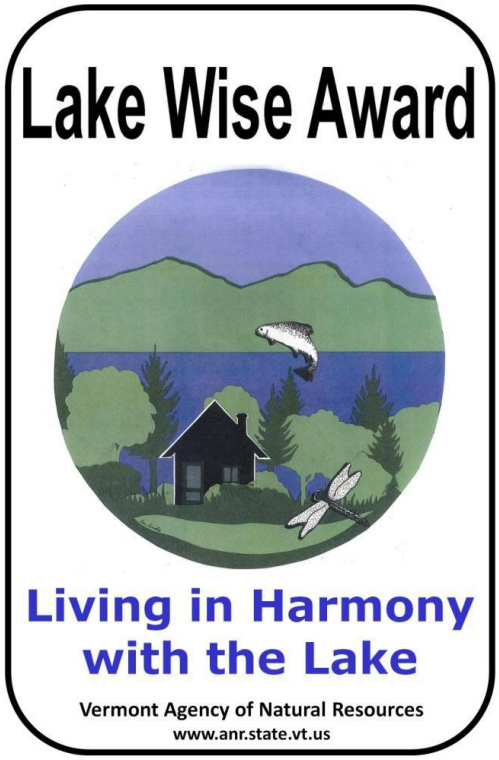
lawns, houses and driveways may contribute 5% more runoff, 7% more P, and 18% more sediment to lakes than undeveloped sites (citation). Remediation and restoration practices along developed shorelands can reducing impact and include management of stormwater runoff and restoration of native vegetation.

The DEC WSMD promulgates protection regulations primarily through the Shoreland Protection Act[15], but also facilitates restoration in partnership with watershed groups and lake associations. The DEC Lake Wise program provides education and trainings to landowners, but also includes contractor trainings for shoreline bioengineering techniques. For interested watershed groups and lake communities, DEC assists with development of watershed plans for individual lakes to identify priority projects. In addition, DEC supports work to protect recreational uses impacted by Aquatic Invasive Species (AIS).

## Progress and Recommendations

### *Lake Wise Program*

The Lake Wise Program, an ANR initiative that awards lake-friendly shoreland properties, is available to lakeshore owners and lake associations to assess shorelands for improvements that benefit water quality and wildlife habitat. The program provides on-site review of shoreland conditions and recommendations for lessening the impact of existing shoreland development on a lake. Landowners wishing to retrofit their property to meet Lake Wise standards are given a list of BMPs that can be easily implemented. Participation is tracked and a cumulative benefit of the program in terms of improved property management can be calculated.




To date, Lake Iroquois is the only inland lake in the North Basin with participating shoreland properties, including 11 landowners who have implemented BMPs towards receiving a sign or certificate. On Lake Champlain, participating properties are clustered in the Town Farm Bay, Malletts Bay and St. Albans Bay area. Inland lakes

[15] regulates shoreland development within 250 feet of a lake's mean water level for all lakes greater than 10 acres in size.

with a poor or fair shoreland score would benefit from implementing Lake Wise Program BMPs (see Table 3). Most areas of Lake Champlain shoreline would benefit.

Where water resources issues exist, priority is given to shorelines where lake associations are interested in supporting a community stewardship ethic and have helped to promote the program. Lake Iroquois has been a focus for this reason. Communities in the islands have also expressed interest and could be a focus for additional efforts.

### *Aquatic Invasive Species Monitoring*

In addition to Lake Champlain, three lakes have identified Aquatic Invasive Species (AIS): Lake Iroquois (Hinesburg, Williston), Lower Lake (Hinesburg), and Indian Brook Reservoir (Essex Junction). The specific AIS (both plant and animal) and associated strategies to address existing population can be found in Table x and the WSMD Lakes and Pond Program AIS Map.

Once any aquatic invasive becomes established in a waterbody, eradication becomes difficult. The Agency's strategy is to reduce spread to new waterbodies through monitoring to allow for early detection measures and possible eradication. Since the last TBP, Lake Champlain has seen the introduction of the Fishhook water flea. Current monitoring and outreach messages are focused on these species. No additional spread to inland lakes or ponds has been identified. Strategies to support AIS spread prevention efforts include regular and expanded AIS monitoring, initiating AIS Greeter Programs, and AIS spread prevention through signage or Vermont Invasive Patroller program. Current greeter programs exist at Lake Iroquois, St. Albans Bay (?)xxxxxxxx.

For established population, the Agency provides financial and technical assistance to lake associations and municipalities to manage populations to allow for continued recreational uses. Management of existing populations is also supported through the DEC Grant-in-Aid Program. For the last x years, the Lewis Creek Assn is involved in Frog Bit, an aquatic nuisance species, control in Town Farm Bay and watershed with support from the Agency and partners.

Monitoring of Aquatic Invasive Species is also prioritized based on current threats, including the spiney water flea and …  Removal efforts are prioritized based on interests of community groups, except for the removal of Water Chestnut, where the Agency's goal is to reduce northward advancement of populations.

## I. Natural Resource Restoration - Rivers

Rivers constantly balance the energy they produce and the work that must be done to carry the water, sediment, and woody material produced in their watersheds. A change in any of these factors will cause adjustments of the other variables until the river system comes back into equilibrium. These changes can be caused by natural events and by human activity. Human activities can disrupt the balance by changing flow inputs to the channel (e.g., by deforestation, increasing impervious surfaces and runoff, or water withdrawals) or by changing sediment regime (e.g., dams, dredging, or in response to intensified erosion). In the North Lake Basin, changes are frequently caused by natural flood events as well as increases in impervious surfaces and runoff, channel straightening, berming, and dams. The impact of these actions may be seen immediately or for decades after the activity occurred.

The VDEC supports the management of rivers to protect and restore their equilibrium condition. Stream equilibrium leads to good water quality, healthy aquatic habitat, and flood resilience in the basin. The Lake Champlain Phase I Implementation Plan includes protection strategies as well as restoration to achieve equilibrium as well as the phosphorus load reduction targets for unstable streams. River corridor and floodplain protection ensures that the desired channel evolution, stream equilibrium, and natural floodplain function can take place whether it be from restoration activities or through the natural channel forming processes that occur during floods. Protection efforts supported are discussed in Chapter 2, including municipal protection of flood plain and river corridors.

The Agency supports community involvement in strategic floodplain protection and restoration work as part of a Functioning Floodplain Initiative. Additional strategies include support of dam removal where landowners are willing as well as continued support of towns and VTrans to replace culverts with geomorphologically compatible ones or bridges where resources allow

## Progress and Recommendations

To help communities and watershed organizations identify and track priority projects, the Agency is currently supporting the development of floodplain connectivity mapping and hydrology -hydraulics mapping framework. A second part of the initiative is the development of a methodology and maps for the Lake Champlain Basin to quantify existing and potential floodplain functions related to water quality, habitats and flood hazard mitigation. The Agency's Functioning Floodplain Initiative is envisioned to augment current state river corridor planning.

Until the methodology is completed, stream geomorphic assessments (see below) and the Agency Rivers Program staff help communities prioritize areas and project types to enhance stream continuity and reduce associated nutrient load. Areas where community interest exists in corridor protection include the LaPlatte River watershed.

**Figure 18. Floodplain restoration in 2019 at Beecher Brook, a project managed by Lewis Creek Assn with ERP funding. Photo credit: Lewis Creek Assn.**

The VANR contributes technical assistance and funding required to enhance flood resilience through actions including the construction of flood benches and the removal of berms and dams. Moreover, VANR continues to provide technical assistance to encourage towns to protect river corridors through municipal zoning, over lays, and conservation.

## *Stream Geomorphic Assessments*

Stream geomorphic assessments (SGA) and associated corridor plans describe the physical integrity of rivers and develop management strategies in support of stream equilibrium. The final products of the assessment are the condition of each reach, the channel adjustment process that may be underway, and the sensitivity of the reach to change from anthropogenic and/or natural sources. The Phase 1 and Phase 2 SGAs completed on the North Lake Basin streams can be found here. No other geomorphic assessments are planned for this basin at this time. Phase 2 lite assessment would be supported at these reaches: Mill River, LaPlatte River…..????

The Phase 2 lites would result in additional project development to advance restoration of floodplain access and stream stability through active projects such as floodplain excavation, berm removal, channel restoration, and/or river corridor easements where feasible. These projects will be key to restoring stream stability and water quality, especially in subwatersheds where nutrient and/or sediment impairment is of concern.

## *Dams of the North Lake Basin*

Dams are considered a channel modifications. There are 25 dams in the basin compared with over 1,000 statewide. While dams provide renewable energy and recreational opportunities such as boating, fishing, and swimming, they can also:

- impede a stream's ability to transport flow and sediment;
- cause streambank erosion and flooding problems;
- degrade and alter fisheries habitat;
- create barriers to AOP;
- alter downstream temperature
- degrade water quality; and
- impede river-based recreational activity.

Of the 22 inventoried dams, 18 are in-service, 4 are breached or partially breached (Table 21). In 2019, the Mill Pond dam on Indian Brook in Colchester was removed and the area restored as a stream channel.

Agency regulatory oversight includes certification of hydroelectric dams pursuant to a Section 401 of the federal Clean Water and 2018 Act 161. There are no hydroelectric dams in The North Lake Basin.

Under a new law passed in 2018, Act 161, VDEC is required to maintain an inventory of all dams in the state and develop rules that will require all dams to be regularly inspected. The law addresses gaps in inspection requirements for hundreds of small dams. The administrative rules are expected to be in place by July 2020 with standards to follow 2 years later.

Dam owners are also voluntarily removing dams with the assistance of partners including TNC, USFWS, VNRC and the Agency. Table x provides a list of dams in the basin along with potential for removal based on landowner interested, potential for infrastructure damage downstream if dam fails (Dam Haz Z Class) as well as a ranking for ecological improvement (TNC Rank).

**Table 18. Vermont dam inventory with priority dams assessed by xxx identified by color (yellow, orange, red continuum from low to high priority)**

| State ID | Dam Name | Stream | Town | TNC Rank | Dam Haz Class | Dam Status | Comments |
|---|---|---|---|---|---|---|---|
| **3.01** | Mud Creek | Mud Creek | Alburgh | Medium | 3 | In Service | VDFW WMA |
| **51.01** | Colchester Pond | Pond Brook | Colchester | High | 2 | In Service | WVPD natural area/park |
| **69.01** | Indian Brook Reservoir | Indian Brook | Essex | Medium | 1 | In Service | Town park |

| State ID | Dam Name | Stream | Town | TNC Rank | Dam Haz Class | Dam Status | Comments |
|---|---|---|---|---|---|---|---|
| **70.01** | St. Albans North Reservoir | Mill River | Fairfax | Medium | 1 | In Service | Provides drinking water |
| **70.02** | St. Albans South Reservoir | Mill River | Fairfax | Low | 1 | In Service | Provides drinking water |
| **79.01** | Stone Bridge Pond | Stone Bridge Brook | Georgia | High | | Breached | |
| **97.01** | Lake Iroquois | Patrick Brook | Hinesburg | Medium | 3 | In Service | Lake with homes |
| **97.02** | Lower Pond | Patrick Brook | Hinesburg | Very Low | 2 | In Service | Pond with homes |
| **97.03** | Iroquois Mfg. Co. Mill Pond (Upper) | Patrick Brook | Hinesburg | Very Low | 3 | In Service | |
| **97.04** | Cemetery Pond | Patrick Brook | Hinesburg | Low | | Breached (Partial) | |
| **97.05** | Twitchell | La Platte River-TR | Hinesburg | Medium | 3 | In Service | Pond with home |
| **97.07** | Champlain Valley Union High School | Patrick Brook-OS | Hinesburg | Low | 3 | In Service | |
| **97.08** | Iroquois Mfg. Co. Mill Pond (Lower) | Patrick Brook | Hinesburg | Very Low | 3 | Breached (Partial) | |
| **128.04** | Milton Pond | Malletts Creek-TR | Milton | High | 3 | In Service | |
| **128.07** | Long Pond | Lake Champlain-TR | Milton | Medium | 3 | In Service | Pond with homes |
| **192.02** | UVM (Upper) | Lake Champlain-TR | South Burlington | Very Low | 3 | In Service | At UVM horticulture research center |
| **192.03** | UVM (Lower) | Lake Champlain-TR | South Burlington | Very Low | 3 | In Service | At UVM horticulture research center |
| **192.05** | UVM (East) | Muddy Branch-OS | South Burlington | Very Low | 3 | In Service | At UVM horticulture research center |

| State ID | Dam Name | Stream | Town | TNC Rank | Dam Haz Class | Dam Status | Comments |
|---|---|---|---|---|---|---|---|
| **192.06** | Village at Dorset Park Pond #1 | Potash Brook-TR – OS | South Burlington | | 3 | In Service | |
| **192.07** | Village at Dorset Park Pond #2 | Potash Brook-TR – OS | South Burlington | | 3 | In Service | |
| **192.08** | Village at Dorset Park Pond #3 | Potash Brook-TR – OS | South Burlington | | 2 | In Service | |

