Northern Lake Champlain Direct Drainages

Tactical Basin Plan

Burlington Waterfront, Lake Champlain

December 2020

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

Approved:

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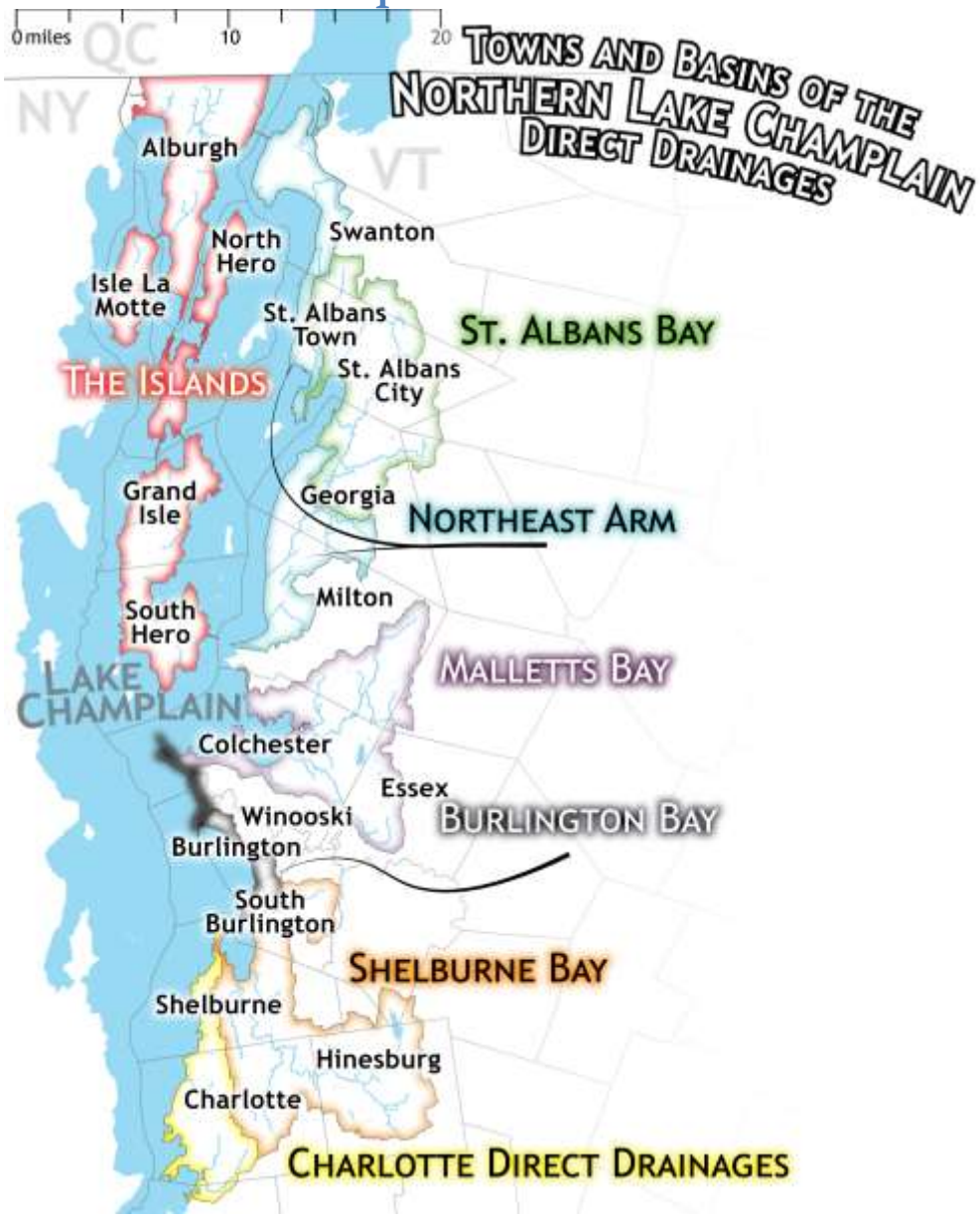
Cover Photo: Karen Bates

Northern Lake Champlain Direct Basin Municipalities

Alburgh	Ferrisburgh*	St. Albans City	Williston*
Burlington	Georgia	St. Albans Town	Westford*
Charlotte	Grand Isle	St. George*	
Colchester	Hinesburg	Shelburne	
Essex Junction	Isle Le Motte	South Burlington	
Essex Town	Milton	South Hero	
Fairfield*	North Hero	Swanton	

**Only a very small area of the municipalities is in the watershed and not included in map below.*

Map of Sub-basins



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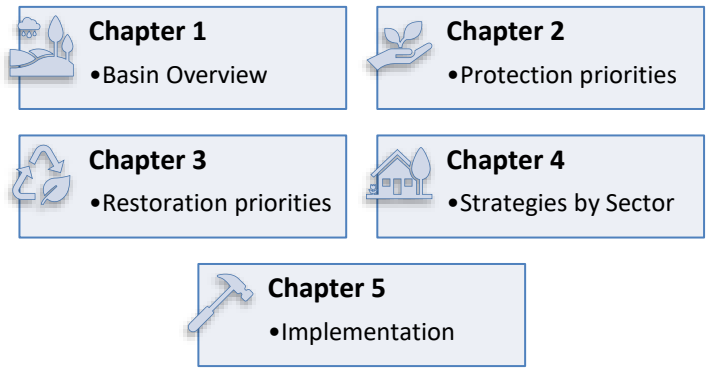
Executive Summary

The Northern Lake Champlain Direct Drainages (Basin 5) Tactical Basin Plan is a water quality management plan to protect, maintain, enhance, and restore the quality of the basin's surface waters. The overriding goal is for surface waters to meet or exceed Vermont Water Quality Standards.

The Vermont Clean Water Act requires the development and adoption of Tactical Basin Plans for each of Vermont's 15 river basins on a five-year rotational cycle. These plans integrate watershed modeling, water quality monitoring, sector-specific pollution source assessments, and stakeholder input to document geographically explicit actions. The Agency of Natural Resources is assisted in the implementation of the plans through a combination of state and federal funding sources, partner support (Appendix A) and the public rulemaking process for certain protection efforts.

The five chapters in this plan are a framework for understanding Basin 5's unique characteristics and water quality issues, and where and how to implement projects to protect and restore water quality in the basin.



The surface waters in Basin 5 provide recreational and aesthetic opportunities, drinking water, agricultural irrigation, and habitat for plant and animal communities. Chapter 1 describes the surface water conditions, including: the predominant pollutants degrading these uses (phosphorus, sediment, pathogens, and toxins); as well as other stressors present in the basin (aquatic invasive species and altered flows.)

The main sources of the top three pollutants, elevated phosphorus, sediment, and pathogens include agricultural, urban and road runoff, and eroding river channels. Many actions taken to address these pollutants will also achieve required reductions in phosphorus loading to Lake Champlain (detailed pollution reduction targets, known as the Lake Champlain TMDL Phase II content, are provided in Chapter 3).

In Chapter 2, the plan describes management goals for Basin 5 surface waters as well as identifying surface waters where current monitoring and assessment data meet criteria for a different classification, see below:

Waterbody	Town	Current Classification	Monitoring and assessment data suggests that surface water meets criteria for a different classification
Colchester Pond	Colchester	A2	B2 for all uses
Milton Pond	Milton	A2	B2 for all uses
Mud Creek	Alburgh	Class II Wetland	Class I Wetland
Sand Bar wetland	South Hero	Class I Wetland	NA
Trout Brook (section)	Milton	B2	B1 for aquatic biota
Malletts Creek Tributary 7	Milton	B2	Additional monitoring needed to confirm condition meets B1
North Shore Wetland	Burlington	Class I Wetland	NA
LaPlatte River Wetlands	Shelburne	Class I Wetland	NA

Chapter 3 includes Phase II content for the Lake Champlain Phosphorus Total Maximum Daily Load (TMDL) that augments Phase II content initially presented in the 2017 Basin 5 Tactical Basin Plan. The Phase II content established target phosphorus load reductions from the basin to Lake Champlain and includes high-resolution phosphorus load modeling and projected phosphorus reductions for smaller sub-watershed as well as by types of sources (wastewater treatment plants, developed lands stormwater, roads, forestry and agricultural). In addition, Chapter 4 describes progress made in developing associated regulatory programs as well as permittee compliance leading to the practices that will work towards meeting the phosphorus load allocations. The TMDL as well as the associated Phase I Implementation Plan point to issuance of this plan as a component of the accountability framework.

Chapter 4 provides an overview of progress made to date and provides a guide for the next 5 years to address pollution from land use sectors contributing to water quality issues. Information from assessments in the basin and derived from public input have been compiled to guide the development of strategies for the following sectors: agriculture, developed lands—stormwater and roads, wastewater treatment facilities, and restoration of forest lands, lakes, rivers, and wetlands.

Chapter 5 includes a total of 40 strategies in the implementation table as well as a list of surface waters identified for water quality monitoring. Individual implementation projects are listed in the Watershed Projects Database, which includes geographically explicit actions to protect, maintain, enhance and restore .

The strategies are supported by sector-based recommendations in Chapter 4 as well as the following strategies and identified focus areas summarized from the Chapter 5 Implementation Table:

Focus Areas (HUC12 in Bold)	Priority Strategies
Agriculture	
Mud Creek, St. Albans Bay (and Swanton shoreline**), Jewett Brook, Lake Champlain, LaPlatte River, Hoisington Brook,**	• Support outreach and technical and financial assistance for Best Management Practices and Required Agricultural Practices to reduce erosion off fields, manage stormwater off production areas, enhance riparian buffers, develop, and implement nutrient management plans. Promote adoption of stewardship practices through award program, • Continue nutrient management planning • Coordinate with agricultural service providers to provide cross training
Developed Lands – Stormwater	
Stormwater impaired streams and those trending towards impairment: Allen, Munroe and upper LaPlatte. Malletts Bay: Smith Hollow and Crooked Creek; Islands: Keeler Bay Areas with high landslide potential,	• Develop and implement stormwater master plans, Flow Restoration and Phosphorus Control Plans • Support landowners in meeting compliance with the Three-Acre General Permit • Use social marketing tools[1] to encourage adoption of residential Best Management Practices • Assist landowners in managing stormwater from private roads • Assist road crews and contractors in adopting winter ice management that results in reduced use of Chlorides (also below)
Developed Lands – Roads	
All town will have a complete Road Erosion Inventory (REI) Private roads in priority HUC12s like LaPlatte River and Islands.	• Complete Road Erosion Inventories (REIs) and implement BMPs on high priority road segments. • Provide and support training for road crews on culvert replacements and maintenance of road BMPs
Wastewater	
Hinesburg, South Burlington, Residential Septic health: Lake Iroquois, Lake Champlain Islands	• Support upgrades and optimize phosphorus removal from WWTF to meet TMDL allocation • Assist communities in addressing inadequate onsite wastewater treatment through the planning and development of solutions • Promote proper septic system maintenance