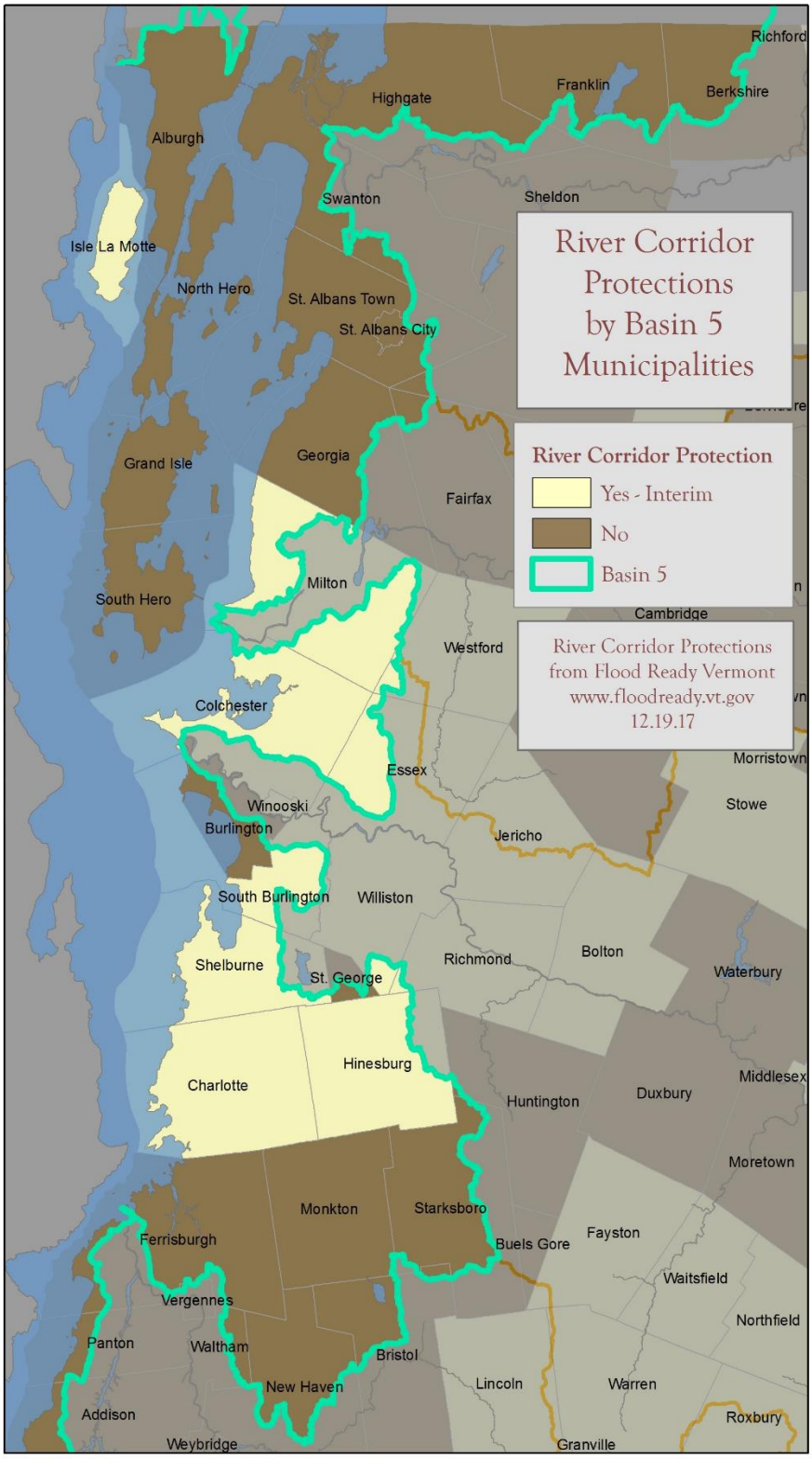
## *Floodplain Management*

Municipalities play an important role in moving rivers towards equilibrium by protecting floodplain connection. In turn, floodplain connection helps the municipality increase the community's flood resilience. VDEC and partners provide assistance by identifying flood attenuation zones, e.g., floodplains, river corridors, forests and wetlands, and recommending actions and policies to towns that will protect these functions and reduce the risks facing existing development. The Flood Ready website hosts supportive materials for municipal officials including community data on the River Corridor Protections Summary Report and Expanded Community Reports.

VDEC River Corridor and Floodplain Protection Program has prepared model flood hazard bylaws to assist municipalities in the development of their flood hazard regulations. These bylaws have been pre-reviewed by the Federal Emergency Management Agency (FEMA) and meet or exceed the requirements of the National Flood Insurance Program (NFIP). In addition, adoption and enforcement of Section D, River Corridors, qualifies communities for enhanced cost share under the Emergency Relief and Assistance Fund (ERAF).

ERAF provides State funding to match Federal Public Assistance after federally Declared disasters. Eligible public costs are reimbursed by federal taxpayers at 75%. As of October 23, 2014, the State of Vermont contributes 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. Only x towns qualify for the 17.5% contribution. However, x towns are participating in the National Flood Insurance Program, have adopted the Town Road and Bridge Standards, and have adopted a Local Hazard Mitigation Plan.

Towns that meet ERAF criteria protect water quality while protecting themselves financially. Questions regarding the model flood hazard bylaws and ERAF should be directed to the appropriate DEC Regional Floodplain Manager: https://bit.ly/2L2rc0e.


River Corridor Protections by Basin 5 Municipalities
River Corridor Protection
Yes - Interim
No
Basin 5
River Corridor Protections from Flood Ready Vermont www.floodready.vt.gov 12.19.17
Richford
Highgate
Franklin
Berkshire
Alburgh
Swanton
Sheldon
Isle La Motte
North Hero
St. Albans Town
St. Albans City
Grand Isle
Georgia
Fairfax
Milton
South Hero
Cambridge
Westford
Colchester
Essex
Morristown
Stowe
Winooski
Burlington
Jericho
South Burlington
Williston
Shelburne
St. George
Richmond
Bolton
Waterbury
Hinesburg
Charlotte
Middlesex
Huntington
Duxbury
Moretown
Monkton
Starksboro
Ferrisburgh
Buels Gore
Fayston
Waitsfield
Vergennes
Northfield
Panton
Waltham
Bristol
New Haven
Lincoln
Warren
Addison
Roxbury
Weybridge
Granville

# J. Natural Resource Restoration—Wetlands

As recently as the 1950s, wetlands were seen as obstacles to development, agriculture, and transportation, and consequently, were systematically drained and altered. The remaining wetland may only comprise 35% of Vermont's original wetland cover. These losses and alterations resulted in a reduction in wetland processes that protect and improve water quality and wildlife habit including attenuating sediment and nutrients, providing habitat for a wide variety of plants and animals, and increasing flood resilience. While protecting remaining wetland resources is an important strategy in the basin (see Ch. 2), restoring degraded wetlands will improve water quality and will reduce P export from the landscape to meet the State's clean water goals.

Protection or restoration of wetlands is supported through the VDEC Wetlands Program Restoration Initiative that includes identifying sites with the greatest potential for P removal through restoration, and wetland conservation and mapping. The North Lake Basin candidates for restoration are focused in the Charlotte Direct Drainages, the LaPlatte, St. Albans Bay as well as the Islands.

## Wetland Restoration

A Lake Champlain wetland restoration site prioritization modeling was updated in 2018 utilizing Regional Conservation Partnership Program funds. The VDEC RCPP Wetland Restoration Site Prioritization Map, which identify potential wetland restoration areas with the highest likelihood of phosphorus attenuation are now available on the ANR Atlas and the Wetland Inventory Mapper. Partners such as NRCDs, NRCS, VLT, TNC and DFW are using these maps and a subset of project packets to help target wetland restoration outreach. For example, DFW has initiated a wetland restoration and acquisition initiative with funding from EPA through the Lake Champlain Basin Program. The primary focus of this project is wetland restoration on new and existing DFW acquisitions with a goal of 40% lands restored. One of the geographic focus areas is the St. Albans Bay watershed and the priority mapping is being utilized for outreach.

Other areas in the North Lake Basin that may rank high are areas in close proximity to surface waters with clay soils (i.e., in soil hydrologic groups C and D). Charlotte Direct Drainages, the LaPlatte, St. Albans Bay as well as the Islands would all be an appropriate target for initial wetland restoration efforts based on those criteria. VDEC and partners will focus on highest priority sites for contractor outreach and partner collaboration.

## Wetland Conservation and Mapping

The VDEC is currently working on a wetland easement calculator to evaluate the value of wetlands for protection through the easement process. The wetland conservation easements will be used to

prioritize protection and restoration of wetlands with significant function and values related to water quality, flood protection, climate change mitigation and wildlife habitat.

# Chapter 5 – Strategy Implementation

## A. Process

The North Lake Basin Plan addresses the impaired, stressed, and altered waters in the basin as well as protection needs for high quality waters. The list of strategies in the Implementation Table (Table 20) and the Monitoring and Assessment Table (Table 21) cover future assessment and monitoring needs, as well as projects that will lead towards surface water protect or restoration.

Actions in The North Lake Basin are associated with both regulatory requirements as well as voluntary opportunities. Chapter 4 describes a community in each sector that is well on its way to meeting permit compliance or is actively adopting voluntary practices. Continuation of availability of resources will ensure that this pattern continues. At this point, funding is not a major hurdle to complete projects unless related to capacity building. A new act supporting the delivery of clean water services, Act 76, was established in 2019 to increase regional capacity to develop and carry out projects that fulfill actions identified in the Phase II Lake Champlain Phosphorus TMDL Implementation Table. The Act 76 fact sheet developed by VDEC explains the fundamental aspects of the Act.

PARTNERS helping?

The Implementation Table Summary is a list of 49 priority strategies to be used to guide efforts toward watershed practice implementation. A list of related, individual project entries is found in the online Watershed Projects Database (WPD). The projects vary in level of priority based on the strategies outlined in the summary. Not all the WPD projects are expected to be completed over the next five years, but each strategy is expected to be pursued and reported upon in the following plan and updated in the WPD.

As projects are developed, priority for CWIP funding will be given to those projects that achieve the highest water quality benefits. Additionally, projects that provide cumulative benefits (i.e. flood resilience, water quality improvement, water resource protection, aquatic organism passage) will receive additional consideration for prioritization.

Table 19 is organized by land use or pollutant sectors described in Chapter 4

Table 20 provides a list of monitoring and assessment recommendations for Basin 5 in the next 5 years

### Keeping track of progress

The Clean Water Initiative Program (CWIP) funds, tracks, and reports on priority projects to restore Vermont's waters, and communicates progress toward meeting water quality restoration targets outlined in the Total Maximum Daily Loads (or TMDLs). CWIP also coordinates funding, tracking,

and reporting of clean water efforts for federal and state partners, including Clean Water Initiative partner state agencies – the Agencies of Agriculture, Food and Markets; Commerce and Community Development; Natural Resources; and Transportation – and the Lake Champlain Regional Conservation Partnership Program of the Natural Resources Conservation Service. The 2019 report includes a summary for the North Basin, see Figure 26

# Northern Lake Champlain Watershed Results

**Results of clean water projects funded by State of Vermont agencies completed, SFY 2016-2019, by sector, in the Northern Lake Champlain watershed. Note: Does not include results of projects funded, but not yet completed.**

**AGRICULTURE**

| AGRICULTURE PROJECT OUTPUTS | 2016 | 2017 | 2018 | 2019 | TOTAL |
|---|---|---|---|---|---|
| Acres of agricultural land treated by conservation practices | 229 | 615 | 457 | 1,233 | 2,533 |
| Acres of agricultural land treated by forest and grass buffers | – | 81 | – | – | 81 |
| Acres of pasture with livestock excluded from surface waters | – | 81 | – | – | 81 |
| Number of barnyard and production area practices installed | 18 | 4 | 7 | 3 | 32 |
| Acres of water quality protections within newly conserved agricultural lands | – | 20 | 14 | – | 34 |
| Estimated acres of agricultural land treated through equipment | – | 153 | 2,018 | 4,934 | 7,105 |
| **AGRICULTURE POLLUTANT REDUCTION** | **2016** | **2017** | **2018** | **2019** | |
| Total phosphorus load reduction (kilograms per year) | 2.0 | 111.0 | 73.8 | 332.7 | |

**NATURAL RESOURCES**

| NATURAL RESOURCES PROJECT OUTPUTS | 2016 | 2017 | 2018 | 2019 | TOTAL |
|---|---|---|---|---|---|
| Acres of forested riparian buffer restored | – | 9 | 4 | 3 | 15 |
| Acres of riparian corridor conserved and restored through easements | – | – | – | – | – |
| Acres of floodplain restored | – | – | – | – | – |
| Acres of lakeshore restored | – | – | – | – | – |
| Stream miles reconnected for stream equilibrium/fish passage | – | – | – | – | – |
| Acres of wetland conserved and restored through easements | – | – | – | 17 | 17 |
| Acres of forestland conserved with water quality protections | – | – | 8 | – | 8 |
| Miles of forest road drainage and erosion control improvements | – | – | – | – | – |
| Number of stream crossings improved | – | – | – | – | – |
| Square feet of eroding gully remediated | – | – | 7,108 | 27 | 7,135 |
| **NATURAL RESOURCES POLLUTANT REDUCTION** | **2016** | **2017** | **2018** | **2019** | |
| Total phosphorus load reduction (kilograms per year) | – | 8.0 | 13.2 | 13.2 | |

**DEVELOPED LANDS**

**ROADS**

| DEVELOPED LANDS AND ROADS PROJECT OUTPUTS | 2016 | 2017 | 2018 | 2019 | TOTAL |
|---|---|---|---|---|---|
| Acres of existing impervious surface treated by stormwater practices | 0.2 | – | 0.7 | 67 | 68 |
| Miles of municipal road drainage and erosion control improvements | – | 0.1 | 1.6 | 4.9 | 6.6 |
| Number of municipal road drainage and stream culverts replaced | – | – | 2 | 17 | 19 |
| Cubic yards of Class IV road gully erosion remediated | – | – | – | – | – |
| Cubic yards of catch basin outlet erosion remediated | – | – | – | – | – |
| Acres stabilized through use of hydroseeder/mulcher equipment per year | – | – | – | – | – |
| **DEVELOPED LANDS AND ROADS POLLUTANT REDUCTION** | **2016** | **2017** | **2018** | **2019** | |
| Total phosphorus load reduction (kilograms per year) | 0.1 | 1.0 | 2.2 | 34.5 | |

**WASTEWATER**

| WASTEWATER PROJECT OUTPUTS | 2016 | 2017 | 2018 | 2019 | TOTAL |
|---|---|---|---|---|---|
| Number of combined sewer overflow abatements completed | – | – | – | – | – |
| Number of sewer extensions completed | – | – | – | – | – |
| Number of wastewater collection systems refurbished | – | – | – | – | – |
| Number of wastewater treatment facility refurbished | – | – | – | – | – |
| Number of wastewater treatment facility upgrades completed | – | – | – | – | – |

Figure 19. Summary of work supported in the North Basin 2018-2019.

## B. The North Lake Basin Implementation Table Summary

Table 19. Summary implementation actions for the Basin 5 tactical basin plan (Lake Champlain P TMDL associated strategies with *).

| Strategy | Priority Area | Towns | Partners (see Partners) | Funding (see also LINK) |
|---|---|---|---|---|
| **Expand small farm NMP development courses and workshops, trainings for farmers, manure applicators and technical service providers*** | St. Albans Bay, Islands Malletts Bay, LaPlatte River, Charlotte Direct | | VACD, UVM extension | CWF |
| **Increase inspections in critical and priority watersheds:** | St. Albans Bay, Islands Malletts Bay, LaPlatte River, Charlotte Direct | | AAFM, FNLC. NRCD | AAFM |

| | | | | |
|---|---|---|---|---|
| **Increase BMP implementation in *critical* and priority watersheds: 1.Provide farms with access to case managers in St. Albans Bay to increase conservation practice implementation through participation in State and federal financial and technical assistance programs*;** | St. Albans Bay (critical), Islands, Malletts Bay, LaPlatte River, Charlotte Direct | | AAFM, DEC, NRCD(Critical) | RCPP, USDA |
| **Increase technical assistance in critical and priority? watersheds: support technical staff to work with farms to meet RAP and higher BMPs *** | St. Albans Bay (critical), Islands, Malletts Bay, LaPlatte River, Charlotte Direct | | FNLC, FWC, NRCD, VACD | AAFM |
| **Pilot and support the Environmental Stewardship Program to incentivize additional BMP adoption *** | All | | VAAFM | AAFM |

| | | | | |
|---|---|---|---|---|
| **Promote grassed waterways: Target funding to critical source and priority areas*** | St. Albans Bay (critical), Islands, Malletts Bay, Town Farm Bay | | NRCD | AAFM, NRCS |
| **Support Equine manure management workshops** | Malletts Bay, LaPlatte and tributaries, Charlotte direct drainages, The Islands | | WNRCD | |
| **Help municipalities control runoff from gravel and paved roads: provide technical and financial resources to assist with implementation of work to meet Municipal Roads General Permit*** | All | All | CCRPC, NRCD | CWF: VTrans; grant-in-aid |
| **Provide technical assistance to promote best winter management practices on public and private roads and parking lots** | (where high Chloride data?) | area covered by MS4s | UVM Sea Grant, WNRCD, NRPC | |

| | | | | |
|---|---|---|---|---|
| **Support implementation of projects identified in water quality plans (e.g.,stormwater master plans and Phosphorus and Flow Reduction Plans)*** | All | | FNLC, LCA, WNRCD, NRPC, CCRPC | CWF |
| **Promote adoption of residential practices to protect surface waters** | All | | CCRPC, NRPC, FNCRD, WNRCD, MS4s, LCA | |
| **Implement "Three-acre" permit.*** | | | DEC | CWF |
| **Support municipals' efforts to protect and improve surface water quality and decrease fluvial erosion (Functioning Floodplain Initiative for this and following strategies?)*** | Stevens, Mill, LaPlatte, McCabes | | DEC, NRPC, CCRPC | (ACCD?) |

| | | | | |
|---|---|---|---|---|
| **Increase the number of river and floodplain restoration projects Re-establish connections to floodplains. Includes two-tiered ditch*** | two-tiered ditch in priority watersheds for agric. work | | DEC, TNC, FNLC, LCA, NRPC | CWF |
| **Replace geomorphologically incompatible culvert and bridges: RPCs work with towns to identify, add to capital budget, seek additional funding sources*** | | | NRPC, CCRPC, LCA | federal hazard mitigation funds, Municipalities, VTrans grants |
| **Increase River Conservation Easements: support projects which incorporate channel management and riparian buffer*** | | | DEC, VLT, | RCCP, CWF |
| **Support studies to investigate benefits of removal of dams listed in Table X*** | | | VT Dam group, DEC, | CWF, LCBP, Watershed Gran |

| | | | | |
|---|---|---|---|---|
| **Prioritize work with landowners based on contribution of erosion features on logging roads to water quality impairment. Provide technical and financial assistance*** | Mill River, Malletts Creek, LaPlatte, Mud Hollow | | DFPR | RCPP |
| **Provide loggers with access to portable skidder bridges as part of their general practices either through rental program or assistance with building and ownership of bridges *** | Mill River, Malletts Creek, LaPlatte, Mud Hollow | | DFPR, FNRCD, WNRCD | RCPP |
| **Enhance forest cover to improve watershed health by promoting the use of Ecologically Sensitive Treatment Areas for managed forest in current-use*.** | | | DFPR | |

| | | | | |
|---|---|---|---|---|
| **Provide outreach to landowners, forest managers, loggers on AMPs*** | | | DFPR | |
| **Support management of forest roads to reduce erosion*** | Mill River, Malletts Creek, LaPlatte, Mud Hollow | | DFPR | |
| **Assist community with management and control of invasive species** | St. Albans Bay; Pelot Bay; Lake Iroquois; Town Farm Bay | | DEC, LCA, LCC | DEC AIS Grant-in-Aid, LCBP |
| **Provide education and outreach to reduce spread of AIS** | All boating access | | LCBP, | LCBP |
| **Promote lake-friendly shoreline property maintenance** | Lake Iroquois and Lower lake, Georgia shorelines, Island shorelines (or all of Lake Champlain or based on a report showing areas most susceptible to erosion?) | | DEC, UVM Sea Grant, WNRCD, VYCC, NRPC | |
| **Promote improved maintenance of on-site wastewater systems** | Fairfield Pond; Lake Iroquois; Georgia shorelines, Island shorelines | | DEC, WNRCD, FNLC | DEC, LCBP, UVM Sea Grant, |

| | | | | |
|---|---|---|---|---|
| **Designate wetlands within the basin as Class I** | Mud Creek? | | DEC, watershed groups | |
| **Identify potential wetland restoration sites based on Lake Champlain wetland restoration map and additional resources and restore*** | Wetlands adjacent to WMAs for EPA funding: Black, Malletts and Mud Creeks, Maquam | | DEC, TNC, USFWS | USDA, RCPP |
| **Encourage protection of forested land** | Lake Iroquois | | Town, LIA, DFRP | Federal town forest land program |
| **Identify Streams and Wetlands for Reclassification to increase protection of high quality conditions** | Trout River | | DEC, towns, watershd groups | |
| **Increase understanding of surface water condition and potential sources** | (Table 20) | | DEC, towns,CCST SCRW, FNLC | DEC LaRosa Program Partnership |

## C. Monitoring Priorities

Within the North Lake's 5-year planning process, monitoring is scheduled for 2021. The monitoring scheduled during this year includes stream and wetland biomonitoring as well as . In addition, other programs will feed monitoring data into the planning process on an ongoing basis. The Agency's Water Quality Monitoring Program Strategy describes the monitoring programs supported by both the Agency and its partners., which are also listed in Chapter 2. Common goals for monitoring efforts across programs include identifying water quality conditions as well as pollution sources.

Prior to the monitoring year, the DEC Watershed Management Division coordinate a water quality summit for the basin to better integrate monitoring efforts across the division. During the summit, sites included in Table 20 as well as additional sites are prioritized and efforts across programs coordinated to enhance efficiency.

**Table 20. Monitoring Needs for North Basin**

| Watershed | Stream | Monitoring Type | Reason |
|---|---|---|---|
| **St. Albans Bay** | Mill River | Biomonitoring for slow winder | Failed VWQS criteria in 2018 and previous sampling period. |
| | Jewitt Brook | Chemistry | Continue chemistry. Conduct biomonitoring when improvement seen. |
| | Stevens Brook trib 7 | Biomonitoring | urban trib with potential pollutant sources |
| **Northeast Arm** | Trout Brook | Biomonitoring | Update for protection: bugs good on Mainstem in 2003, but fish not meeting B1 criteria. |
| | Stone Bridge Brook | Biomonitoring | Update to confirm 2012 delisting. |
| **Islands** | Mud Creek (below wetland) | Chemistry | data gathering for reclassification to Class 1. Lake level affects stream, can not do biomonitoring. |
| | Sucker Brook | Biomonitoring | Data gap. |
| | Keeler Bay tributaries | Chemistry | Determine impact to bay from landuse |
| | Folsom Harbor trib | Chemistry | Data gap |
| | Whipple road, South Hero | Chemistry | Data gap. |
| **Malletts Bay Malletts creek** | Malletts Creek Trib crossing 480 Duffy road | Biomonitoring | Reclassification potential to B1 based on forested condition, |

| Watershed | Stream | Monitoring Type | Reason |
|---|---|---|---|
| | Malletts Creek Main trib | Biomonitoring | data update. Milton town development, new diary farm in area in 2018? |
| | Allen Brook | Biomonitoring | 2016 bug data failed. Stormwater impaired? |
| | Crooked Creek | Biomontioring/ chemistry (metals) | Update: poor before 2011 |
| | Smith Hollow Brook | Biomonitoring | high sedimentation load |
| | Pond Brook | Biomonitoring | update, as previous sample in 90s. |
| **Shelburne Bay** | Englesby Brook | Chemistry | Chlorides? |
| | Potash Brook (others?) | Chemistry | Chlorides |
| | Upper LaPlatte | Biomonitoring | Support protection strategies |
| | Mud Hollow | Biomonitoring/ chemistry | Update from 2009 |
| | McCabes | Biomonitoring | bracketing agric from urban area. Planned for 2019 |
| **Charlotte** | Holmes | Biomonitoring/chemisry | previous chem data shows high P. near beach |
| | Thorp | Biomonitoring | previously failed, sample to determine listing |
| **Basin Wide** | | | |
| | Stormwater Impaired streams | Biomonitoring | Update baseline as resources allow |

*List of partner acronyms below.

.

**Partner Acronyms:**

| | | | |
|---|---|---|---|
| **VAAFM** | VT Agency of Agriculture Food & Markets | **TRORC** | Two Rivers-Ott<br>Regional Comm |
| **CC** | Conservation Commission | **USFS** | United States Fo |
| **CWIP** | Clean Water Initiative Program | **USFWS** | United States Fi<br>Service |
| **ACRWC** | Addison County River Watch Collaborative | **VDEC** | Vermont DEPA<br>Environmental |
| **CVFC** | Champlain Valley Farmers Coalition | **VDFW** | Vermont DEPA<br>Wildlife |
| **ACRPC** | Addison County Regional Planning Commission | **VDFPR** | Vermont DEPA<br>Parks and Recre |
| **RRPC** | Rutland Regional Planning Commission | **VRC** | Vermont River |
| **MAPP** | Monitoring Assessment and Planning Program | **RNRCD** | Rutland Natural<br>Conservation D |
| **RRPC** | Rutland Regional Planning Commission | **TNC** | The Nature Cor |

# List of Acronyms

| | |
|---|---|
| 319 | Federal Clean Water Act, Section 319 |
| 604(b) | Federal Clean Water Act, Section 604b |
| VAAFM | Agency of Agriculture, Food, and Markets |
| AAPs | Accepted Agricultural Practices |
| ACWIP | Agricultural Clean Water Initiative Grant Program |
| AIS | Aquatic Invasive Species |
| AMA | Agricultural Management Assistance Program |
| AMPs | Acceptable Management Practices (for logging) |
| ANR | Agency of Natural Resources |
| ANS | Aquatic Nuisance Species |
| AOP | Aquatic Organism Passage |
| BASS | VDEC Biomonitoring and Aquatic Studies Section |
| BBR | Better Backroads program |
| BMP | Best Management Practices |
| CREP | Conservation Reserve Enhancement Program |
| CWI | Clean Water Initiative Grant Funding |
| CWIP | Clean Water Initiative Program |
| CWSRF | Clean Water State Revolving Fund |
| DPW | DEPArtment of Public Works |
| DWSRF | Drinking Water State Revolving Fund |
| EBTJV | Eastern Brook Trout Joint Venture |
| EQIP | Environmental Quality Incentive Program |
| ERAF | Emergency Relief and Assistance Fund |
| ERP | Ecosystem Restoration Program |
| FAP | Farm Agronomic Practices |
| FEH | Fluvial Erosion Hazard |
| FERC | Federal Energy Regulatory Commission |
| FOVLAP | Federation of Vermont Lakes and Ponds |
| FSA | Farm Service Agency (USDA) |
| GIS | Geographic Information System |
| GSI | Green Stormwater Infrastructure |
| IDDE | Illicit Discharge Detection (and) Elimination |
| LFO | Large farm Operation |
| LID | Low Impact Development |
| LiDAR | Light Detection and Ranging |
| LIG | Local Implementation Grants (LCBP) |
| LIP | Landowner Incentive Program |
| LTP | Land Treatment Plan |
| LWD | Large Woody Debris |

| | |
|---|---|
| MAPP | Monitoring, Assessment and Planning Program |
| MFO | Medium Farm Operation |
| MPG | Municipal Planning Grant |
| MRGP | Municipal Roads General Permit |
| NEMO | Nonpoint Education for Municipal Officials |
| NFIP | National Flood Insurance Program |
| NMP | Nutrient Management Plan |
| NPDES | National Pollution Discharge Elimination System |
| NPS | Non-point source pollution |
| NRCD | Natural Resource Conservation District |
| NRCS | Natural Resources Conservation Service |
| ORW | Outstanding Resource Water |
| PDM | Pre-Disaster Mitigation |
| PFW | Partners for Fish and Wildlife |
| RAP | Required Agricultural Practices |
| RTE | Rare, Threatened and Endangered Species |
| RCP | River Corridor Plan |
| RCPP | Regional Conservation Partnership Program |
| RMP | River Management Program |
| RPC | Regional Planning Commission |
| SFO | Small Farm Operation |
| SGA | Stream Geomorphic Assessment |
| SPA | Source Protection Area |
| SWG | State Wildlife Grants |
| SWMP | Stormwater master plans |
| TBP | Tactical Basin Plan |
| TFS | Trees for Streams |
| TMDL | Total Maximum Daily Load |
| TNC | The Nature Conservancy |
| TS4 | Transportation Separate Storm Sewer System General Permit |
| TU | Trout Unlimited |
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| USFS | United States Forest Service |
| USGS | United States Geological Survey |
| UVA | Use Value Appraisal program, or Current Use Program |
| UVM ext. | University of Vermont Extension |
| VACD | Vermont Association of Conservation Districts |
| VANR | Vermont Agency of Natural Resources |
| VDEC | Vermont Department of Environmental Conservation |

| | |
|---|---|
| VDFPR | Vermont Department of Forests, Parks and Recreation |
| VDHP | Vermont Department of Historic Preservation |
| VDH | Vermont Department of Health |
| VEM | Vermont Emergency Management |
| VFB | Vermont Farm Bureau |
| VFWD | Vermont Fish and Wildlife Department |
| VHCB | Vermont Housing and Conservation Board |
| VIP | Vermont Invasive Patrollers |
| VLCT | Vermont League of Cities and Towns |
| VLRP | Vermont Local Roads Program |
| VLT | Vermont Land Trust |
| VTrans | Vermont Agency of Transportation |
| VRC | Vermont River Conservancy |