[1] https://www.epa.gov/sites/production/files/2016-09/documents/socialmarketingguide_overall.pdf

Focus Areas (HUC12 in Bold)	Priority Strategies
Natural Resources – Rivers	
All Rivers with following priorities: Jewett Brook, Stevens Brook Mil River, LaPlatte River, See Table 18 for dams	• Develop and implement river corridor remediation projects including shoreline reforestation, floodplain restoration, dam removal • Assist towns with culvert replacement to improve geomorphic compatibility with streams • Provide outreach to communities on floodplain and river corridor protections • Identify river corridor and wetlands easements, and riparian area restoration
Natural Resources – Lakes	
Lake Iroquois, Lake Champlain shoreline	• Restore forest cover on shorelands, improve septic system performance, reduce erosion from shoreland residential properties and roads • Support aquatic invasive species spread prevention and management efforts
Natural Resources – Wetlands	
Class I Wetland Candidate: Mud Brook Priority **Conserve: Wetlands adjacent to Vermont Wildlife Management Areas** **Restoration: see the DEC RCPP Wetland Restoration Site Prioritization Map**	• Conduct studies on potential Class I candidates and support local outreach to municipalities and landowners to gauge interest in supporting Class I designations • Provide technical support for parties interested in submitting petitions • Support wetland restoration and conservation
Natural Resources – Forests	
High TP loading watersheds in Phase II plan including **Mill River, Malletts Creek, LaPlatte River**	• Identify and remediate erosion from logging roads and landings with high erosion potential • Provide outreach, technical assistance, and workshops on Acceptable Management Practices and Current Use Program • Support forestland conservation and skidder bridge program

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[2]. The basin specific water quality goals, objectives, and strategies aim to protect public health and safety and ensure public use and enjoyment of Vermont waters. As a result, these plans can be considered a strategic guidebook for the Vermont Agency of Natural Resources (ANR) and watershed partners to protect and restore Vermont's surface waters.

The tactical basin planning process allows for the issuance of plans for Vermont's 15 basins every five years, as required by statute 10 V.S.A. § 1253. Updating a basin plan includes the following steps (Figure 1):

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

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.

Based on surface water monitoring and assessment results, the plans identify opportunities for protection through special state designations as well as conservation of the natural landscape. Plans also identify opportunities for restoration through reduction of pollutants and stressors. When appropriate, the plans set out the pollutant reductions needed to restore water quality through development of Total Maximum Daily Loads.[3] In the Chapter 5. Implementation Table, strategies,

[2] The TBPs also 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

[3] Total Maximum Daily Loads (TMDL) establish a pollution reduction budget for phosphorus, that requires the reduction of pollutants through regulatory programs as well as voluntary restoration opportunities. See Chapter 3 for detailed explanation.

including education and outreach opportunities as well as protection and restoration actions, are identified along with eligible federal and state-funding sources and partners willing to assist in implementation of actions.

Watershed partners assist ANR in the development of the plan as well as implementation. Northern Lake Champlain Direct Drainages (North Lake Basin) planning benefits from the participation of at least 9 groups. They provide volunteer-collected data to augment ANR's assessment data and they participate in development of strategies during the planning process (see Appendix A, Table 21). In the next rendition of the North Lake Basin Plan, partners' roles will be formalized as an outcome of Act 76 of 2019, which is further described at the end of Chapter 3.

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. The WPD is continuously updated to capture project information from the TBP process, on the ground assessments, and emerging projects due to natural and anthropogenic events.

ANR's Clean Water Portal is an online platform that houses a variety of clean water tools to assist with project planning, searching existing projects, funding opportunities. Tools on the portal used for watershed planning include:

- Clean Water Project Explorer
- Watershed Projects Database (WPD) Search
- Water Quality Project Screening Tool
- Funding Opportunities Tool
- Stormwater Treatment Practice (STP) Calculator
- Clean Water Dashboard

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 just south of the Ferrisburgh and Charlotte town-line and ending at the Canadian border, and all Vermont surface waters in the drainage, except the three-major river watersheds that drain directly into this section of the Lake (Figures 3 and 4). The Agency of Natural Resources (ANR) has completed separate basin plans for those three major river watersheds, the Lamoille, the Winooski and the Missisquoi. The Pike and Rock Rivers and direct drainages to the Missisquoi Bay, although originally included as part of the North Lake Basin, are addressed in the Missisquoi River tactical basin planning process[4].

The Northern Lake Basin is only about 37 % forested, a much lower percentage than other basins in Vermont (Figure 2). Historically, the Basin has been heavily farmed and 35% of the basin is still in agricultural use. Developed land, including transportation infrastructure, occupies approximately 13%, a higher percent than seen in other Vermont basins. The remaining 15% includes waterbodies.

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. A more detailed basin description is available in the Watershed Management Division's (WSMD) North Lake Basin assessments The forested landscape helps to protect water quality in the basin. Degraded waters are often adjacent to managed landscapes, i.e., agricultural and developed lands (Figures 2, 3, 4). Managing land use to reduce discharge or allow treatment of polluted runoff improves and protects water quality.

For planning purposes, the entire area is broken down into seven subwatersheds along with associated streams as identified in Table 1. The basin is also broken down into hydrologic-unit code (HUC) 12's and Lake Champlain lake segments (Table 1) for the following reasons: 1. 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; and 2. phosphorus nutrient-loading goals are established for each lake segment (see Chapter 3 for more information on the Lake Champlain Phosphorus TMDL).

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

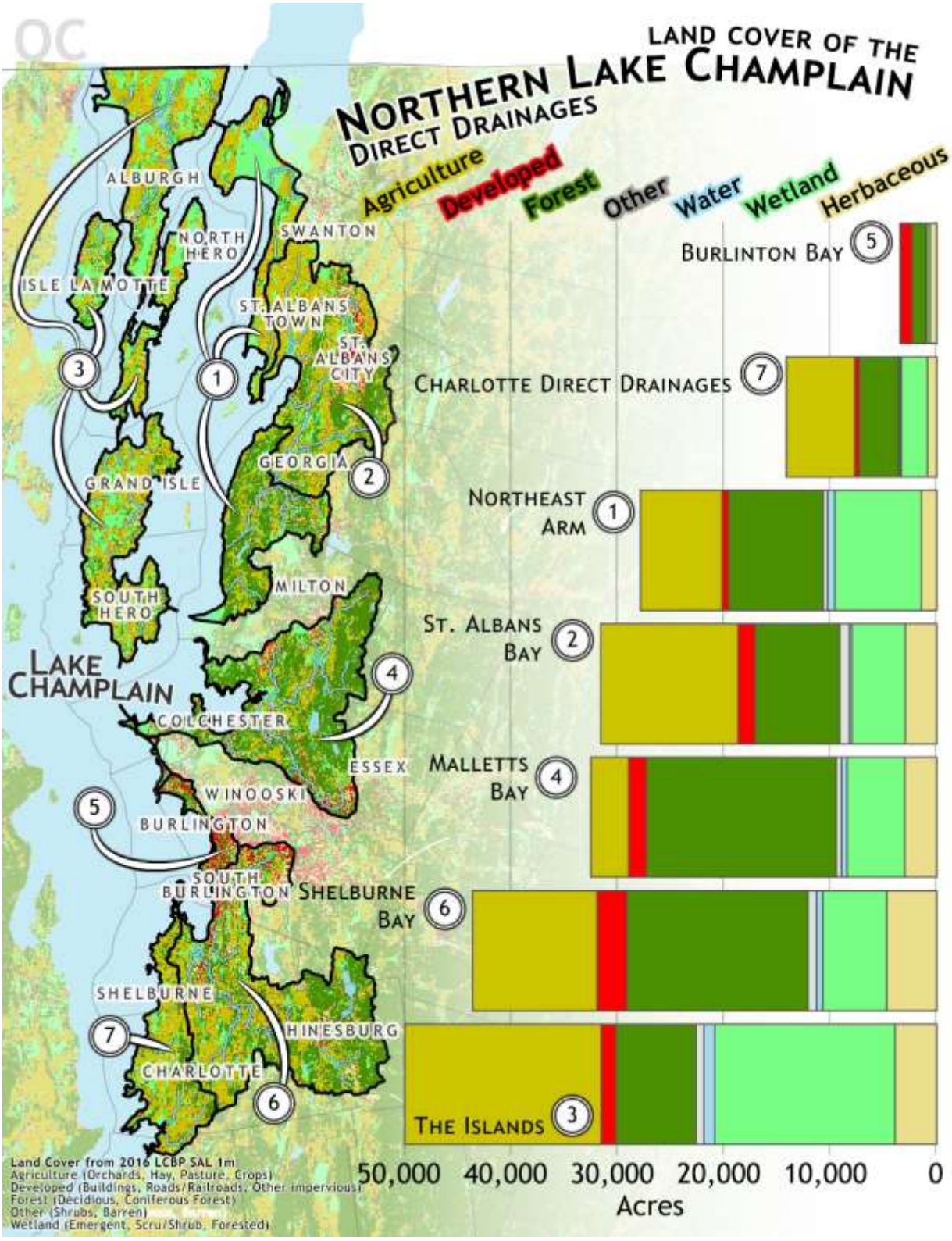


Figure 2. The North Lake Basin land-use map

Table 1. Subbasins, streams, town, adjacent lake segments and HUC12s of the North Lake Basin

Subbasin (Locations in Figure 2)	Contributing Streams and Ponds	Towns	Adjacent Lake Segment	HUC12[5](Locations in Figure 11)
1. East shoreland of Northeast Arm	Mill River and St. Albans Reservoirs	Georgia, Swanton, Fairfield, St. Albans Town	Northeast Arm	**Mill River, St. Albans Bay**
2. St. Albans Bay	Jewett Brook, Rugg Brook, Stevens Brook	St. Albans city and town, Swanton	Northeast Arm	**St. Albans Bay Jewett Brook**
3. Champlain Islands	Mud Creek, Sucker Brook, tributaries to Keeler Bay	Alburgh, Isle La Motte, South and North Hero, Grand Isle	Isle Le Motte, Northeast Arm, Main Lake	**Mud Creek, Carman Brook St. Albans Bay, Malletts Bay, Lake Champlain**
4. Malletts Bay	Malletts Creek, Allen Brook, Smith Hollow Brook, Crooked Creek, Moorings Stream, Milton Pond, Indian Brook and Reservoir, Colchester Pond and Pond Brook	Colchester, Milton, Essex Junction, Westford	Main Lake, Northeast Arm	**Malletts Creek Malletts Bay**
5. Burlington Bay	Englesby Brook	Burlington	Main Lake	**Lake Champlain**
6. Shelburne Bay	Potash Brook, Munroe Brook, Bartlett Brook, LaPlatte River, and Lake Iroquois	Burlington, Charlotte, Ferrisburgh, Hinesburg, Saint George, Shelburne, South Williston	Shelburne Bay, Main Lake	**Munroe Brook Shelburne Bay, LaPlatte River**
7. Charlotte Drainages	Thorp Brook, Holmes Brook and Kimball Brook	Charlotte, Ferrisburgh	Main Lake	**Hoisington Brook**

[5] Modeling results for Phosphorus loading (see Chapter 3) are provided at the HUC12 level. Chapter 4 identifies priority areas for remediation, including HUC12's with high Phosphorus loading.