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

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

**Acceptable Management Practices (AMP)** - methods to control and disperse water collecting on logging roads, skid trails, and log landings to minimize erosion and prevent sediment and temperature changes in streams.

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

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

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

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

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

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

**Farm production area** - means those areas of a farm where animals, agricultural inputs, or raw agricultural products are confined, housed, stored, or prepared whether within or without structures, including barnyards, raw materials storage areas, heavy use areas, fertilizer and pesticide storage areas, and waste storage and containment areas. Production areas include egg washing or egg processing facilities, milkhouses, raw agricultural commodity preparation or storage, or any area used in the storage, handling, treatment, or disposal of mortalities.

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

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

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

**Natural Community** - An interacting assemblage of organisms, their physical environment, and the natural processes that affect them.

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

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

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

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

**Production Area** - means those areas of a farm where animals, agricultural inputs, or raw agricultural products are confined, housed, stored, or prepared whether within or without structures, including barnyards, raw materials storage areas, heavy use areas, fertilizer and pesticide storage areas, and waste storage and containment areas. Production areas include egg washing or egg processing facilities, milkhouses, raw agricultural commodity preparation or storage, or any area used in the storage, handling, treatment, or disposal of mortalities.

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

**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 or natural restoration of a dynamic equilibrium condition, as that term is defined in 10 V.S.A. §1422, and for minimization of fluvial erosion hazards, as delineated by the Agency in accordance with the VANR River Corridor Protection Guide.

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

**Thermal modification** - the change in water temperature

**Turbidity** - the capacity of materials suspended in water to scatter light usually measured in Nephelometric Turbidity Unit (NTU). Highly turbid waters appear dark and "muddy."

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

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

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

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

**Wetlands** - are places where land and water meet which may be inundated or saturated by water for a few weeks of the year to shallow water year-round. Vermont's wetlands are defined as those areas of the state that are inundated by surface or ground water with a frequency sufficient to support plants and animals that depend on saturated or seasonally saturated soil conditions for growth and reproduction. These areas are commonly known as ponds, bogs, fens, marshes, wet meadows, shrub swamps, and wooded swamps.

# Appendix A. Partners

## A. Watershed Partners

Partners in the tactical planning process include multiple State and federal agencies. They can play multiple roles, include funder, technical resource (see the appendices in the Vermont Surface Water Management Strategy) or project manager as well as providing guidance during the planning process. These partners are undertaking watershed monitoring, assessment, protection, restoration, and education and outreach projects in The North Lake Basin.

**Chittenden County Regional Stormwater Education Program (RSEP)/ Chittenden County Stream Team (CCST)** is a project to engage citizens across an eight-town area (Burlington, Essex, Essex Junction, Milton, Shelburne, South Burlington, Williston & Winooski) to implement projects to reduce non-point source pollution and stormwater volume at the local level. The project utilizes social networking tools to form a cadre of concerned citizens and professionals interested in hands-on activities to reduce the harmful effects of stormwater. The project is managed by the Chittenden County Regional Planning Commission, and run by the Winooski Natural Resources Conservation District. Special focus is placed on impaired streams in the eight municipalities as well as three entities, the Burlington International Airport, University of Vermont, Vermont Agency of Transportation, that are subject to the Municipal SEPArate Storm Sewer Systems (MS-4) permit under Phase 2 of the federal Clean Water Act. The impaired streams are Allen Brook, Bartlett Brook, Centennial Brook, Englesby Brook, Indian Brook, Morehouse Brook, Munroe Brook, Potash Brook and Sunderland Brook

**Franklin, Winooski and Grand Isle County Conservation Districts** are locally led and operated organization that promotes and supports soil and water conservation. The mission of the Districts is to "help provide conservation assistance to the people living in the area through education programs and partnerships with federal, state, and local entities involved in natural resources management." The Winooski conservation district has been most active of the three, and projects have included water quality sampling with volunteers, tree planting (trees for streams) programs and stormwater management programs for residential landowners.

**Friends of Northern Lake Champlain** is a non-profit organization dedicated to the rehabilitation and protection of northern Lake Champlain and all the waters that flow into it. The organization works collaboratively with local communities, farmers, government, lake associations, regional planning, and policy developers to reduce polluted land use runoff into Lake Champlain

**Lake Champlain Basin Program** is a congressionally designated initiative to restore and protect Lake Champlain and its surrounding watershed. The program works with partners in New York, Vermont, and Québec to coordinate and fund efforts to address challenges in the areas of phosphorus pollution, toxic substances, biodiversity, aquatic invasive species, and climate change. The LCBP also administers the Champlain Valley National Heritage Partnership, which builds

appreciation and improves stewardship of the region's rich cultural resources by interpreting and promoting its history

**Lake Champlain Committee** is a bi-state organization that is solely dedicated to protecting Lake Champlain's health and accessibility. The committee uses science-based advocacy, education, and collaborative action to protect and restore water quality, safeguard natural habitats and ensure recreational access. The program is also the home organization for the Lake Champlain Paddlers' Trail, providing a safe, recreational corridor for human-powered craft on the lake. The Lake Champlain Committee also leads citizen- based efforts to conduct blue-green algal surveillance and reporting for Lake Champlain and adjacent waterbodies. These efforts are coordinated with ANR and the VT Department of Health

**Lake Iroquois Association** was formed to maintain and enhance healthy ecosystems and appropriate public uses of Lake Iroquois (located in the four towns of Williston, Hinesburg, Richmond, and St. George, Vermont) and those aspects of its watershed which impact on the health and well-being of the lake. The association does this by monitoring, prevention and management initiatives, research, education, advocacy and other actions, involving the co-operative efforts of property owners, town, state, and federal officials and other interested parties.

**LaPlatte Watershed Partnership's** mission is to protect significant ecological values and natural systems within the LaPlatte watershed for wildlife, plants and human cohabitation. This citizen's group, made up of people from Charlotte, Hinesburg, Shelburne and Williston, works with other organizations to provide resources and information that will facilitate conservation improvement activities in the watershed towns. The water quality monitoring arm of the LWP is the South Chittenden River Watch program.

**St. Albans Area Watershed Association** was created in 2002 with the primary goal of restoring the water quality of St. Albans Bay and the surrounding watershed. The association is a grassroots group.

**Lake Champlain Sea Grant** develops and supports research, outreach and education programs to empower communities, businesses and other stakeholders in the Lake Champlain Basin to make informed Decisions regarding the management, conservation, utilization and restoration of their aquatic resources for long-term environmental health and sustainable economic development

**Watershed Municipalities and the Regional Planning Commissions -** The basin includes 21 municipalities (Figure 1, 2) as well as the Chittenden County and Northwest Regional Planning Commissions. The municipalities play an important role in protecting or remediating water resources as prescribed under State and federal law (see Chapter 2, section I). In addition, municipalities also expend resources to treat stormwater from roads, assist watershed groups or municipal conservation commissions in efforts to assess water quality through monitoring programs or implement water resource restoration projects. Often with the assistance of the regional planning

commissions, ANR or the Vermont League of Cities and Towns, these municipalities have also adopted zoning or ordinances that further ensure water resource protection.

# Appendix B 2015 The North Lake Basin Report Card

Table X provides an update on the work completed by ANR and partners to implement strategies that appear in the 2015 basin plan. The final column includes the status of the action: Not started, in progress, completed.

**Table 5. 2015 The North Lake Basin Implementation Table - Restoration, Protection, Assessment and Monitoring Actions – All actions are scheduled to be implemented from 2014-2019**

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| Town Farm Bay and Charlotte shoreline | Charlotte | All waters | Land erosion, nutrients, channel erosion | High | Identify and implement needed agricultural BMPs for areas identified as significant pollutant sources based on risk for erosion, water quality data and agriculture inspections. | DEC, AAFM (Erosion and Sediment Source Risk Maps Fig 4-8) | DEC, UVM extension, NRCS, NRCD | CREP, NRCS, AAFM | In Progress |
| Town Farm Bay and Charlotte shoreline | Charlotte | All waters | Land erosion, | High | Identify and implement needed. Better Backroads BMPs for roads identified in Appendix B | DEC Erosion and Sediment Source Risk Maps (Figs. 4-8) | Municipality | BBR, ERP | In Progress |
| Town Farm Bay and Charlotte shoreline | Charlotte | All waters | Land erosion | Medium | Develop and implement stormwater management plan for private and public roads. Use Road erosion Risk layer (Fig. 4-8) and map points of stormwater inputs to ditches to assist in project prioritization | Charlotte | Town of Charlotte, DEC, | BBR, ERP, LCBP, Watershed Grants | In Progress |
| Town Farm Bay and Charlotte shoreline | Charlotte | All waters | Pathogens, nutrients | Medium | Identify need for improved pump out facilities for boats and apply for funding | DFW | | Federal Clean Vessel Act Funds | DFW wrote grant state wide? |
| Town Farm Bay and Charlotte shoreline | Charlotte | All waters | Land erosion, channel erosion | Medium | Support geomorphic assessments Phase 2 light to identify opportunities for regaining floodplain connection and potential gully remediation. | DEC | Town of Charlotte, LCA, DEC | ERP, LCBP, Watershed Grants | Not started |
| Town Farm Bay and Charlotte shoreline | Charlotte | All waters | Aquatic Invasive Species | Medium | Support community's efforts to control aquatic invasive plants (e.g. yellow flag iris, purple loosestrife, European frogbit) | LCA | DEC, Town of Charlotte, LCA | AIS grant in aid program | In Progress |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| Kimball Brook | Ferrisburgh | At railroad crossing | Pathogens, nutrients, land erosion | Medium | Manage Kimball Brook cow crossing under railroad | SCRW, 2010 | Landowners, Local Implementation Teams, VTrans, Vermont Rail | AAFM, ERP | Not Started |
| Kimball Brook | Charlotte | T8.s2.01 | Land erosion, Encroachment | Medium | Manage stormwater and replace culvert on townline road | SCRW, 2010 | Town of Charlotte, SCRW | BBR | Call town |
| Holmes Brook | Charlotte | T3 S4.01 T3-05 to T3-07, and all tributaries | Pathogens, nutrients, land erosion | High | Install riparian buffers and enhance nutrient management on agricultural land | DEC | NRCS, UVM extension | CREP, NRCS | NRCS, UVM extension ? |
| Shelburne Bay | Williston, St. George, Hinesburg, Charlotte, Shelburne | All waters | Land erosion, nutrients | High | Identify and implement needed BMPs for agricultural fields identified in Fig. 4-8 as at moderate to high risk for erosion. Use EPA scenario tool when available | DEC Erosion and Sediment Source Risk Maps (Figs. 4-8) | UVM extension | CREP, NRCS | In Progress |
| Shelburne Bay | Williston, St. George, Hinesburg, Charlotte, Shelburne | All waters | Land erosion, | High | Identify and implement needed Better Backroads BMPs for roads identified in Appendix B as at moderate to high risk for erosion | DEC Erosion and Sediment Source Risk Maps (Figs. 4-8) | Municipalities | BBR, ERP | In Progress |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| Shelburne Bay | Williston, St. George, Hinesburg, Charlotte, Shelburne, S. Burlington | All waters | Land erosion, Nutrients, channel erosion | High | Continue to support volunteer water quality monitoring in the LaPlatte, McCabes, Munroe, Potash and Lake Iroquois as well as the lay monitors on Lake Iroquois. | DEC | SCRW, LIA, Chittenden County Stream team, DEC | DEC LaRosa Lab, volunteer group municipal donations and volunteer labor | In Progress |
| Shelburne Bay | Williston, St. George, Hinesburg, Charlotte, Shelburne, S. Burlington | All waters | Encroachment, channel erosion | High | Replace geomorphologically incompatible culvert and bridges : At least 8 priority replacements in subbasin, see Appendix C | DEC | municipalities, RPC, VTrans, | federal hazard mitigation funds, Municipalities, VTrans | RPC? |
| Shelburne Bay | Shelburne | Munroe Brook | Channel erosion, Flow alteration, nutrients, land erosion | High | Finalize and implement Flow Restoration Plan for stormwater-impaired waters in Shelburne pursuant to MS4 permit. | FRP | Shelburne | Municipal, SRF, ERP, State and Fed. Highway funds | In Progress |
| Shelburne Bay | Burlington | Bartlett Brook | Channel erosion, Flow alteration, nutrients, land erosion | High | Finalize and implement Flow Restoration Plan for stormwater-impaired waters in Burlington pursuant to MS4 permit. | FRP | Burlington | Municipal, SRF, ERP, State and Fed. Highway funds | In Progress |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| Shelburne Bay | South Burlington | Potash Brook | Channel erosion, Flow alteration, nutrients, land erosion | High | Finalize and implement Flow Restoration Plan for stormwater-impaired waters in South Burlington pursuant to MS4 permit. | FRP | South Burlington | Municipal, SRF, ERP, State and Fed. Highway funds | In Progress |
| Shelburne Bay | Williston, St. George, Hinesburg, Charlotte, Shelburne, South Burlington | All waters | Channel erosion, Flow alteration, nutrients, land erosion | High | Manage stormwater runoff from private and town roads (see Appendix B) | DEC | Towns, SCRW | BBR | In Progress |
| Shelburne Bay | Hinesburg, Charlotte, Shelburne | All waters | Land erosion, Nutrients, channel erosion | Medium | Discussion w/ agricultural producers about SCRW water quality sampling results | UVM extension | Champlain Valley farmer coalition, UVM Extension, DEC, SCRW | UVM extension | Agric meeting? |
| LaPlatte River | Williston, St. George, Hinesburg | Lake Iroquois subwatershed | land erosion, channel erosion | High | Manage stormwater runoff from private and town roads, including Dynamite Hill and Mt. Prichard Roads. | LIA, 2013 | DEC, landowners | BBR | In Progress |
| LaPlatte River | Williston, Hinesburg | Lake Iroquois subwatershed | Land erosion, nutrients, thermal modification | High | promote the Lake Wise Program and associated Lake Leaders training sessions to encourage lake-friendly shoreline property maintenance (Appendix E) | LIA, 2013, DEC | WNRCD,LIA, DEC | LCBP, Watershed Grants | In Progress (shore line stabilization projects completed 2017 ) |
| LaPlatte River | Williston, Hinesburg | Lake Iroquois subwatershed | Aquatic Nuisance Species | High | Support community's efforts to control aquatic invasive plants (e.g. European frogbit), | LIA | LIA, DEC | AIS grant-in-aid program | In Progress |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| LaPlatte River | Williston, Hinesburg | Lake Iroquois subwatershed | Land erosion, Nutrients, channel erosion | High | Assist development of a bluegreen algae volunteer monitoring program develop a plan for response and communication for cyanobacteria blooms | DEC | DEC, VDH, LIA | DEC, VDH staff time | Complete |
| LaPlatte River | Williston, Hinesburg | Lake Iroquois subwatershed | Land erosion, Nutrients, channel erosion | High | Assist in analyzing data collected on the Lake Iroquois tributaries by the LIA, | LIA, DEC | DEC, LIA | Staff time | In Progress |
| LaPlatte River | Hinesburg | Beecher Brook T5.01D | land erosion, channel erosion, encroachment | Medium | Relocating town garage, old access road and sand pile to divert runoff away from town gravel pit, reducing stormwater runoff to river | LWP, 2007 | Town, DEC | ERP, LCBP, Watershed Grants | Complete |
| LaPlatte River | Hinesburg | Beecher Brook T5.01B, C | Encroachment | Medium | Protect River corridor, FEMA buyout potential | LWP, 2007 | Town, DEC | FEMA | |
| LaPlatte River | Hinesburg | M17 | channel erosion, encroachment | Medium | Replace geomorphologically incompatible culvert at crossing used for agriculture and silviculture | LWP, 2007 | Town forest committee, DEC | NRCS | |
| LaPlatte River | Hinesburg | M16 | Encroachment | Low | Investigate potential for berm removal. | LWP, 2007 | LCA | ERP, LCBP, Watershed Grants | |
| LaPlatte River | Hinesburg | M16 | Land erosion, channel erosion | Medium | Swale improvement at gas station/Lyman Meadows | LWP, 2010 | LCA, town | ERP, LCBP, Watershed Grants | |
| LaPlatte River | Hinesburg | M16-M12 | Channel erosion, land erosion | High | Work with town to review flood resiliency status and improve stormwater infrastructure planning and regulation | LWP, 2007 | DEC, LCA, Town | DEC staff time | |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| LaPlatte River | Hinesburg | M15S2.02 and upstream | Channel erosion, nutrients | High | Assess adequacy of CVU field drainage practices to protect stream | LWP, 2007 (Silver street rain garden report) | DEC, LCA, CVU | ERP, LCBP, Watershed Grants | Complete |
| LaPlatte River | Hinesburg | Patrick Brook M15 S2.01 | channel erosion | Medium | Protect stream corridor to allow for passive geomorphic restoration | LCA | LCA | ERP, LCBP | |
| LaPlatte River | Hinesburg | Patrick Brook M15 S2.01 | land erosion, channel erosion | High | Detain stormwater on south side of Route 116 | LWP, 2010 | LCA, town | ERP, LCBP, Watershed Grants, | Ongoing |
| LaPlatte River | Hinesburg | Patrick Brook M15 S2.01 | Flow alteration; | High | Support a collaborative town led process in developing a management plan for Patrick Canal, incorporating local knowledge and river science. | LWP, 2007 | Town, landowners, DEC | ERP, LCBP, Watershed Grants | Not started |
| LaPlatte River | Hinesburg | Patrick Brook T4.03 | land erosion | High | Allow lawn area to naturalize and function as wetland at entrance road to cemetery | LWP, 2010 | Town | n/a | |
| LaPlatte River | Hinesburg | Patrick Brook T4.03, T4.04 and T4.06 | encroachment | Low | Investigate removal of old mill footings and partial dams. Bedrock may provide more flow restriction than dams. | LWP, 2007 | DEC | n/a | Not started |
| LaPlatte River | Hinesburg | M15 | Channel erosion, Land erosion, nutrient loading | High | Continue to identify and implement GSI stormwater management projects for village. Encourage centralized stormwater treatment system where dense development exists. Also choose treatment areas based on locations of soils with high infiltration potential | LWP, 2010; Hinesburg, 2010 | LCA, town | ERP, LCBP, Watershed Grants | In Progress |
| LaPlatte River | Hinesburg | M15 | Channel erosion, Land erosion, nutrient loading | High | Plant riparian area with woody vegetation and fence out cattle on M15A, and improve management of pastures | LWP, 2007 | UVM extension | CREP, NRCS | |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| LaPlatte River | Hinesburg | M15 | Channel erosion, Land erosion, nutrient loading | Low (Clay Soils) | Investigate active stream restoration especially if predicted channel adjustment towards WWTF requires active protection | LWP, 2007 | Town, DEC | ERP | |
| LaPlatte River | Hinesburg | T3.01 and T3.02 | Channel erosion, land erosion, nutrient | High | Fence out livestock and plant riparian buffer | LWP, 2007 | NRCS, UVM Extension | CREP, NRCS | |
| LaPlatte River | Hinesburg | M12, 13, 14 | Channel erosion, Land erosion, | High | Protect undeveloped stream corridor to allow for continued flow and sediment attenuation and to improve water and habitat quality. | LWP, 2007 | LCA, VLT | ERP, LCBP, Watershed Grants | |
| LaPlatte River | Hinesburg | M13 | Channel erosion, Land erosion, | High | Plant riparian area with woody vegetation | LWP, 2007 | LCA | CREP, NRCS | |
| LaPlatte River | Hinesburg | M12, 13, 14 | land erosion, nutrient loading, pathogens | High | Encourage Agricultural BMPs for grazing in flood plain, pasture management, and surface water drainage practices | DEC | NRCS, UVM Extension | CREP, NRCS | |
| LaPlatte River | Hinesburg | M12 | Land erosion, nutrient loading | High | Plant woody riparian buffer and investigate wetland restoration of agric. ditches to stream | LWP, 2007 | LCA, DEC, USFWS | ERP, USFWS | |
| LaPlatte River | Hinesburg | M12 | Encroachment, land erosion | Medium | Floodwaters crossing road is community concern. Develop alternatives for managing flooding over Leavensworth Rd that includes allowing flows to cross over road | LWP, 2007 | LCA, town, engineer | BBR | Not started |
| LaPlatte River | Charlotte | M9a | land erosion | Medium | Riparian plantings near Habitat for Humanity property | LWP, 2008 | LCA | ERP | |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| LaPlatte River | Charlotte | M08-01 | (protection) | Medium | Protect river corridor to allow for passive restoration | LWP, 2008 | LCA, DEC, VLT, Town of Charlotte | ERP | |
| LaPlatte River | Shelburne | M06-4 | land erosion, channel erosion | High | Restore incised reach and address stormwater inputs with GSI practices | LWP, 2008 | SCRW, DEC, Town of Shelburne | ERP, LCBP, Watershed Grants | |
| LaPlatte River | Shelburne | M01-M02 | (protection) | Medium | Assist with petition for Class I designation for LaPlatte wetland | DEC | TNC, Shelburne NRC | n/a | Completed |
| LaPlatte River | Shelburne | M06-M01 | Land erosion, Nutrients, channel erosion | High | Complete stormwater management planning, including Gardenside Condo area | DEC | SCRW, DEC, Town of Shelburne | ERP | Ongoing |
| LaPlatte River | Shelburne | M01 | Aquatic Invasive species | Medium | support community efforts to control aquatic invasive plants (e.g., European frogbit) | DEC | DEC | AIS grant-in-aid program | In Progress |
| Bingham Brook | Charlotte | head waters of T2 | Land erosion, nutrients, channel erosion, pathogens | High | Wetland restoration or riparian buffer | LCA | USFWS, DEC, | WRE, CREP | Not Started |
| Bingham Brook and Mud Hollow | Charlotte | T2 | pathogens, land erosion, nutrients, channel erosion | High | ID sources of pathogens from farms - Conduct agricultural assessment on SFO's to determine unmet resource needs. Pursue funding for high priority SFO BMPs | E. coli TMDL | NRCD; UVM Extension | AAFM - BMP, ERP, LCBP, Watershed Grants, NRCS where appropriate | In Progress? Agric meeting |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| McCabes Brook | Shelburne | T1 | land erosion, nutrients, pathogens | High | Identify highest priority resource concerns and implement BMP practices | DEC | NRCD (ARS), NRCS, ANR | AAFM - BMP, ERP, LCBP, Watershed Grants, NRCS where appropriate | Ongoing |
| McCabes Brook | Shelburne | T1.08 | Flow alteration; | Medium | Remove partially breached dam | LWP, 2013 | SCRW, Town of Shelburne, residents | ERP, LCBP | Not Started |
| McCabes Brook | Shelburne | T1.08 | land erosion | Medium | Protect wetland and river corridor | LWP, 2013 | SCRW, Town of Shelburne, residents | ERP | |
| McCabes Brook | Shelburne | T1.07B/A T1.06B | land erosion | Medium | Work with landowners to secure specific protections for the forested river corridor. VLT has easement | LWP, 2013 | SCRW, Town of Shelburne, residents | n/a | |
| McCabes Brook | Shelburne | T1.05B/A | Channel erosion, land erosion | Medium | Determine benefit of increasing floodplain and stabilizing mass failure for benefit of protecting Route 7 | LWP, 2013 | VTrans | State and federal | Not Started |
| McCabes Brook | Shelburne | T1.05 | channel erosion, land erosion | Medium | Divert stormwater from running over bank failure south of vineyard. | DEC | VTrans | VTrans | In Progress (no mow area added) |
| McCabes Brook | Shelburne | T1 | channel encroachment | Medium | Investigate landowner interest in removing private bridge over brook | DEC | SCRW | LCBP, Watershed Grants | Not Started |
| McCabes Brook | Shelburne | T1 | channel encroachment | High | Day light and restore tributary on community school play fields | DEC | SCRW, Town of Shelburne, residents | ERP, LCBP, Watershed grants | In Progress |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| McCabes Brook | Shelburne | T1 | land erosion, channel erosion | High | Address stormwater related issues at school street neighborhood, include work with residential home owners to implement GSI | DEC | SCRW, Town of Shelburne, residents | ERP, LCBP, Watershed Grants | In Progress |
| McCabes Brook | Shelburne | T1.04B | Land erosion, channel erosion | Medium | Protect corridor to allow the river to reach equilibrium and become attenuation asset. | LWP, 2013 | SCRW | ERP, LCBP, Watershed Grants | |
| McCabes Brook | Shelburne | T1.03 | Land erosion, channel erosion | High | review LWP stormwater study projects and identify treatment options, expand village stormwater management plan/hydrologic study to protect McCabe from Impairment status | LWP, 2010 | SCRW, Municipal Planning Grant, ACCD | ERP, LCBP | |
| McCabes Brook | Shelburne | T1.03 | Land erosion, channel erosion | Medium | Plant stream buffer/restore flood plain at the Shelburne Town Garage and Wastewater Treatment Facility on Turtle Lane | LWP, 2013 | SCRW | ERP, LCBP | |
| McCabes Brook | Shelburne | T1.03 | nutrients, land erosion, | Medium | Assess agricultural BMP needs for diverse farmstead north of Harbor Rd | DEC | SCRW, NRCS, UVM extension | AAFM, NRCS, CREP | WNRD visited? |
| Munroe Brook | Shelburne | T1.02 Upstream | land erosion, channel erosion | High | address 136 foot eroding grass swale on Brook Lane replace w/ perforated pipe, add infiltration trench and a raingarden | LWP, 2013 | SCRW, Town | ERP, LCBP, Watershed Grant | Completed |
| Burlington Bay | Burlington | Englesby Brook | land erosion, channel erosion | High | Assist Burlington in developing a flow restoration plan (FRP) for Englesby, due October 2016 | DEC | Burlington | Municipal funds, SRF, ERP | In Progress |
| Burlington Bay | Burlington | As applicable | Encroachment | Medium | Replace geomorphologically incompatible culvert and bridges : at least 5 priority replacement in basin, see Appendix C | DEC | City of Burlington, RPC, VTrans | federal hazard mitigation funds, Municipality, VTrans | |
| Burlington Bay | Burlington | As applicable | pathogens, nutrients | Medium | Reduce stormwater to Combined Sewer (CSO) using GSI practices | DEC | Burlington | ERP, LCBP | Ongoing |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| Small directs to lake | Burlington, South Burlington | All waters | land erosion, channel erosion, | Medium | Manage stormwater using GSI practices | DEC | Municipalities, DEC | ERP, LCBP, Watershed grants | In Progress |
| Small directs to lake | South Burlington | Nesti Brook | land erosion, channel erosion, | High | Stabilize Nesti Brook, create gravel wetland to treat Rt 7 stormwater | DEC | DEC | ERP, Vtrans Enhancement grant | In Progress |
| Malletts Bay | Colchester/Milton, Essex | All waters | Land erosion, | High | Identify and implement needed Better Backroads BMPs for roads identified in Appendix B | DEC Erosion and Sediment Source Risk Maps (Figs. 4-8) | Municipalities | BBR, ERP | In Progress |
| Malletts Bay | Colchester, Essex Junction | All | Encroachment | High | Replace geomorphologically incompatible culvert and bridges : at least 1 priority replacement in basin, see Appendix C | DEC | municipalities, RPC, Vtrans, | Federal hazard mitigation funds, Municipalities, VTrans | |
| Malletts Bay | Colchester | Bay | Pathogens, nutrients | Medium | If need determined for improved pump out facilities for boats, apply for funding to address | DFW | Marinas | Federal Clean Vessel Act Funds | |
| Malletts Bay | Colchester | All | Pathogen | High | Continue sampling of shoreline and enhance program to gage degree of contribution of pathogens from shoreline wastewater systems | DEC | Municipality, DEC | Staff time | In Progress |
| Malletts Bay | Colchester | All | Pathogen | Medium | Develop and implement sampling program to better understand sources of bacteria from natural source | DEC | DEC, municipality | Staff time | |
| Malletts Bay | Colchester | Inner Bay, | Pathogens | High | Consider a sewerline along the inner bay, supported by the state revolving funds if project meets criteria used by DEC Facilities Engineering Division. Provide technical assistance to support application. | DEC | DEC, municipality | State revolving funds | In Progress |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| Malletts Bay | Colchester | Smith Hollow Brook | Pathogens, nutrients | High | Develop sampling plan to target stormwater catch basins for optical brightener testing during high groundwater levels in neighborhoods along Williams Road and Blakeley Road | DEC, | DEC, Municipality, | Staff time | |
| Malletts Bay | Colchester | Smith Hollow Brook M03 | Pathogens, nutrients | High | Provide small farms, including horse farms, with resources to reduce nutrient and pathogens, including opportunities to compost animal waste | E. coli TMDL | WNRCD, DEC | ERP | |
| Malletts Bay | Colchester | Crooked Creek adjacent and downstream of Rte. 7 | land erosion, channel erosion, | High | address runoff to the multiple (10) gullies and stabilize erosion from hayfields and Route 7 stormwater runoff | DEC | DEC, VTrans, NRCS | ERP, VTrans, NRCS | In Progress (5/10 addressed) |
| Malletts Bay | Colchester | Crooked Creek (west of I-89) | land erosion, channel erosion, | High | Address erosion associated with stormwater runoff to small culverted tributary by addressing private camp road management and stormwater management off campground. | DEC | Municipality, DEC | ERP, BBR | Town? |
| Malletts Bay | Colchester | Crooked Creek, Pond Brook and Smith Hollow Brook | Pathogens | High | Manage residential stormwater through education and outreach include dog waste reduction strategies | E. coli TMDL | Municipality, DEC, LCC | LCBP, Watershed Grant | In Progress |
| Malletts Bay | Colchester | Crooked Creek, Pond Brook and Smith Hollow Brook | Pathogens, land erosion, channel erosion | High | Implement GSI practices with goal of diverting runoff to streams | DEC, Colchester, 2011, E. coli TMDL | Municipality, DEC, WNRCD, UVM Sea Grant | ERP, LCBP, Watershed Grant | |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| Malletts Bay | Colchester | Pond Brook M02 to M06 | Land erosion, nutrients | High | Provide small farms, including horse farms, with resources, including opportunities to compost animal waste | DEC | WNRCD, UVM extension | ERP, CREP, NRCS | In Progress WNRD? |
| Malletts Bay | Colchester | Pond Brook M05 | pathogens, nutrients, land erosion | High | Develop sampling plan to further investigate pathogen sources in village neighborhoods in Pond Brook watershed. Consider targeting stormwater catch basins for optical brightener testing during high groundwater levels. | Colchester, 2011 | Municipalities, DEC | State low interest loans for onsite septic | |
| Malletts Bay | Colchester | Indian Brook | Channel erosion, Encroachment | Medium | Assess potential for dam removal at Mill Pond Road | Vermont Dam Task Force | VNRC, The Nature Conservancy, USFWS, DFW DEC. | ERP, USFWS and private funds. | Complete |
| Malletts Bay | Colchester | Indian Brook M01-1 and M02-1 | Channel erosion | Medium | Develop river corridor conservation easements for parcel occupying entire reach | DEC, 2008 | WNRCD, | ERP | |
| Malletts Bay | Essex Junction | Indian Brook M09-A-1 | land erosion, channel erosion, | Low | Develop conservation easements for parcels occupying entire reach | DEC, 2008 | WNRCD, | ERP | |
| Malletts Bay | Essex Junction | Indian Brook M10-A-2 | Encroachment | Medium | Remove derelict structure associated with old crossing | DEC, 2008 | WNRCD, | LCBP, | |
| Malletts Bay Indian Brook | Essex Junction | Indian Brook M11 | land erosion, channel erosion, | Medium | Plant stream buffer along right bank south of the intersection with Grove St. and Educational Drive. | DEC, 2008 | WNRCD, | ERP | |
| Malletts Bay | Essex Junction | Indian Brook M11-A | land erosion, channel erosion, | Medium | Restore incised reach to reestablish meanders and create equilibrium profile and geometry along section adjacent to school. | DEC, 2008 | Municipality, DEC | ERP | |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| Malletts Bay | Essex Junction | Indian Brook M11-B | land erosion, channel erosion, | High | Plant stream buffer along right bank east of the Route 15 crossing. | DEC, 2008 | WNRCD, municipality | ERP | |
| Malletts Bay | Essex Junction | Indian Brook M11-C | land erosion, channel erosion, | High | Develop conservation easements for parcels occupying river corridor. | DEC, 2008 | Municipality, DEC | ERP | |
| Malletts Bay | Essex Junction | Indian Brook | land erosion, channel erosion, | High | Assist Essex Junction in developing a flow restoration plan (FRP) for Indian Brook, due October 2016 | DEC | Essex Junction | Municipal, SRF, ERP, State and Fed. Highway funds | Complete |
| Malletts Bay | Essex Junction | Indian Brook reservoir | Land erosion | High | Continue to support water quality monitoring in the lake through the Lay Monitoring program | DEC | citizens | State | In Progress |
| Malletts Bay | Colchester, , Milton | Malletts Creek, Allen Brook | Land erosion Channel erosion | Medium | Provide education and outreach to encourage the use of the portable skidder bridge housed at Cyr lumber for silvicultural activity | DFPR | WNRCD, DEC, CYR Lumber | ERP | DFPR |
| Malletts Bay | Colchester/Milton | Malletts Creek M04-M13 | Land erosion, nutrients | Medium | Identify and implement needed BMPs for agricultural fields identified in Fig. 4-8 as at moderate to high risk for erosion. Use EPA scenario tool when available | DEC Erosion and Sediment Source Risk Maps (Figs. 4-8) | Local Implementation Teams, UVM extension | CREP, NRCS | Agric meeting? |
| Malletts Bay | all | all | Land erosion, | High | Identify and implement needed Better Backroads BMPs for roads identified in Appendix B | DEC Erosion and Sediment Source Risk Maps (Figs. 4-8) | Municipalities | BBR, ERP | In Progress |
| Malletts Bay | Colchester | Malletts Creek M01 | (protection) | Medium | reclassify Munsons Flats wetland to Class 1 | DEC | Community group, DEC | DEC | Not Started |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| Malletts Bay | Milton/Colchester | Malletts Creek M14-M17, T6 | land erosion, channel erosion | Medium | Prioritize and Implement projects identified in corridor plan for upper watershed; | CCRPC, 2013 | Municipalities, DEC | ERP | |
| Malletts Bay | Milton | Malletts Creek M15-B #1 | channel erosion, land erosion | High | plant woody riparian buffer | CCRPC, 2013 | Local Implementation Teams, UVM extension | CREP, ERP, LCBP, Watershed Grant | |
| Malletts Bay | Milton | Malletts Creek M17-A | Channel erosion | Medium | Investigate corridor protection | CCRPC, 2013 | Municipality | ERP | |
| Malletts Bay | Milton | Milton Pond | Flow alteration | Medium | Follow the recommendations of the past inspection reports and retain an engineer to help with either the rEPAir or removal of the dam. | Town of Milton, DEC | Town of Milton | ERP, LCBP, Watershed Grant | Not Started, town not interested |
| Malletts Bay | Milton | Malletts Creek T6.01 | Channel erosion | Medium | Investigate corridor protection and plant woody riparian buffer | CCRPC, 2013 | WNRCD | CREP, ERP, LCBP, Watershed Grant | |
| Malletts Bay | Milton/Colchester | Allen Brook | Land erosion, | High | Identify and implement needed Better Backroads BMPs for roads identified in Appendix B | DEC Erosion and Sediment Source Risk Maps (Figs. 4-8) | Municipalities | BBR, ERP | In Progress |
| Malletts Bay | Milton | Allen Brook T1.1 - T1.08 | land erosion, channel erosion | High | Develop a stormwater management plan that includes stormwater infrastructure drainage | DEC | DEC, Milton | ERP | Complete |
| Malletts Bay | Milton | Allen Brook T1..07 | land erosion, channel erosion | High | Assess water quality below village with additional biomonitoring sites and water quality sampling sites | DEC | DEC, Milton | ERP | Complete |
| Malletts Bay | Milton | Allen Brook T1.02 and T1.03 | Channel erosion | High | Investigate corridor protection | CCRPC, 2013 | Municipality | ERP | |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| Malletts Bay | Milton | Allen Brook T1.04 | Land erosion | Medium | Stabilize gully near the outfall to Allen Brook with additional stone | CCRPC, 2013 | Municipality, DEC | ERP, LCBP, Watershed Grant | |
| Malletts Bay | Milton | Allen Brook T1.06-B | Land erosion | Medium | plant woody riparian buffer | CCRPC, 2013 | WNRCD | ERP, CREP, NRCS | |
| Inland Sea | Georgia | Champlain shoreline / Georgia | Land erosion, thermal modification | Medium | Support Lake Wise practices (Appendix E) | DEC | FNLC, Georgia Conservation commission | ERP, LCBP, Watershed Grant | Amy Picotte/ |
| Inland Sea | Georgia | Stonebridge Brook | Land erosion, Channel erosion | Medium | Address residential stormwater runoff | Georiga Stormwater Master Plan | Municipality, FNLC | ERP, LCBP, Watershed Grant | Not Started |
| St. Albans Bay | St. Albans city/town/ Georgia | all waters | all | Medium | Increase awareness of water resource issues and promote adoption of residential, business and agricultural BMPs | St. Albans Bay partners | FNLC, FWA, NRPC, UVM Sea Gant; SAAWA, St. Albans city and Towns | LCBP, Watershed grants | Complete |
| St. Albans Bay | St. Albans Town and City | Stevens Brook | Land erosion, channel erosion | High | Assist in St. Albans City and Town and Vtrans in implementing a flow restoration plan | DEC | Municipalities and VTrans | Municipal, SRF, ERP, State and Fed. Highway funds | In Progress |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| St. Albans Bay | St. Albans Town and City | Rugg Brook | Land erosion, channel erosion | High | Assist St. Albans City and Town and Vtrans in developing a flow restoration plan, due October 2016. | DEC | Municipalities, VTrans | Municipal, SRF, ERP, State and Fed. Highway funds | Complete |
| St. Albans Bay | St. Albans Town and City | all waters | Encroachment | High | Replace geomorphologically incompatible culvert and bridges : at least 2 priority replacements in basin, see Appendix C | DEC | Municipalities, RPC, VTrans, | federal hazard mitigation funds, Municipalities, VTrans | |
| St. Albans Bay | St. Albans town, Georgia, | Lake Champlain shoreline | Pathogens, nutrients | Medium | Inspect and maintain (and where needed, replace) on-site septic systems. Consider a feasibility study for alternative onsite treatment if needed. | DEC | DEC, FED | DEC FED loan program, SRF | In Progress |
| St. Albans Bay | St. Albans Town, City | all waters | Toxins, nutrients | High | Encourage use of salt brine instead of salt to reduce overall use of salt and sand | NRPC, 2014 | NRPC | LCBP | In Progress |
| St. Albans Bay | St. Albans Town | all waters | Aquatic nuisance and invasive species | High | Support community's efforts to control aquatic nuisance plants and Eurasian Water Milfoil | Franklin Watershed Initiative | SAAWA, St. Albans Town | AIS grant-in-aid program | In Progress |
| St. Albans Bay | all | all waters | Pathogens, nutrients, land erosion | High | Review agricultural practices on every farm and identify AAP and BMPs needs. Use CSA maps (NRCS, 2015) and EPA scenario tool | Franklin Watershed Initiative | AAFM, UVM extension | CREP, RCPP (Appendix D) NRCS | In Progress (agric meeting) |
| St. Albans Bay | all | all waters | Pathogens, nutrients, land erosion | High | Develop a plan and identify partners to work with agricultural producers to ensure implementation of needed practices | NRCS RCPP | NRCS, DEC, AAFM, FNLC, VACD, FNRCD, USFWS, UVM extension | NRCS, CREP | Complete |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| St. Albans Bay | all | Mill Brook | Land erosion | High | Identify and implement needed Better Backroads BMPs for roads identified in Appendix B | DEC Erosion and Sediment Source Risk Maps (Figs. 4-8) | Municipalities | BBR, ERP | In Progress |
| St. Albans Bay | Georgia | Mill Brook M2T2.2 S1;M2T 2.06; M03-M06 | pathogens, nutrients, land erosion, channel erosion | High | Identify BMP needs for fields in priority CSA and where geomorphic assessment identifies sediment regime dEPArture | Map; NRPC, 2008; | Local Implementation Teams, FNLC, UVM extension | NRCS RCPP NRCS, CREP | Agric. |
| St. Albans Bay | Georgia | Mill Brook M2T2.2 S1.3S3. 01 | Land erosion, channel erosion | High | Identify and address source of channel erosion including channel adjustment, stormwater and sediment inputs | Georgia Stormwater Master Plan, DEC | DEC, conservation commission, | ERP | |
| St. Albans Bay | Georgia | Mill Brook M2T2.2 S1.03 | land erosion, channel erosion | High | At elementary school manage stormwater discharge to streams using infiltration at source where possible | DEC | Town, school, DEC | ERP, LCBP, Watershed grants | In Progress( Green schools?) |
| St. Albans Bay | Georgia | Mill Brook | Land erosion, channel erosion | Medium | Assist towns in defining appropriate slope failure risks for future development, and map | NRPC | NRPC, municipalities, DEC - Geology | Emergency Management funds | |
| St. Albans Bay | St. Albans Town | Rugg Brook | Land erosion, nutrients | High | Identify and implement needed BMPs for production areas as well as agricultural fields identified in Fig. 4-8 as at moderate to high risk for erosion. | DEC Erosion and Sediment Source Risk Maps (Figs. 4-8) | AAFM, UVM extension | CREP, NRCS, RCPP | |
| St. Albans Bay | St. Albans Town | Rugg Brook | land erosion, channel erosion | High | Identify and implement needed stormwater management for roads identified in Appendix B. | DEC Erosion and Sediment Source Risk Maps (Figs. 4-8) | Municipality | BBR, ERP | In Progress |
| St. Albans Bay | St. Albans Town | Rugg and Stevens Brooks | land erosion, channel erosion | High | Prioritize and implement needed stormwater management identified in the St. Albans Town stormwater master plan and NRPC NPS project list | St. Albans Town Stormwater Master Plan, 2015; *NRPC 2015* | Municipality | ERP, SRF | In Progress |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| St. Albans Bay | St. Albans Town | Rugg Brook | channel erosion | Medium | When landowner interested investigate 2-tiered channel off Bronson Road and river corridor easement | DEC | DEC, NRCS | ERP, USDA | |
| St. Albans Bay | St. Albans Town | Stevens Brook | Land erosion, nutrients | High | Identify and implement needed BMPs for production areas as well as agricultural fields identified in CSA map as moderate to high risk for erosion. | NRPC CSA erosion risk maps (2014), NRCS Gap watershed for 2015-2016 | AAFM, UVM extension | CREP, NRCS, RCPP (Appendix D) | |
| St. Albans Bay | St. Albans Town | Stevens Brook | Land erosion | High | Identify and implement needed Better Backroads BMPs for roads identified in Appendix B or NRPC Road erosion risk maps and in St. Albans Town stormwater master plan | NRPC Road erosion risk maps, St. Albans Town, 2015 | Municipalities | BBR, ERP | In Progress |
| St. Albans Bay | St. Albans City | Stevens Brook 1 | Encroachment | High | protect flood plain and wetlands between city limits and mouth | Gaddis, 2007 | USFWS, Watershed groups | USDA-WRE | In Progress (CREP plantings) |
| St. Albans Bay | St. Albans City | Stevens Brook 3 | Channel erosion, land erosion | High | Reduce stormwater flow into Weldon street CSO with GSI practices | DEC | Municipality | Municipal, SRF, ERP | City NRPC? |
| St. Albans Bay | St. Albans City | Stevens Brook | Channel erosion | Medium | Daylight section of stream and install stormwater best management practices | NRPC, 2014 | Municipality | ERP, SRF | |
| St. Albans Bay | St. Albans Town | Stevens Brook (tributary 7) | Flow alteration, channel erosion, land erosion | Medium | Provide golf course with technical assistance to achieve ANR "Green Links" certification | DEC | DEC | DEC | AID? |
| St. Albans Bay | St. Albans Town | Stevens Brook (tributary 7) | Land erosion, Channel erosion, nutrients | High | Develop and implement a stormwater management plan for watershed urban area along Route 7 | DEC | DEC, municipality, FNLC | ERP | |
| St. Albans Bay | St. Albans Town | Jewett Brook | Non-erosion nutrients | High | Identify locations for tile drainage BMP's based on AAFM survey of 2015 | AAFM | AAFM, LCBP, FNLC | CREP, NRCS, NRCS-CIG | In Progress |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| St. Albans Bay | St. Albans Town | Jewett Brook | Land erosion, nutrients | High | Identify and implement needed BMPs for production areas as well as agricultural fields identified in Fig. 4-8 as at moderate to high risk for erosion. | NRPC CSA erosion risk maps (2014) | AAFM, UVM extension | CREP, NRCS, RCPP (Appendix D) | |
| St. Albans Bay | St. Albans Town | Jewett Brook | Land erosion, | High | Identify and implement needed Better Backroads BMPs for roads identified in Appendix B, and NRPC Road erosion risk maps | NRPC Road erosion risk maps (2014) | Municipality | BBR, ERP | In Progress |
| Islands | all | All waters | land erosion | High | Identify and implement needed Better Backroads BMPs for roads identified in Appendix B | DEC road erosion risk layer, Fig 4-8 | Municipalities | BBR, ERP | In Progress |
| Islands | Alburgh | All waters | Pathogens, nutrients | High | Conduct sanitary survey on Cedar drive and East shore road | citizen complaint, DEC | DEC | DEC | |
| Islands | Alburgh | All waters | (protection) | Medium | reclassify Mud Creek Marsh to Class 1 | DEC | Community group, DEC | DEC | Not Started |
| Islands | Alburgh | All waters | Land erosion, Channel erosion, nutrients | High | Prioritize and implement projects in the Alburgh Stormwater Master Plan | DEC | Municipalities; landowners; Grand Island NRCD | ERP, LCBP | In Progress |
| Islands | All | All waters | Aquatic Invasive species | Medium | Determine effectiveness of a fire district for shoreline owners to fund AIS management projects. | DEC | Shoreline assn, DEC | 604b funding to RPCs | |
| Entire Basin | All | All waters | Aquatic Invasive specific | | Incorporate materials specific to spiny water flea into signs, greeter program. Place spiny water flea spread prevention information at all lake accesses (see Appendix I) | DEC | DEC | DEC, LCBP | Complete ? |
| Entire Basin | All | All waters | Aquatic Invasive specific | High | Develop a pilot network of hot water power wash stations at selected high priority Lake Champlain accesses to assist boaters with DEContamination of watercraft and gear | DEC | LCBP greeter stewards | DEC, staff time | Lakes and Ponds? |