Climate Change Implications for Water Resource Management

The changing climate is a consideration in ANR's planning around the protection and restoration of Vermont's water resources. The changing precipitation patterns seen in Vermont have led to an increase in pollutants washing into waterways, while increasing temperatures are altering aquatic habitat. In response, ANR plans acknowledge the need to intensify management activities that address pollutant loading from land use, especially sediment and nutrients. In addition, plans promote the protection as well as enhancement of natural resources, like river corridors, wetlands and shoreland. Natural resources help minimize impacts, including those related to increasing surface water temperatures.

The recognition that the changing climate has resulted 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 and additional analyses are provided by the 2019 Vermont Clean Water Performance Report (page 52).

In addition to degrading water quality and habitat, increased nutrients and surface water temperature provide cyanobacteria a boost over other algal communities, leading to an increase in blue green algal blooms. The Agency, the Vermont Department of Health and partners have worked collaboratively to help communities identify and avoid contact with these toxic blooms. Strategies that support these efforts in addition to strategies to improve surface waters are included in the basin strategies (see Chapter 5 Implementation Table).

B. Surface Water Conditions

Assessment Methodology

The Agency's Watershed Management Division (WSMD) in the Vermont Department of Environmental Conservation (DEC) uses monitoring data to assess the health of individual surface waters in relation to the Vermont Water Quality Standards per the 2019 DEC Assessment and Listing Methodology (VDEC, 2019). Vermont's assessment approach is described in the Vermont Water Quality Monitoring Program Strategy 2011-2020, (VDEC, 2015).

The DEC water quality monitoring programs support collection of the following surface water data in support of tactical basin planning: stream biomonitoring, lakes and ponds monitoring, including Lake Champlain Monitoring, wetland bioassessment and monitoring, and Stream Geomorphic Assessments. The ANR Department of Fish and Wildlife also provides fisheries data. In addition, assessments that focus on identifying sources of pollutants to surface waters include the Road Erosion Inventories , Stormwater Master Plans and Illicit Discharge Detection and Elimination Infrastructure mapping.

Rotational Water Quality Assessment

The Watershed Management Division (WSMD) of DEC conducts field work and compiles data and generates assessment reports in conjunction with the statewide rotational water quality assessment process. The DEC has designed a rotational watershed assessment process with a goal that surface waters (rivers, streams, lakes, ponds) of all 15 major river basins in the state are evaluated once every five years. By focusing annual evaluations on selected basins rather than statewide, more systematic, and intensive efforts can be made to collect and evaluate available pollution sources and water quality information within a watershed, and take emergency corrective actions as necessary

Volunteer Monitoring Programs

The Agency's surface water assessments also benefit from results obtained through surface water sampling by volunteers. The DEC programs that support volunteer monitoring include the WSMD Lay-Monitoring Program and the LaRosa Partnership Program (LPP). While the Lay-Monitoring Program focuses on identifying nutrient levels in lakes, the LPP supports sampling of streams for a number of chemical parameters. 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 and are described below.

The Lewis Creek Association. samples the LaPlatte River and tributaries, and Munroe, Thorp, Holmes and Kimball Brooks and the Lake Iroquois Association samples the lake's tributaries. The results have helped to identify impairments and stressed waters in the Shelburne Bay watershed.

The Rethink Runoff 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. The chloride results will help ANR identify subsequent testing needs to identify chloride-impaired streams.

In addition, the Town of Colchester has provided assessment data through an EPA-supported *Integrated Water Resources Management Study* (Stone Environmental, 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 (Table 7).

Assessment Results

The WSMD uses monitoring results to determine if a surface water meets (attains) or does not meet (exceeds or violates) certain Vermont Water Quality Standards (VWQS) criteria. In this plan, waters exceeding VWQS for the surface waters' current classification are identified as candidates for a higher classification, one whose criteria aligns with the surface water's current conditions (Table 5). Surface waters that violate VWQS are identified as degraded (Tables 2, 3, and 7).

Degraded surface waters are divided into three categories: stressed, altered and impaired waters:

Stressed waters support designated uses identified in the VWQS, but the water quality and/or aquatic biota/ habitat have been degraded by sources of human origin and the water may require some attention to maintain or restore its high quality. In some instances, stressed waters may need further assessments to confirm impairments because of documented disturbances or impacts.

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 occurring and arising 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 VWQS 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 Basin. In Figure 3 and 4, the impaired waters are divided into three categories: those with a TMDL approved by EPA, those needing a TMDL (referred to as 303d listed waters[6]) and those with an alternative management plan to a TMDL.

In addition to the VWQS, ANR uses criteria from additional lake and wetland assessments to identify lakes and wetlands that meet a more pristine condition than most surface waters. The assessment results (Chapter 2) can also be used to identify specific pollutants or stressors that could be addressed in Chapters 3 and 4. The assessment results for inland lakes (not Lake Champlain) can

[6] To address Section 303(d) of the Federal Clean Water Act, the DEC develops the 303(d) List of Impaired Waters The State also produces the Priority Waters List, which identifies other waters that do not meet water quality standards, but do not require a TMDL. Sections of that list include: Part B- impaired waters that have other required remediation measures in place; Part D-impaired waters with TMDLs in place; Part E-waters altered by AIS; and Part F-waters altered by flow modifications. These lists can be viewed on the DEC Assessment and Listing webpage)

be found in the Inland Lake Score Card . The wetlands assessment information is available through the WSMD Wetlands Program.

Monitoring and assessment results can be viewed on the **Vermont ANR Natural Resources Atlas.** For a more detailed description of monitoring results see the **Vermont Integrated Watershed Information System online data portal**. Monitoring and assessment needs to address gaps in the understanding of the basin's surface waters are outlined in Table 20. A summary of water quality conditions based on these assessments for streams, lakes and wetlands follows.

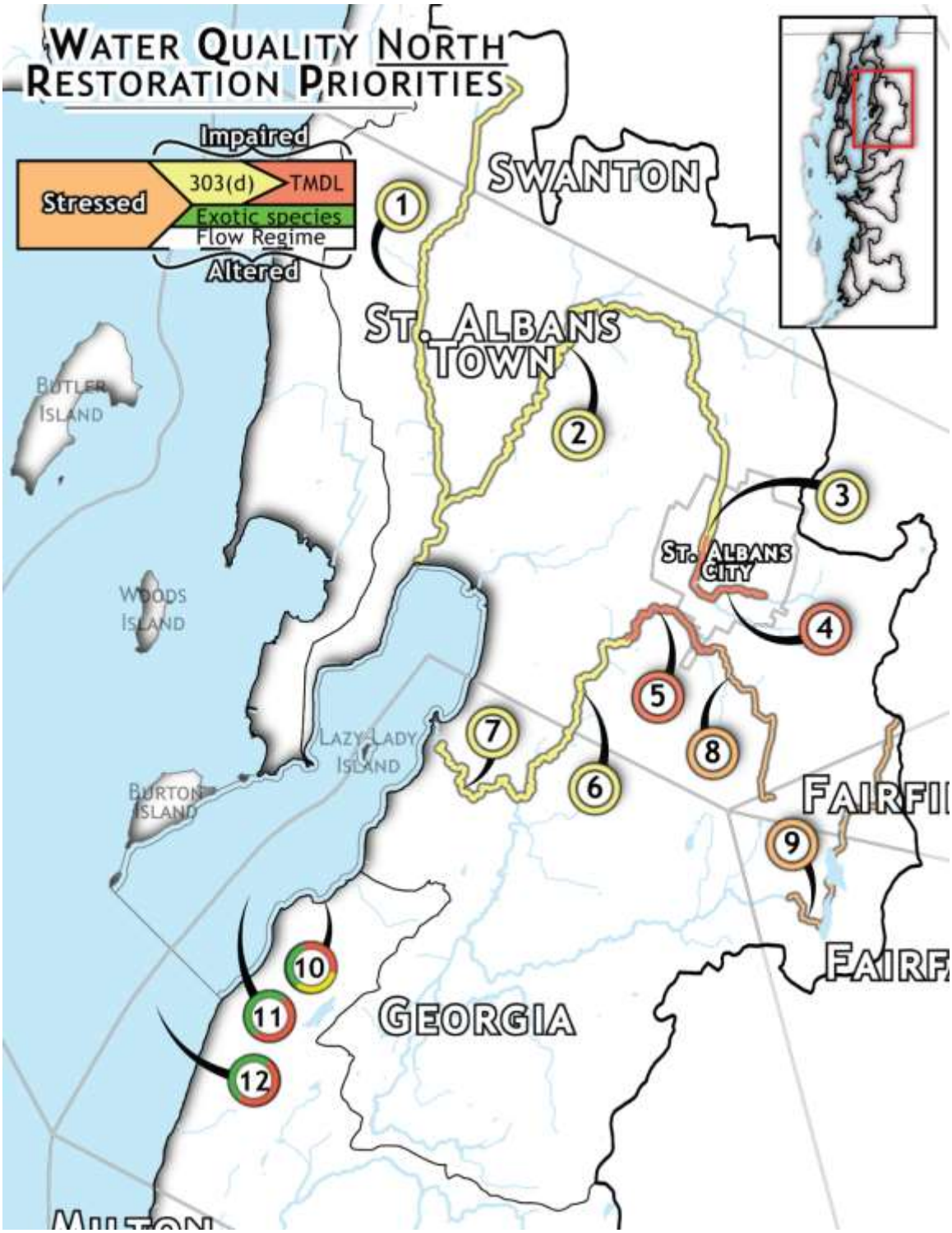


Figure 3. Impaired, stressed and altered surface waters in the northern section of the North Lake Basin, See Tables 2, 3 and 7 for detailed information regarding numbered streams.

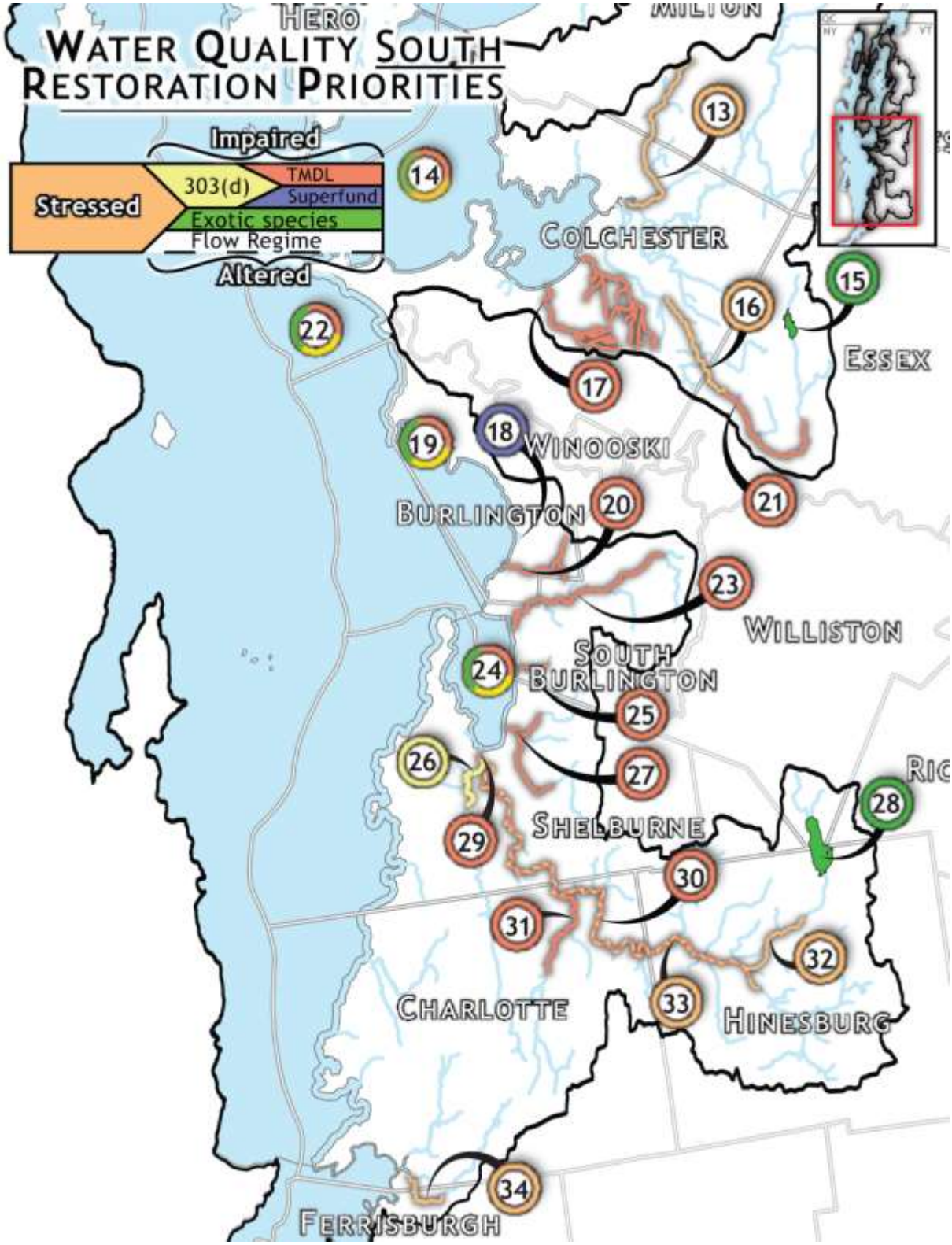


Figure 4. Impaired, stressed and altered surface waters in the southern section of the North Lake Basin. See Tables 2, 3 and 7 for detailed information regarding numbered streams.

Rivers

The WSMD's state-wide assessment of streams 2013-2017 Probability Report (VDEC, June 2019) indicate that a vast majority of stream miles in Vermont maintain biological communities that are "very high quality" waters, reflecting the reference condition, or minimal changes. Biological communities, including, macroinvertebrates and fish, provide a measurement of health as they are susceptible to stressors resulting from watershed land use change, as well as substrate habitat quality altered by loss of canopy and algae growth.

Compared to national averages, Vermont has more sites in "least disturbed" condition for salinity, nitrogen, and phosphorus than national or regional averages. Of the three stressors, total phosphorus appears to be the most dominant stressor.

Although the North Lake Basin, in relationship to rest of state, is more heavily developed, the majority of streams meet VWQ standards, based on DEC biomonitoring data, see North Lake Basin assessments. Those subwatersheds with higher percentages of forest cover do tend to support a higher percentage of streams meeting standards (e.g., Shelburne Bay and Malletts Bay), than the other subwatersheds, see Figures 2, 3, 4.

Based on river miles, sediment and nutrients are the most prevalent pollutants[7] in the North Lake Basin streams and rivers. Pathogens are the 2nd most prevalent. Physical alterations are also present throughout the watershed, ranging from habitat alteration, general stream channel instability and encroachment into the flood hazard zone. More isolated problems specific to particular reaches[8] include, thermal modification, toxic compounds from hazardous waste sites, and flow alteration.

The following tables list the impaired, stressed and altered rivers. Table 7 in Chapter 3 includes streams in the basin that are impaired but under an EPA-approved management plan (Total Maximum Daily Load or TMDL)

Table 2. Impaired, altered and stressed rivers on the Vermont 2018 Priority Waters List (VDEC, 2018) and 2016 Stressed Waters List (VDEC, 2016).

ID[9]	Waterbody Segment	Pollutant	Water Quality Problem	Sector	Remediation Approaches
	IMPAIRED SURFACE WATER (Part A – DEC 2018)				
6	Rugg Brook, From Mouth to approx. 3.1 Miles Upstream	Nutrients, Sediment, E. coli	Runoff	Agriculture	See Chapter 3. Lake Champlain Phosphorus TMDL (LC TMDL)

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

[8] The waters and associated problems are listed in the EPA and state lists (see Table 2, 3 and 7)

[9] IDs associated with numbers on Figures 3 and 4.

ID[9]	Waterbody Segment	Pollutant	Water Quality Problem	Sector	Remediation Approaches
1	Jewett Brook 3.5 Miles	Nutrients, Sediment	Runoff	Agriculture	LC TMDL
7	Mill River, From St. Albans Bay to 1.8 Miles Upstream	Nutrients, Sediment	Agricultural Runoff, Streambank Erosion	Agriculture	LC TMDL
2	Stevens Brook, Mouth Upstream 6.5 Miles	Nutrients, Sediment, E. coli	Agricultural Runoff; Morphological Instability, St Albans CSO	Agriculture Developed land	LC TMDL
3	Stevens Brook, Lasalle St Downstream 0.5 Mi	Metals (Cd, Ba, Cn, Zn)	Sediment Contamination from St Albans Gas and Light Haz Waste Site	Legacy from industrial activity	Follow up with landowner to continue site investigation to determine extent of contamination
26	McCabe's Brook, Mouth to RM 1.4	Nutrients	Possible Toxic Impact Below WWTF; Unstable Channel Above	Developed land,	
	IMPAIRED SURFACE WATERS (Part C – DEC 2018)				
5	Rugg Brook, RM 3.1 to RM 5.3	Stormwater	Stormwater Runoff	Developed land	See Chapter 3 Stormwater TMDL (SW TMDL)
4	Stevens Brook, RM 6.5 at Pearl St to RM 9.3	Stormwater	Stormwater Runoff, Erosion/Sedimentation, Morphological Instability	Developed land,	SW TMDL
21	Indian Brook, RM 5.8 (Suzie Wilson Rd) to RM 9.8	Stormwater	Stormwater Runoff, Land Development, Erosion	Developed land,	SW TMDL
17	Direct Smaller Drainages to Inner Malletts Bay	E. coli	Urban Runoff, Potential Failed/Failing Septic Systems; Includes Smith Hollow Brook & Crooked Creek	Developed land	See Chapter 3 Bacterial TMDL (Bacterial TMDL)
20	Englesby Brook	E. coli	Elevated E. coli Levels at Blanchard Beach	Developed land	Bacterial TMDL
18	Englesby Brook, Mouth to RM 1.3	Stormwater	Stormwater Runoff, Blanchard Beach Closure	Developed land	SW TMDL
	STRESSED SURFACE WATERS (DEC 2016)				
33	LaPlatte River, From Lake	Land Development	Turbidity, Sediment, Temp.	Developed Land,	See LC TMDL. WNRCD supports

ID[9]	Waterbody Segment	Pollutant	Water Quality Problem	Sector	Remediation Approaches
	Champlain to Hinesburg	with all Attendant Impacts			Trees for Streams program in area
16	Indian Brook, Mouth to RM 5.4	Potential Impacts from Landfill Leachate, Developed Areas, Hazardous Waste Site	Sediment, Toxics, Metals	Developed Land	Condition stable. Monitoring will continue. Agency working towards post-closure certification. No PFAS detected in 2018 testing.
9	Mill River, 3.5 Miles in Upper Reaches	Agricultural & Urban Runoff, Streambank Erosion	Sediment, Nutrient & Organic Enrichment, E. coli	Agriculture Developed Land	Monitor to confirm pollutants and stressors. See also Lake Champlain P TMDL
8	Rugg Brook, Upstream from Route 7	Land Development Suburban Runoff	Flow Changes, Physical Alterations	Developed Land	See also LCTMDL
32	Patrick Brook, From LaPlatte R up to Lower Pond	Land Development Channelization	Sediment, Physical Alterations	Developed Land	See also LC TMDL
34	Kimball Brook, From Town Farm Bay up 1.1 Miles	Pasture, Barnyard, Lack of Riparian Vegetation	Turbidity, Nutrients	Agriculture	See also LC TMDL

Lakes and Ponds

The North Lake Basin drains to Lake Champlain and encompasses nine inland lakes or ponds that are above 10 acres in size.

Encroachment through shoreland development is the most predominant stressor to the lakes in the North Lake Basin (Figure 5) as it is for all Vermont lakes (USEPA, 2016). The shoreland in 2/3rds of the basin's inland lakes are threatened by development, although nutrient levels are not increasing as they are in other Vermont lakes, and a third are in fair condition. Aquatic Invasive Species (AIS) alters habitat and degrades recreational opportunities in at least three inland lakes with Eurasian Water Milfoil, *Myriophyllum spicatum*, the predominant species of concern (Table 3, Figure 5).

The North Lake Basin also includes inland lakes notable 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 Lake Score Card.

Regarding the condition of Lake Champlain, assessment information is provided in Table 3. The lake is evaluated by segments and those associated with the North Lake Basin are identified in Table 1. Lake Champlain is impaired for Phosphorus and Mercury and is under an EPA-approved management plan (Total Maximum Daily Load or TMDL) for each (Table 7.)

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.

The State of the Lake Report (Lake Champlain Basin Progran, 2018) provides a summary of certain assessment results as ecosystem indicators status and trends. A report is provided for Northeast Arm, Malletts Bay and the Main Lake, the basin's adjacent lake segments. This report will be updated anew in 2021.

Table 3. Impaired, altered and stressed lakes and ponds in the Vermont 2018 priority waters list (VDEC, 2018) and 2016 stressed water list (VDEC, 2016), IDs associated with numbered surface waters in Figures 3 and 4.

ID	Waterbody (name and location)	Pollutant	Water Quality Problem	Sector	Remediation Approach
	IMPAIRED SURFACE WATER (List B- DEC 2018)				
18	Burlington Bay - Lake Champlain - Pine Street Barge Canal	Priority & Nonpriority Organics, Metals, Oil, Grease, PCBs	Coal Tar contamination of Sediments (Superfund site)	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 E -DEC 2018)				
(not shown on Figure 3 or 4)	Champlain, Lake - Isle LaMotte	Eurasian Water Milfoil (EWM) and Zebra Mussels (ZM) Infestation.		NA	Some mechanical harvesting of all nuisance vegetation. ZM are ubiquitous.