| Subbasin | Town | Stream seg-ment | Stressor addressed | Priority | Project Description | Source | Potential Partners | Funding source | Status |
|---|---|---|---|---|---|---|---|---|---|
| Entire Basin | All | All waters | nutrients, land erosion, channel erosion | Medium | Identify potential wetland restoration sites based on Lake Champlain wetland restoration map | DEC | DEC, USFWS | USDA – WRE, RCPP | Complete |
| Entire Basin | All | All waters | Pathogens, nutrients, land erosion | High | Update AAP brochure and distribute during animal vaccinations | AAFM | AAFM, UVM extension, veterinarians | AAFM | Complete (RAP) |
| Entire Basin | All | All waters | Pathogens, nutrients | High | Assist wastewater treatment facilities in meeting TMDL goals to reduce phosphorus loading to Lake Champlain | DEC FED | municipalities | State Clean Water Revolving Fund | In Progress |
| Entire Basin | See Figure 16 for specific towns | All waters | Channel erosion, encroachment | High | Protect river corridors to increase flood resilience and to allow rivers to reach equilibrium by assisting towns to adopt appropriate ordinances | DEC | Municipalities, RPCs, DEC | 604b funding to RPCs; DEC staff time | In Progress |
| Entire Basin | See Table 7 | All waters | Nutrients, land erosion, channel erosion, pathogens | High | Monitor and assess surface waters to gain better understanding of condition and potential sources | DEC | DEC, watershed groups, CCST | DEC including LaRosa Partnership Program, | In Progress |