ID	Waterbody (name and location)	Pollutant	Water Quality Problem	Sector	Remediation Approach
11	Champlain, Lake - St. Albans Bay	EWM And ZM Infestation.		NA	Some mechanical harvesting of all nuisance vegetation. ZM are ubiquitous.
14	Champlain, Lake - Malletts Bay	EWM And ZM Infestation.		NA	No active management. ZM are ubiquitous.
15	Indian Brook Reservoir	Locally Abundant EWM Growth.		NA	Herbicides previously used to control EWM.
19	Champlain, Lake - Burlington Bay	EWM And ZM Infestation.		NA	No active management. ZM are ubiquitous.
22	Champlain, Lake - Main Lake	EWM And ZM Infestation.		NA	No active management. ZM are ubiquitous.
24	Champlain, Lake - Shelburne Bay	EWM And ZM Infestation.		NA	No active management. ZM are ubiquitous.
32	Lower Pond	EWM			No active management. EWM is ubiquitous.
28	Lake Iroquois	Abundant EWM Growth.		NA	Ongoing management plan that includes herbicides, DASH, benthic barriers, and handpulling.
	STRESSED SURFACE WATERS (DEC 2016)				
See Fig. 5	Long Lake (Milton)	Phosphorus		Developed Land	See also Lake Champlain P TMDL
See Fig.5	Colchester Pond	Depleted Oxygen in Hypolimnion	Phosphorus, Organic Enrichment	Agriculture, roads	See also Lake Champlain P TMDL
28	Lake Iroquois	Phosphorus		Developed Land, Roads	See also Lake Champlain P TMDL

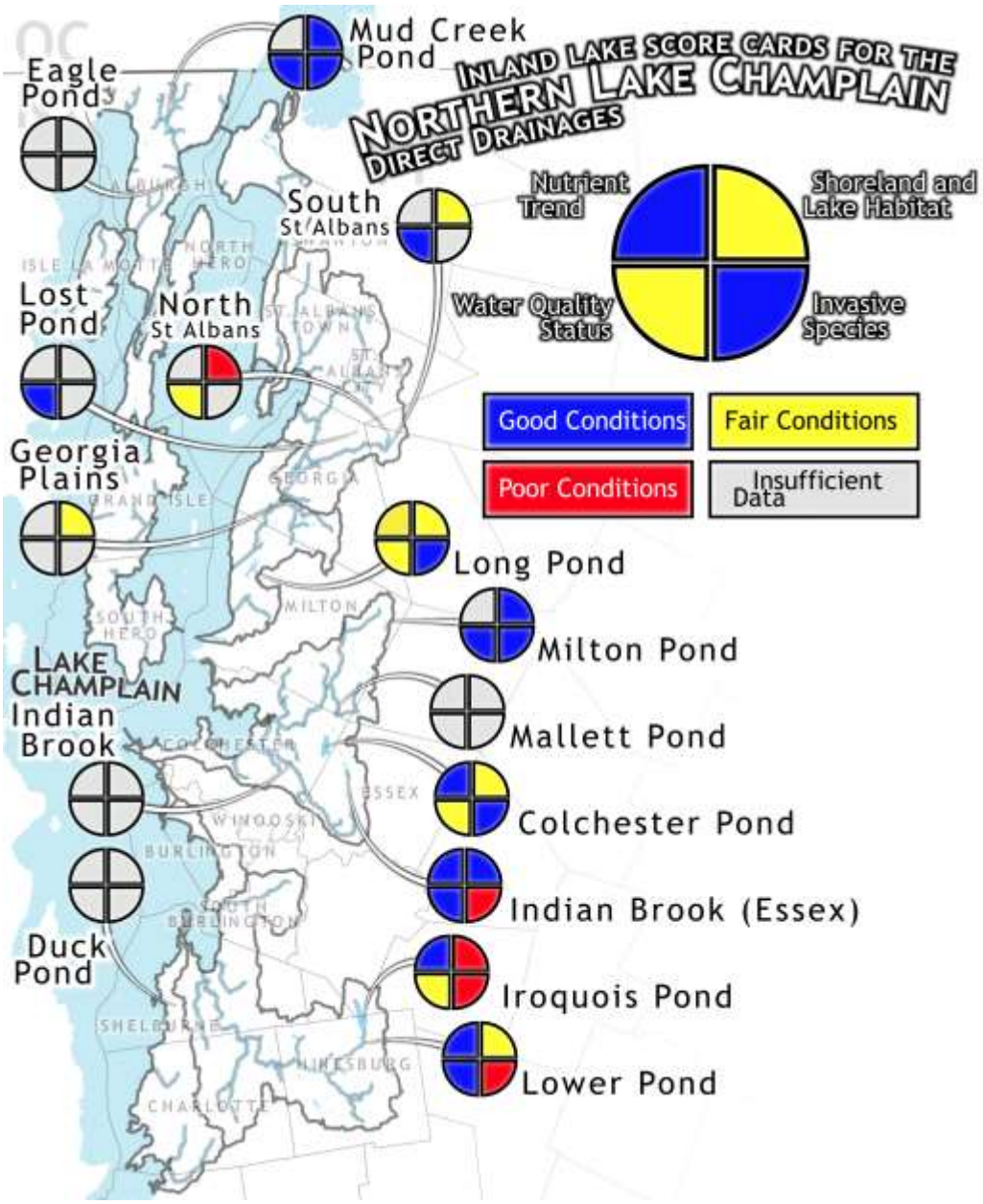


Figure 5 . Lakes score card results for North Lake Basin's inland lakes.

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). Sampling in the North Lake Basin includes 59 VRAM plots and 11 vegetation plots surveyed. To date many of the North Lake Basin wetland assessments conducted by the program have focused on poor condition systems and as such, an unbiased comparison of the North Lake Basin and state wetland condition is not possible.

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

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 and Kimball Brooks (Charlotte), Mill River (Georgia), LaPlatte River* (Shelburne)[10], and Malletts Creek (Colchester), Sandbar *wetlands.
- Alburgh'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 the Agency as a wildlife management area, activity outside the area result in detrimental impacts to water quality and the habitat.

[10]An asterisk denotes wetlands that are protect under the Vermont Wetland Rules as Class I (see Chapter 2). The other wetlands listed are protected as Class II.

Chapter 2 – Protection of Surface Waters

A. Priority Surface Waters for Protection

Most surface waters in the basin support swimming, fishing and provide drinking water when treated; however, other surface waters support additional uses that may depend on a higher quality of water that is closer to a pristine condition. Documentation of these waters ensures protection within the state's existing regulatory framework, in addition to implementation of strategies that result in protection of their watersheds.

The condition of these pristine waters is currently supported by predominantly forested watersheds where surface runoff is filtered, absorbed, or slowed down; however, anthropogenic activities threaten to degrade these waters. Specific threats include atmospheric deposition (acid rain and mercury), introduction of invasive species, fragmentation of forests, increased flooding events, and expansion of developed lands.

The DEC protects Vermont's more pristine waters by safeguarding these natural systems from deleterious change over the long term through the expanded use of proactive protection tools. The following tools are addressed in this plan:

- Upward classification of waters, designation of Outstanding Resource Waters and Class I wetlands,
- Identification and funding of projects focused on protection (see also Section C and Chapter 4 Natural Resource Restoration Sector),

Legal mechanisms provided by the Vermont Water Quality Standards (VWQS) and state statute allow for the establishment of enhanced management objectives or augmented protections for specific waterbodies, including the more pristine waters. These legal mechanisms guide ANR permitting processes to ensure that regulated activities on the landscape protect the condition of pristine or close to pristine surface waters. The VWQS refers to these waters as "very high-quality waters," for reclassification purposes, while more pristine wetlands are protected as Class I and surface waters with one or more exemplary uses, are designated Outstanding Resource Waters.

The tactical basin planning process includes reviewing ANR monitoring and assessment data to identify any surface waters that meet VWQS or Vermont Wetlands Rules criteria to allow for an upward classification or new designation of surface waters and lists them in the plan (see Table 6 for the North Basin) These waters become priorities for protection. In addition to the documentation of their condition, they also become priority waters for other protection strategies including protection of forested or other natural landscapes within their watersheds (see Chapter 4 Natural Resource Restoration). Surface waters prioritized for protection are mapped in Figure 6.

B. Surface Water Reclassification and Designations

The Vermont Water Quality Standards[11], VWQS, serve as a foundation for protecting Vermont's surface waters. The VWQS are management goals, objectives, and criteria that establish designated uses (e.g. swimming and fishing) that must be protected. The VWQS establish the classification to which the uses are managed (see Table 4), and set minimum chemical, physical and biological criteria that must be met to support each use at its classification tier. All waters in the State of Vermont are to be held to high-quality water standards for all uses, as outlined in the VWQS. These high-quality waters may be protected by the Anti-degradation Policy of the VWQS or by upward reclassification. For examples, High Quality Waters are classified as B2 waters. Very High-Quality Waters are those waters achieving a higher classification than B2, including A1 and B1 (Table 4).

As required by the VWQS, the tactical basin plan identifies surface waters that meet criteria for a higher classification, or Outstanding Resource Water or Class I wetland designations (see Table 5). In addition, the plan identifies existing uses and cold-water fisheries, also required by the VWQS. (See Appendix C). More detailed information regarding upward classification or designations can be found at the associated links below:

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

The ANR recommends new management objectives for specific surface waters through a classification or designation action, which includes consideration of public input. While ANR typically relies on the publication of tactical basin plans to identify candidates for reclassification (10 V.S.A. § 1424a), the public may also present a proposal for establishing management objectives for ANR consideration at any time. The Agency's Department of Environmental Conservation is developing and updating relevant procedures, forms, and guidance documents, as necessary, to enable submission, evaluation, and implementation of petitions to reclassify streams and lakes, and

[11] 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.

to designate Outstanding Resource Waters. The Department has already developed these procedures and documents for Class I: those wetlands that satisfy criteria for designation may be proposed for such designation through departmental rulemaking authority, and as consistent with the Vermont Wetland Rules.

Table 4. Criteria for surface water classifications

Use	A1-Very High-Quality Waters	B1- Very High-Quality Waters	B2-High Quality Waters
Aquatic Biota	Excellent-Natural Condition	Very Good – minor change from reference condition	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 Status

Table 5 lists the North Lake Basin waterbodies that meet Vermont Water Quality Standards classification other than B2 or meet criteria for Class I wetlands. In addition, it includes surface waters where monitoring and assessment data suggest that surface water meets criteria for a different classification. At this time, no basin 5 surface waters have been identified as meeting Outstanding Resource Water criteria.

Table 5. Listed surface waters meet criteria for following class of surface water or wetland, with any potential for a different classification based on monitoring or assessment data.

ID on Figure 6	Waterbody	Town	Current Classification	Monitoring and assessment data suggests that surface water meets criteria for a different classification[12]
N/A	Colchester Pond	Colchester	A2	B2 for all uses
N/A	Milton Pond	Milton	A2	B2 for all uses
1	Mud Creek	Alburgh	Class II Wetland	Class I Wetland
2	Sand Bar wetland	South Hero	Class I Wetland	NA
3	Trout Brook (section)	Milton	B2	B1 for aquatic biota
4	Malletts Creek Tributary 7	Milton	B2	Additional monitoring needed to confirm condition meets B1
5	North Shore Wetland	Burlington	Class I Wetland	NA
6	LaPlatte River Wetlands	Shelburne	Class I Wetland	NA

Figure 6 identifies the location of surface waters in the basin where monitoring and assessment data indicate conditions that meet criteria for B1 classification as well as location of three higher quality wetlands that are presently designated as Class I (also listed as part of table 5). The multiple Basin 5 river confluences with the lake provides for the large unique wetland types represented by the current Class I wetlands. The relatively low number of streams that meet criteria for very high-quality waters (B1 or A1) is due to the higher proportion of developed land and agricultural land use to forested land cover in the basin.

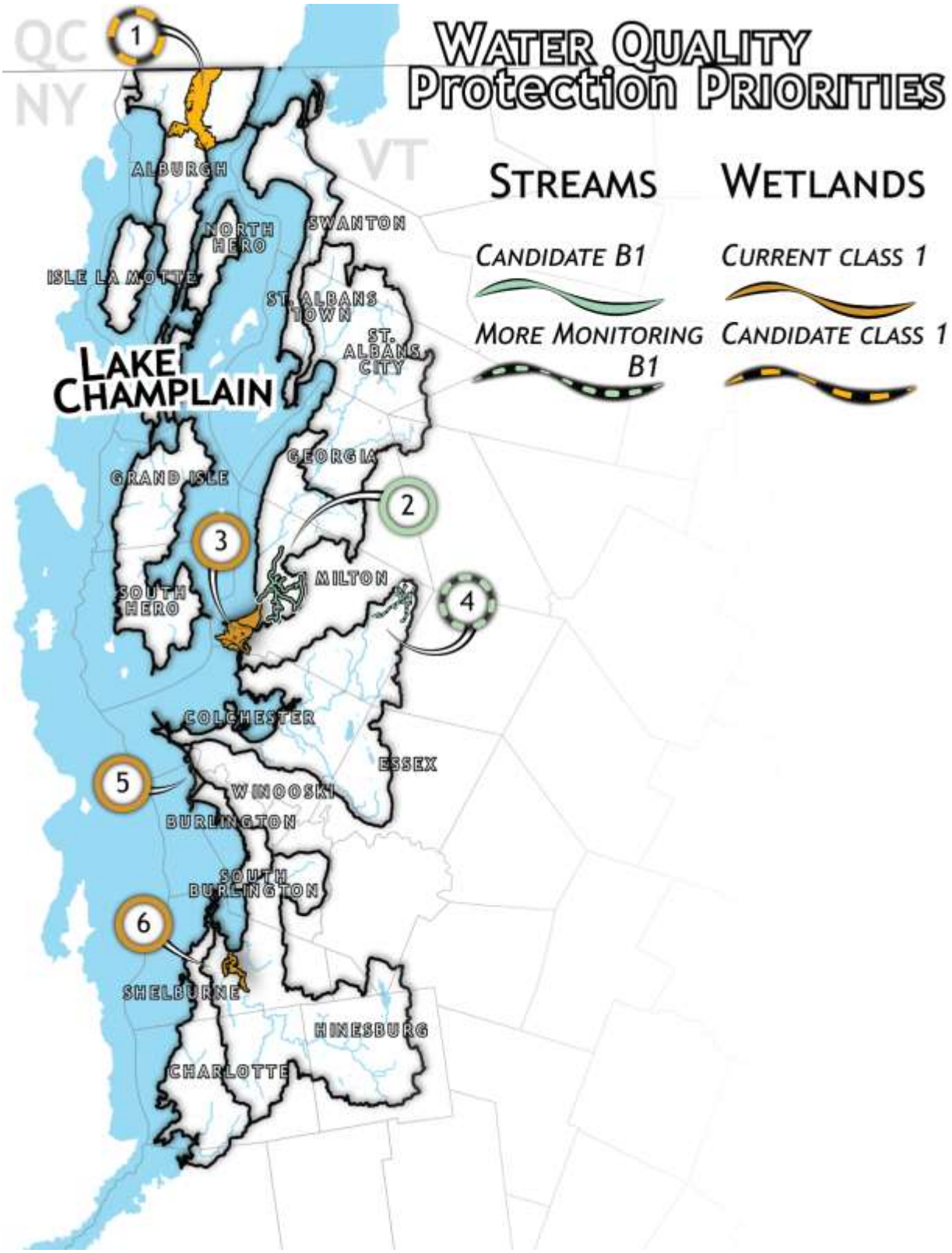


Figure 6. Priority North Lake Basin surface waters for protection, see Table 5.

C. Protection Strategies

The activities that lead to the protection of surface waters include the enhancement or protection of natural resources (e.g., wetlands, floodplains, forest) in the watershed of the surface water. In addition, municipalities play a role by directing development through ordinances to avoid adverse impacts to natural resources.

Prioritization of natural community protection for the benefit of receiving surface waters can be done through the Water Quality Blueprint, a tool found in the ANR Clean Water Road Map Additional strategies that support enhancement and restoration of natural are included in the Chapter 5 Implementation Table.

A relatively new source of grant funding to support protection and restoration of natural communities is available through the Agency's Water Infrastructure Sponsorship Program (WISPr). In addition, available funding will be augmented by Act 76, which will support natural resource protection through a collaborative process, see Chapter 5 for additional information.

Protection efforts completed 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.

Expanding Protection through Municipal Action

Municipal zoning bylaws or land development regulations, comprehensive plan (aka 'town plan') policies and municipal programs can provide community-specific protections and guidance to maintain and enhance local water resources. Encouraging a community to use municipal 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 municipal ordinances in Appendix D completed by the Chittenden County and Northwest Regional Planning Commissions provides an overview of existing types and level of protection. The RPCs' have also identified opportunities for protection and potential timeframe for providing resources to help municipality address these gaps in Table 6. Identifying a timeframe is

complicated by the fact that scheduled town plan updates, when most regulatory updates are often initiated, are limited over the next 5 years,

Existing resources include templates to assist municipalities in development of language for ordinances, zoning or town plans that protects natural systems are provided by the Vermont League of Cities and Towns, and the Vermont Planning Information Center.

Table 6. Opportunities for addressing municipal gaps in natural resource protection, with associated timeframe and resources.

Municipality	Water Resource Improvement	Time frame	Partner RPC	Comment
Franklin County				
Georgia	River Corridor (RC) Update		NRPC	Town currently pursuing adoption of river corridors into land development regulations
Swanton	Consider adoption of RC 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	Consider expanded protections in Special Flood Hazard Areas	TBD	CCRPC	Challenging due to preexisting development along lake shoreline
Westford	Consider adoption of RC model bylaws	TBD	CCRPC	Town Planning Commission has discussed several times in recent years

Resources for Enhancing Floodplain Protection

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. To encourage municipalities to adopt floodplain protection, DEC and partners help 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 ANR Flood Ready website hosts supportive materials for municipal officials including community data on the River Corridor Protections Summary Report and Expanded Community Reports.

DEC River Corridor and Floodplain Protection Program has prepared model flood hazard bylaws to assist municipalities in the development of their flood hazard regulations. DEC recognizes that

Vermont's historic settlement patterns has resulted in a significant level of river corridor encroachment in densely developed areas. The DEC model hazard bylaws contain provisions to facilitate infill and redevelopment in designated centers and densely developed areas within river corridors and flood hazard areas. DEC regional floodplain managers routinely provide technical assistance to municipal and regional planning staff on incorporating these provisions into town 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%. 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. Of the 19 municipalities that include significant area in the basin, 18 municipalities are participating in the National Flood Insurance Program and have adopted the Town Road and Bridge Standards, and 17 have adopted a Local Hazard Mitigation Plan. By adopting river corridor protection, 10 of the 19 municipalities have been granted "early adopter" status by the DEC, qualifying for the 17.5% contribution (see Appendix D). Over the next five years, DEC Regional Floodplain Managers will continue to work with municipalities and the regional planning commissions to assist at least five municipalities in their consideration of adopting floodplain protection (Table 6).

Chapter 3 – Remediation and Restoration of Surface Waters

A. Addressing Degraded Surface Waters

The Agency of Natural Resources (ANR) targets stressed, altered and impaired surface waters (Tables 2, 3 and 7) for remediation and restoration efforts. Regulatory programs administered by ANR and the Agency of Agriculture, Food and Markets (AAFM) play a significant role in efforts to reduce pollutants and stressors responsible for degrading surface waters. The most recent regulatory changes relating to phosphorus and sediment reduction in surface waters 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 land use practices.

Pollutant reduction will be accelerated as Act 64-associated permitting programs are established and compliance dates met. Regulations created or updated under Act 64 with associated deadlines are listed below:

- Required Agricultural Practices (RAPs) – see page 46 and Table 11 for timeframe associated with Lake Champlain Farm inspections and Nutrient Management Planning.
- Town road permit by 2020- Municipal Roads General Permit (MRGP)
- VTrans highway and non-highway developed land permit by 2020 - Transportation Separate Storm Sewer System (TS4) Permit
- Management of stormwater on under-treated or un-treated 3-acre parcels by 2020- Operational Three-Acre Permit

The act also established a Clean Water Fund to assist municipalities and landowners with technical and financial assistance. With these funds, the Agencies also support voluntary efforts to meet permit deadlines sooner than required or to implement non-regulatory practices.

Chapter 4 includes a more detailed progress report relating to Act 64-related permit adoption and permittee compliance activities along with education and outreach efforts to facilitate compliance.

B. North Basin Total Maximum Daily Loads

When needed, ANR takes a focused approach to addressing degraded surface waters through the development of a Total Maximum Daily Load, (TMDL). The TMDLs establish pollution reduction targets that become the goal for subsequent planning and implementation efforts as required under the federal Clean Water Act . In the North Lake Basin, four TMDLs provide goals associated with loading of specific pollutants in impaired waters (Table 7). The bacteria and stormwater TMDLs

address streams encompassed by the basin, while Phosphorus and a mercury (in fish tissue) TMDLs provide targets lake segments.

The term, Total Maximum Daily Load, refers to the maximum amount of a pollutant that 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 (TBP) describe how these pollutant reductions will be achieved by outlining strategies and priority projects or actions based on monitoring, sector-based assessments, as well as mapping and modeling data. This is an iterative approach where ANR monitors improvements in meeting TMDL targets and revises strategies in future plans to achieve TMDL goals.

Table 7. Status of TMDLs developed for the North Lake Basin by Subbasin, pollutant, and source.