# Appendix B. Existing Uses in The North Lake Basin

## Swimming

Most of the swimming in the basin takes places on the many lakes and ponds which have a presumed existing use of contact recreation. During the basin planning process, no locations of swimming use on rivers were identified that are accessed through publicly owned lands such as stream crossing right-of-ways.

## Recreational Boating

It is the Agency's long-standing stipulation that all lakes and ponds in the basin have existing uses of boating and so only boating locations on rivers are listed below. A number of locations are good whitewater or flatwater boating stretches in the basin; some highly rated by the Vermont Paddlers Association, listed in the AMC or New Hampshire or Vermont paddlers Guide. The Clyde River is part of the Northern Forest Canoe Trail and includes some spectacular flat water canoeing. All sites listed on Table B1 are rated significant for recreational boating (Jenkins, 1992) or were otherwise brought to VDEC's attention. Many canoe access areas and dam portages have been established. Anyone boating these reaches should carefully scout routes before launching. This basin plan makes no representations as to the suitability or safety of the listed reaches with respect to the individual skills of the reader of this plan or those of prospective boaters.

**Table 21 Determination of existing uses of flowing waters for boating in The North Lake Basin.**

| Waterbody | Town | Basis for determining the presence of an existing use |
|---|---|---|
| LaPlatte River<br><br>Mouth to RM 1 | Shelburne | Lake Champlain Land Trust Shelburne River Park canoe and kayak launch at RM 1[16]. Majority of riparian buffer is part of a Nature Conservancy Preserve |

[16] RM is river mileage measured from the river terminus.

**Table 22 Determination of existing uses of flowing waters for fishing in The North Lake Basin.**

| Waterbody | Town | Basis for determining the presence of an existing use |
|---|---|---|
| Mud Creek - Lake Champlain to the dam in Alburgh (just upstream of<br>Route 78 bridge). | Alburgh | General state fishing regulations pertaining to Lake Champlain apply. Parking at Fish and Wildlife Mud Creek Wildlife Management Area off Rte. 78.. |
| Mill River - Lake Champlain to the falls in Georgia (just upstream of<br>Georgia Shore Rd bridge). | Georgia | General state fishing regulations pertaining to Lake Champlain apply. Town of Georgia parking lot at Georgia Shore Road bridge provides access to area with conservation easement. |
| Malletts Creek to the first falls upstream of Roosevelt<br>Highway (US 2 and US 7) in Colchester. | Colchester | General state fishing regulations pertaining to Lake Champlain apply. During spring high water, the stretch can be canoed (personal communications, Bernie Pientka, DFW fisheries biologist). |
| LaPlatte River to the falls in Shelburne (under Falls Road Bridge | Shelburne | General fishing regulations pertaining to Lake Champlain apply. State Fish and Wildlife access ramps located at mouth of LaPlatte. Falls can be reached by boat from the Lake Champlain Land Trust Shelburne River Park canoe and kayak launch at RM 1 |

**Table 23 Determination of existing uses of waters for public surface water supplies in The North Lake Basin.**

| Waterbody | Town | Basis for determining the presence of an existing use |
|---|---|---|
| Colchester Pond | Colchester | Classified at an A(2) (Water Resources Panel 2006) |
| St. Albans Reservoir North | Fairfield | Water source for one or more community water supplies regulated by the Water Supply Division |

| | | |
|---|---|---|
| Northeast Arm - Lake Champlain | N/A | Same as above |
| Main Lake – Lake Champlain | N/A | Same as above |
| Malletts Bay – Lake Champlain | N/A | Same as above |
| Burlington Bay | N/A | Same as above |
| Shelburne Bay | N/A | Same as above |