Name	Pollutant	Source	Status
Malletts Bay Drainages; Mud Hollow, LaPlatte River	E. coli (bacteria)		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 Implementation Plan, June 2016. See annual status reports

The mercury TMDL will be met through the region's efforts to reduce anthropogenic sources as well as EPA's national efforts to control atmospheric emissions. The other TMDLs associated with the North Lake Basin 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 ANR 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

Sixteen of Vermont's waters are listed as "impaired" due to stormwater runoff from impervious surfaces, including pavement and buildings. Twelve of these falls within urban areas, whereas the other four are associated with ski areas. These waters fail to meet the Vermont Water Quality Standards based primarily on biological monitoring data. Vermont's TMDLs lists stormwater as the surface water quality problem because 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 channel are substantial contributors to the aquatic life impairment. In addition, reductions in stormwater runoff volume will help restore diminished base flow (resulting in 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 12 (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 Small Municipal Separate Storm Sewer Systems (MS4s) General Permit, and the Transportation Separate Storm Sewer System (TS4) General Permit. Included in the reissuance in 2018 of the MS4 permit is the requirement for municipalities to develop Phosphorus Control Plans to comply with the Lake Champlain Phosphorus TMDLs (addressed later in this section). For the MS4s, the Phosphorus Control Plans (PCPs) must simultaneously meet the statutory requirements for municipal road stormwater management in addition to the requirements for other developed lands within the municipality. This general permit also includes new road stormwater management standards, identical to those included in the Municipal Roads General Permit (MRGP).

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) and by April 1, 2021 will have developed Phosphorus Control Plans (PCP). Implementation of the required BMPs is ongoing and will be completed no later than 2032. These projects are competitive for ANR Clean Water Initiative grant funds based on phosphorus removal efficiencies and readiness for implementation, see the Northern Lake Champlain Watershed Summary in the Vermont Clean Water Initiative 2019 Performance Report for a list of previously funded stormwater projects.

Statewide Bacterial TMDLs

Twenty-one of Vermont's waters are impaired at least in part due to bacterial contamination associated with human health risk. The bacteria, ***Escherichia coli, (E. coli)*** is an indicator for the presence of waterborne pathogens. Five bacteria-impaired waters in the North Lake Basin include:

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

A Vermont Statewide Bacteria TMDL Report supports bacteria reduction and watershed restoration throughout Vermont, including the river segments listed above. The TMDL, which established bacterial 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.

The LaPlatte River and its tributary Mud Hollow include agricultural land that contributes to the bacteria load. Although agricultural activity is limited in Smith Hollow Brook and Crooked Creek, site-specific actions are needed to address agricultural sources based on visual inspection of the watersheds of these streams by ANR staff. The TMDL report supports the implementation of agricultural-related practices including land treatments that reduce runoff of animal waste into streams and excluding livestock from riparian buffers.

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, including pet waste management, enhanced street sweeping, catch basin cleaning and animal carcass disposal.

In subsequent town monitoring of Crooked Creek and Smith Hollow to determine source of bacteria to Malletts Bay, failed onsite wastewater systems were also identified or suspected. Subsequent work by the municipality has occurred to identify failed systems as well plan for alternative wastewater treatment opportunities.

The bacteria concentrations of each listed stream will need monitoring to show improvements, see monitoring priorities in Table 21.

As these streams are also stressed or impaired for nutrients or sediment, the Lake Champlain Phosphorus TMDL Implementation Plan directs efforts towards these streams. The strategies that will reduce nutrients and sediment, specifically those associated with managing animal waste and organic debris, will also serve to reduce bacteria loading

Lake Champlain Phosphorus TMDL

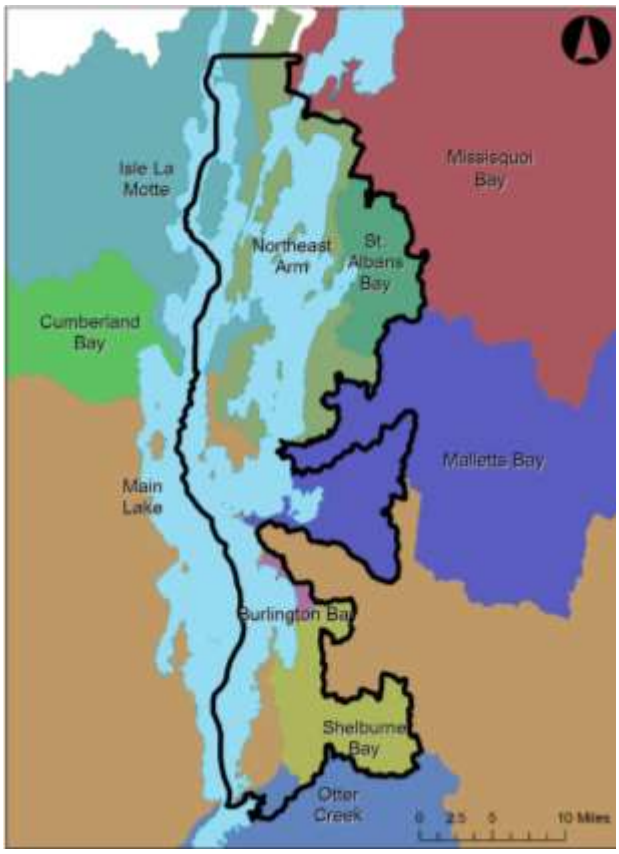


Figure 7 North Lake Basin (Black line) relative to Lake Champlain TMDL lake segments (named), see also Table 2

The North Lake Basin flows into several Phosphorus-impaired segments of Lake Champlain (Figure 7). Vermont is addressing the Phosphorus impairment through the implementation of a 20-year phased restoration plan for the Lake and its tributaries to meet an EPA-approved Lake Champlain Phosphorus TMDL. The first two phases of the plan (Phases I and II) have established phosphorus-load reduction goals and identified a remediation plan for the entire Lake Champlain Basin as well as goals specific to each of the state's planning basins. The Phase II information relating to the North Lake Basin is presented in the 2017 North Lake Basin TBP (DEC, 2017). This 2020 plan provides an update on status of program implementation reported in the 2017 TBP.

The 2016 Phosphorus Total Maximum Daily Loads (TMDLs) for Vermont Segments of Lake Champlain. (LC TMDL) addresses all major sources of Phosphorous (TP) 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 TP is transported to the lake from land to waterways by rain or snowmelt in overland runoff. Impervious surfaces or open soil contribute to these nonpoint sources of phosphorus, where land uses such as agriculture, forestry and developed land is not managed appropriately. The lesser contributor of TP, point sources, include regulated stormwater discharges from both agricultural and developed land as well as wastewater treatment facilities (WWTF). The relative TP loading from each land use sector for each of the 12 lake segments is shown in Figure 8.

The development of the TP load allocations as well as target load reductions for each lake segment (see explanation in the beginning of Section B) included a Soil and Water Assessment Tool (SWAT) model analysis. In addition, 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 necessary TP 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.

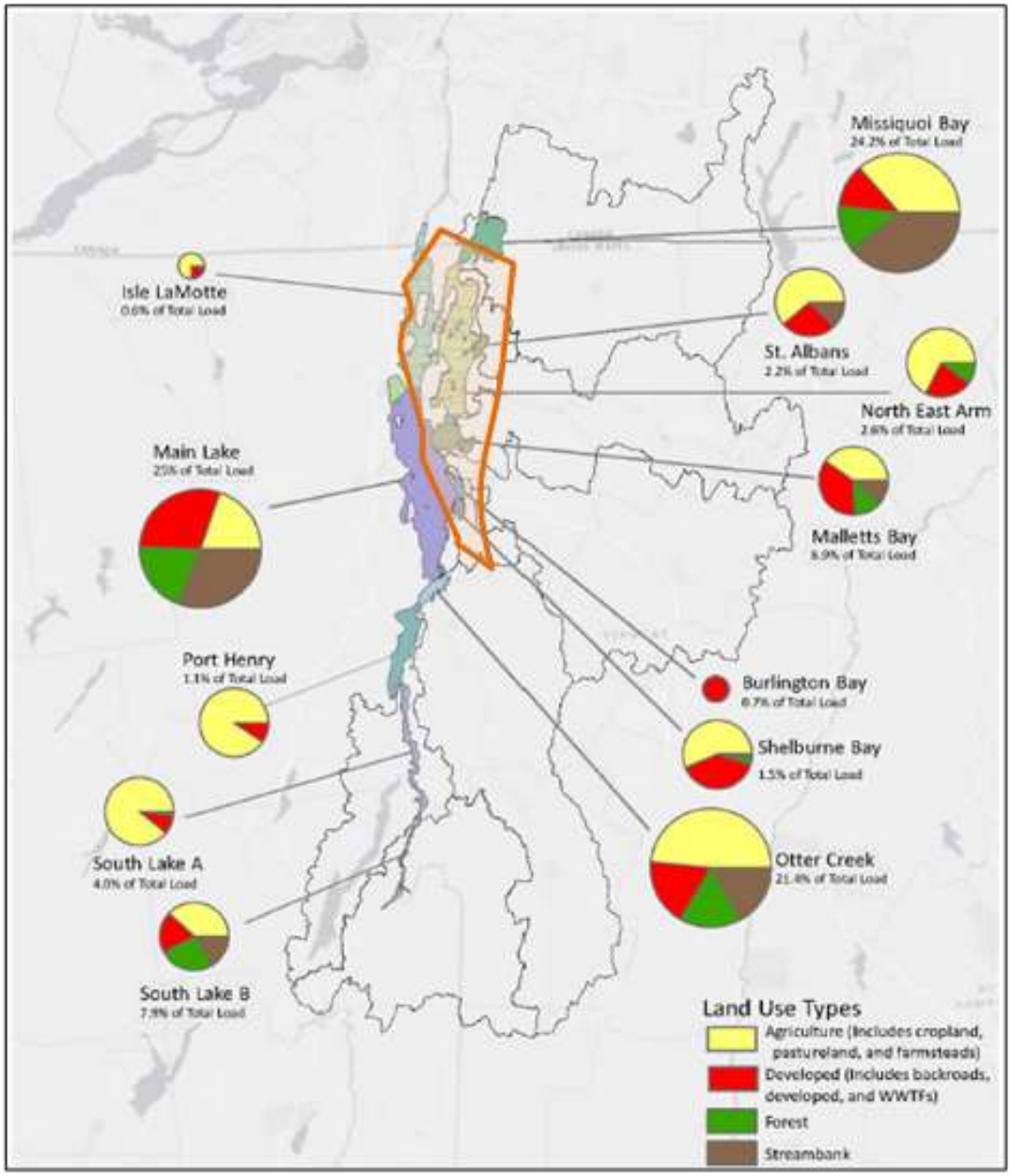


Figure 8. Vermont sources of Phosphorus loading to the 12 Lake Champlain segments by land use: annual average of 2001-2010. The North Lake Basin is highlighted in the orange polygon, see also Figure 7. Vermont contributes about 69 percent (630.6 MT/yr) of the total phosphorus load per year to Lake Champlain 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

Lake Champlain Phosphorus TMDL Accountability Framework

The LC TMDL includes an Accountability Framework that establishes a process to ensure sufficient progress towards implementation of the TMDL (Figure 9). A major part of the Accountability Framework is DECs development of basin-specific tactical plans. The tactical basin plans include an Implementation Table (see Chapter 5) that lay out priority actions essential to implementation of the TMDL. It is 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.