# Appendix C. Municipal Protectiveness Matrix for The North Lake Basin

**Municipal protectiveness matrix for towns with significant area in The North Lake Basin**

| Chittenden County | | | | Franklin County | | | |
|---|---|---|---|---|---|---|---|
| **Town** | **SWMP / FRP †** | **Year filed** | **Projects Identified*** | **Town** | **SWMP Completed** | **Year** | **# of High Priority Projects Identified** |
| **Burlington** | Centennial Brook FRP | 2016 | **4** | | | | |
| **Burlington** | Englesby Brook FRP | 2016 | 29 | | | | |
| **Burlington** | Potash Brook FRP | 2016 | 1 | | | | |
| **Colchester** | Morehouse Brook FRP | 2016 | 2 | | | | |
| **Colchester** | Sunderland Brook FRP | 2016 | 2 | | | | |
| **Essex** | Sunderland Brook FRP | 2016 | 4 | | | | |
| **Essex/UVM** | Sunderland Brook FRP | 2016 | 1 | | | | |
| **Essex Junction** | Sunderland Brook FRP | 2016 | 1 | | | | |
| **Colchester/VAOT** | Sunderland Brook FRP | 2016 | 1 | | | | |
| **Essex Junction** | Indian Brook FRP | 2016 | 9 | | | | |
| **Essex** | Indian Brook FRP | 2016 | 4 | | | | |
| **VAOT** | Indian Brook FRP | 2016 | 2 | | | | |
| **Essex/EJ/VAOT** | Indian Brook FRP | 2016 | 2 | | | | |
| **Jericho** | Town-wide SWMP | 2017 | 21 | | | | |
| **Milton** | Town-wide SWMP | 2019 | 65 | | | | |
| **Richmond** | Town-wide SWMP | 2018 | 21 | | | | |
| **Shelburne** | Munroe Brook FRP | 2016 | 25 | | | | |
| **VAOT** | Munroe Brook FRP | 2016 | 2 | | | | |
| **South Burlington** | Munroe Brook FRP | 2016 | 2 | | | | |
| **South Burlington** | Bartlett Brook FRP | 2016 | 7 | | | | |
| **UVM** | Bartlett Brook FRP | 2016 | 2 | | | | |
| **VAOT/private** | Bartlett Brook FRP | 2016 | 1 | | | | |
| **South Burlington** | Centennial Brook FRP | 2016 | 10 | | | | |
| **Burlington/UVM** | Centennial Brook FRP | 2016 | 2 | | | | |
| **So.Burl / BTV** | Centennial Brook FRP | 2016 | 3 | | | | |
| **So.Burl / VAOT** | Centennial Brook FRP | 2016 | 3 | | | | |
| **So.Burl/Burl./UVM** | Centennial Brook FRP | 2016 | 1 | | | | |
| **South Burlington** | Englesby Brook FRP | 2016 | 3 | | | | |
| **South Burlington** | Potash Brook FRP | 2016 | 96 | | | | |
| **UVM** | Potash Brook FRP | 2016 | 3 | | | | |
| **BTV Airport** | Potash Brook FRP | 2016 | 1 | | | | |
| **VAOT** | Potash Brook FRP | 2016 | 6 | | | | |
| **Underhill** | Town-wide SWMP | 2018 | 20 | | | | |
| **Williston** | Allen Brook FRP | 2016 | 29 | | | | |
| **Winooski** | Morehouse Brook FRP | 2016 | 6 | | | | |

** town-wide SWMP projects could include more than one watershed*
*† Flow Restoration Plan (FRP) projects identified refer to locations; may need more than one "project" at location.*

| | **Status** | **Burlington** | **Charlotte** | **Colchester** |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| **National Flood Insurance Program (NFIP)** | **Enrolled?** | Yes | Yes | Yes |
| **Road and Bridge Standards** | **Adopted?** | Yes | Yes | Yes |
| **Hazard Mitigation Plan (LHMP)** | **Adopted?** | Yes | Yes | Yes |
| **River Corridor Protection** | **Adopted?** | No | Early Adopter | Early Adopter |
| **Comments on River Corridor Protection** | | | | NFIP CRS community |
| **ERAF % from State** | **Percent** | 12.5 | 17.5 | 17.5 |
| **Flood Hazard By-law** | **Adopted?** | Yes | Yes | Yes |
| | **Comment** | Yes | Yes | Yes |
| **Flood Resilience in Town Plan** | **Completed?** | Yes | Yes | Yes |
| | **Comment** | | | |
| **Municipal Bylaw or Zoning District for Water Resource Setback** | **River/Stream** | Yes | Yes | Yes |
| | **Comment** | Named Streams has a 100 ft. setback. minor streams have a 50 ft. setback. Winooski River has a 250 ft. setback. | 100 ft. setback from named streams, 50 ft. setback from unnamed streams, 150 ft. setback from LaPlatte tributary and stream parallel to Bean Road (Section 3.15) | River = 250 ft. setback. Streams = 85 ft. setback. NOTE: 250 ft. back from mean water mark on Winooski & Lamoille River creates no-build buffer 100 ft. from mean water mark. |
| | **Wetland** | Yes | Yes | Yes |
| | **Comment** | Wetland has a 100 ft. setback. | Proposed development within 50 feet of a "potentially significant wetland" triggers a review process. | 50 ft. setback. |
| | **Lake/Pond** | Yes | Yes | Yes |
| | **Comment** | Lake Champlain = 250 ft. setback. minor lake/pond = 50 ft. setback. | 100 ft. vegetated buffer for Lake Champlain | Lake, Pond = has 250 ft. setback. |
| **Potential actions to address gaps in Water Quality Protection** | | Could expand protections in Special Flood Hazard Area. Current regs allow some Conditional Use.<br><br>Actively implementing Flow Restoration Plan(s) as required. Will submit Phosphorus Control Plan to ANR by 4/1/2021. | Continue to pursue funds for final design and implementation of water quality projects identified by Town and/or Lewis Creek Association (LaPlatte River Partnership) | Actively implementing Flow Restoration Plan(s) as required. Will submit Phosphorus Control Plan to ANR by 4/1/2021. |
| | | | | |

| | Status | Essex | Essex Junction | Hinesburg |
|---|---|---|---|---|
| **National Flood Insurance Program (NFIP)** | **Enrolled?** | Yes | Yes | Yes |
| **Road and Bridge Standards** | **Adopted?** | Yes | Yes | Yes |
| **Hazard Mitigation Plan (LHMP)** | **Adopted?** | Yes | Yes | Yes |
| **River Corridor Protection** | **Adopted?** | Early Adopter | Early Adopter | Early Adopter |
| **Comments on River Corridor Protection** | | | | Have some streams within muni Fluvial Erosion Hazard Overlay District |
| **ERAF % from State** | **Percent** | 17.5 | 17.5 | 17.5 |
| **Flood Hazard Bylaw** | **Adopted?** | Yes | Yes | Yes |
| | **Comment** | Yes | | |
| **Flood Resilience in Town Plan** | **Completed?** | Yes | Yes | Yes |
| | **Comment** | | | |
| **Municipal Bylaw or Zoning District for Water Resource Setback** | **River/Stream** | Yes | Yes | Yes |
| | **Comment** | Streams has a 50 ft. setback. | Streams have a 50 ft. setback | Outside of Village District, streams have a 75 ft. setback for new structures, but vegetation mgt. is not addressed. Village District: has stream buffer provisions combined with stream setbacks in village growth area. In these areas stream buffers have greater protection regarding how vegetation is managed. - LaPlatte River and Patrick Brook – 100' on either side. Village District - Streams in developed areas – 25' on either side (see map for clarification), unless waived by the DRB based as described below. |
| | **Wetland** | Yes | No | Yes |
| | **Comment** | Class II wetlands have a 50 ft. setback. | | Wetlands and their associated buffer areas (per State of VT) are protected in Hinesburg's two large rural districts (AG and RR2 – 80% of Hinesburg) from certain types of development – i.e., subdivisions and projects requiring site plan review. See section 5.26 of the Zoning Regulations and section 6.12 of the Subdivision Regulations |
| | **Lake/Pond** | Yes | No | Yes |
| | **Comment** | Lakes/Ponds/Reservoirs over .5 ac = 150 ft. setback. | | Lake/Pond has a 75 ft. setback. Outside of Village District |

| | | | | |
|---|---|---|---|---|
| **Potential actions to address gaps in Water Quality Protection** | | Actively implementing Flow Restoration Plan(s) as required. Will submit Phosphorus Control Plan to ANR by 4/1/2021. | Actively implementing Flow Restoration Plan(s) as required. Will submit Phosphorus Control Plan to ANR by 4/1/2021. | Continue to pursue funds for final design and implementation of water quality projects identified by Town and/or Lewis Creek Association (LaPlatte River Partnership) |
| | | | | |

| | Status | Milton | Richmond | Saint George |
|---|---|---|---|---|
| **National Flood Insurance Program (NFIP)** | **Enrolled?** | Yes | Yes | * No. Formal application to NFIP planned for submission in early 2020 |
| **Road and Bridge Standards** | **Adopted?** | Yes | Yes | Yes |
| **Hazard Mitigation Plan (LHMP)** | **Adopted?** | Yes | Yes | Yes |
| **River Corridor Protection** | **Adopted?** | Early Adopter | Early Adopter | Y es |
| **Comments on River Corridor Protection** | | | | Selectboard adopted both Floodplain and River Corridor Bylaws in fall 2019. |
| **ERAF % from State** | **Percent** | 17.5 | 17.5 | 7.5 – 17.5 |
| **Flood Hazard Bylaw** | **Adopted?** | Yes | Yes | Yes |
| | **Comment** | | | |
| **Flood Resilience in Town Plan** | **Completed?** | Yes | Yes | Yes |
| | **Comment** | | | |
| **Municipal Bylaw or Zoning District for Water Resource Setback** | **River/Stream** | Yes | Yes | Yes |
| | **Comment** | 25 ft. buffer from surface waters throughout town, 50 ft. minimum buffer from surface waters in forestry/conservation district | Winooski, Huntington Rivers has a 50 ft. setback. For other rivers, brooks & ponds a 50 ft. setback is "highly encouraged." | Streams have a 50 ft. setback. |
| | **Wetland** | Yes | Yes | Yes |
| | **Comment** | 50 ft. minimum buffer from wetlands in forestry/conservation district | Class II wetlands have a 50 ft. setback. | Class II wetlands have a 50 ft. setback. |
| | **Lake/Pond** | Yes | Yes | No |
| | **Comment** | 25 ft. buffer from surface waters throughout town, 50 ft. minimum buffer from surface waters in forestry/conservation district | Gillette Pond & Lake Iroquois has a 50 ft. setback. other rivers, brooks & ponds has a 50 ft. setback. | Note: No significant ponds in town. |
| **Potential actions to address gaps in Water Quality Protection** | | Will submit Phosphorus Control Plan to ANR by 4/1/2021. | Continue to pursue funding for design and implementation of projects identified in Stormwater Master Plan | None |

| | Status | Shelburne | So. Burlington | Westford |
|---|---|---|---|---|
| **National Flood Insurance Program (NFIP)** | **Enrolled?** | Yes | Yes | Yes |
| **Road and Bridge Standards** | **Adopted?** | Yes | Yes | Yes |
| **Hazard Mitigation Plan (LHMP)** | **Adopted?** | Yes | Yes | Yes |
| **River Corridor Protection** | **Adopted?** | Early Adopter | Yes | Early Adopter |
| **Comments on River Corridor Protection** | | | Adopted in 2019 | Planning Commission was briefed several times in 2018 and 2019. |
| **ERAF % from State** | **Percent** | 17.5 | 17.5 | 17.5 |
| **Flood Hazard Bylaw** | **Adopted?** | Yes | Yes | Yes |
| | **Comment** | | | |
| **Flood Resilience in Town Plan** | **Completed?** | Yes | Yes | Yes |
| | **Comment** | | | |
| **Municipal Bylaw or Zoning District for Water Resource Setback** | **River/Stream** | Yes | Yes | Yes |
| | **Comment** | LaPlatte, McCabe's and south branch Munroe have a 100 ft. setback. North branch Monroe & tributaries have a 50 ft. setback per Floodplain and Watercourse Overlay District | Muddy and Potash Brook and Winooski River have a 100 ft setback. Minor streams have a 50 ft. setback. Drainage ways have a ten ft. setback | Water Resource Overlay (WRO) District is 50 ft. for first order stream as and 100 ft. for all other streams, rivers, class 2 wetlands, etc. Ponds have the same buffer as the waterway they are associated with. |
| | **Wetland** | Yes | Yes | Yes |
| | **Comment** | Wetlands have a 500 ft. setback. | Wetlands have a 50 ft. setback | Yes, 100 ft. per WRO District |
| | **Lake/Pond** | Yes | Yes | Yes |
| | **Comment** | Shelburne Pond has a 500 ft. setback. Lake Champlain has a 100 ft. setback | Lake Champlain has a 150 ft setback. | Yes, 100 ft. per WRO District |
| **Potential actions to address gaps in Water Quality Protection** | | Actively implementing Flow Restoration Plan(s) as required. Will submit Phosphorus Control Plan to ANR by 4/1/2021. | Actively implementing Flow Restoration Plan(s) as required. Will submit Phosphorus Control Plan to ANR by 4/1/2021. | Continue to investigate potential incorporation of River Corridor model bylaw. |

| | Status | Williston |
|---|---|---|

| | | |
|---|---|---|
| **National Flood Insurance Program (NFIP)** | **Enrolled?** | No* |
| **Road and Bridge Standards** | **Adopted?** | Yes |
| **Hazard Mitigation Plan (LHMP)** | **Adopted?** | Yes |
| **River Corridor Protection** | **Adopted?** | Early Adopter |
| **Comments on River Corridor Protection** | | |
| **ERAF % from State** | **Percent** | 17.5 |
| **Flood Hazard Bylaw** | **Adopted?** | Yes |
| | **Comment** | |
| **Flood Resilience in Town Plan** | **Completed?** | Yes |
| | **Comment** | |
| **Municipal Bylaw or Zoning District for Water Resource Setback** | **River/Stream** | Yes |
| | **Comment** | Named Rivers and Brooks have a 150 ft. setback. unnamed streams have a 50 ft. setback. |
| | **Wetland** | Yes |
| | **Comment** | Class II wetlands have a 50 ft. setback. |
| | **Lake/Pond** | Yes |
| | **Comment** | Lake Iroquois has a 250 ft. setback. |
| **Potential actions to address gaps in Water Quality Protection** | | Actively implementing Flow Restoration Plan(s) as required. Will submit Phosphorus Control Plan to ANR by 4/1/2021. |