DEC tracks progress relating to phosphorus reductions by sector and within those, specific categories of actions using the Clean Water Reporting Framework. DEC also uses the online **Watershed Projects Database**, an electronic extension of the basin plan's Chapter 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

The changes in monitored phosphorus loads is tracked by the long-term monitoring program supported by the Lake Champlain Basin Program and DEC. The program is designed to help assess changes in phosphorus loading based on management actions and other environmental changes. In 2019, the Lake Champlain Basin Program released a report analyzing flow normalized phosphorus concentrations and loads for 18 tributaries from 1990 through 2017 (LCBP 2019). The only tributary sampled in Basin 5 through this program is the LaPlatte River, which shows dramatic reductions in both dissolved and total phosphorus loading during the 1990's likely related to the upgrade of the Hinesburg WWTF in 1991. The report suggests that both total and dissolved phosphorus have remained largely stable for the second half of the record from 2004-2017. Progress in meeting the TMDL phosphorus reduction goals will take time to be reflected in the tributary data so tracking of TP reductions from the implementation of projects will be used to evaluate TMDL progress in the meantime.

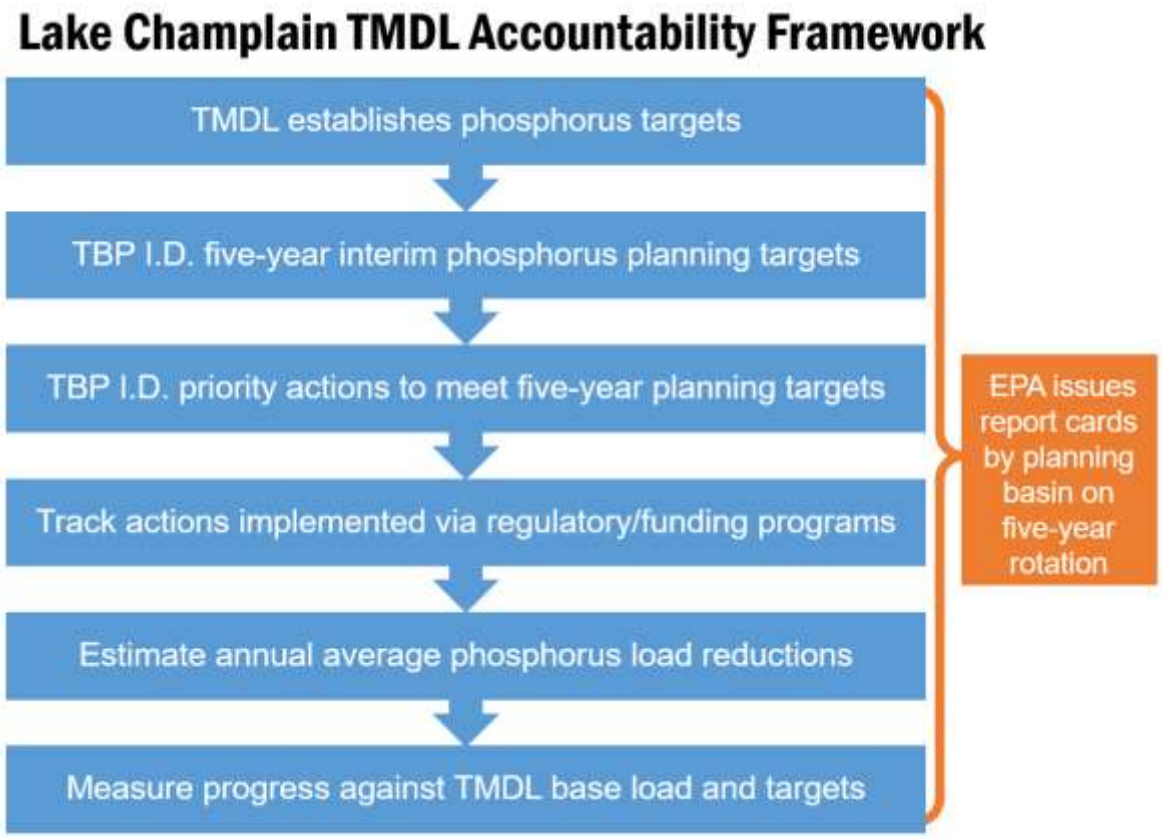


Figure 9. Accountability Framework for meeting the Lake Champlain Phosphorus TMDL

Phase I and II of the TMDL

The Vermont Lake Champlain Phosphorus TMDL Phase 1 Implementation Plan, approved by EPA in 2016, sets the stage for the development of Phase II content for each basin. 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 basin specific information provided in the Phase II content is described below with the corresponding location of the information in this plan in parenthesis:

- division of the TP allocations to the tactical planning basin scale (Table 8),
- catchments prioritized for remediation based on highest modeled load reductions (Figure 10),

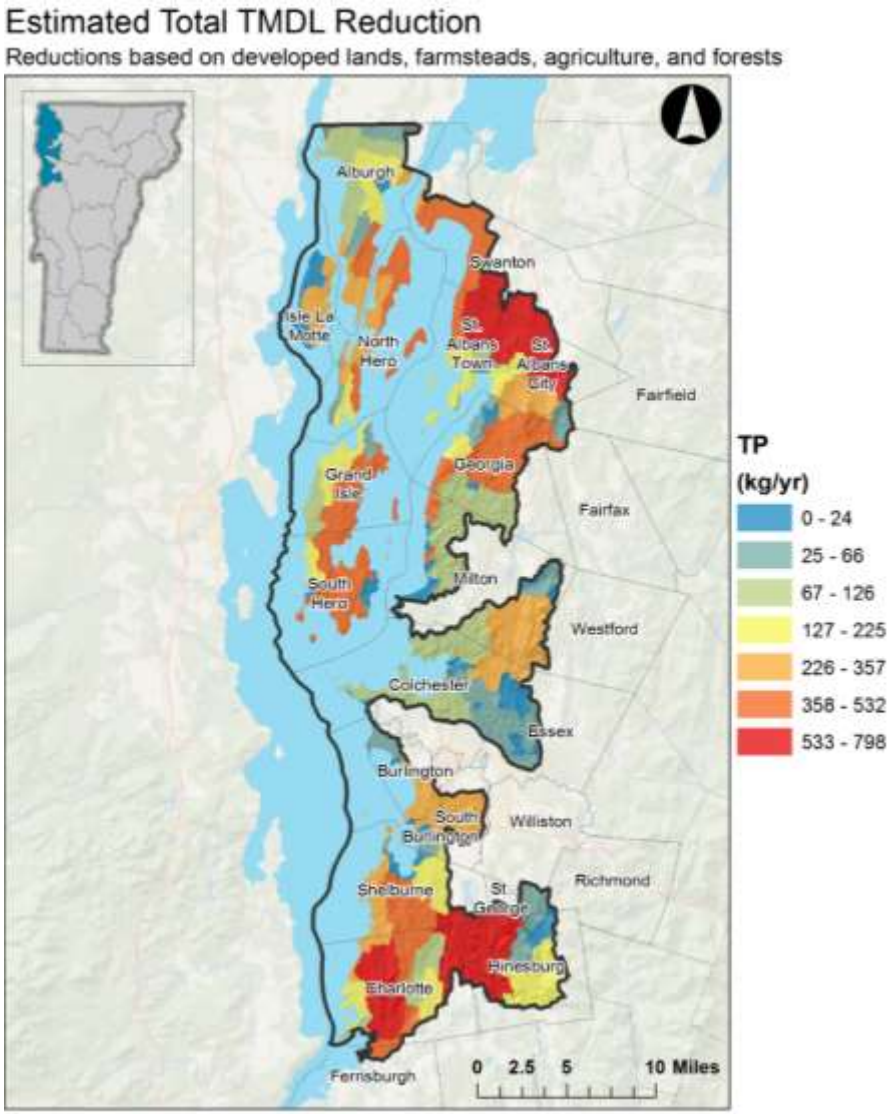
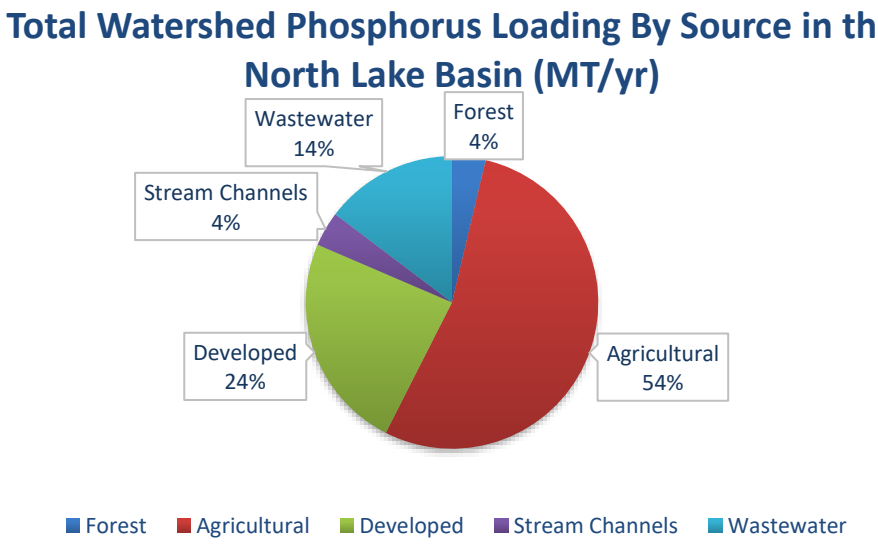


Figure 10. Estimated total TMDL reductions from all land uses at the catchment scale

a progress report on newly enacted regulatory programs that address the policy commitments (see Chapter 4).The North Lake Basin Phase II content is located in the 2017 North Lake Basin TBP in Appendix F and updated in this plan. It includes a downscaled version of the LC basin SWAT analysis that allowed for a quantifiable estimate of the load reductions required on the sub-basin scale (catchment) by each land-use sector (Figure 10). The results will allow ANR to effectively target load reductions by directing water quality projects to the most appropriate locations. Maps illustrating estimates of required load reductions at the catchment level by sector are included in the Phase II content (see 2017 North Lake Basin TBP, Appendix F).

Table 8. Percent reductions needed to meet TMDL allocations from North Lake basin[13] (adapted from 2016 Phosphorus TMDL, Tables 7 & 8)

Source	Category	Allocation Category	Total Watershed TP (MT/yr)	Average TMDL % Reduction	Required TMDL TP Reduction (MT/yr)
Forest	All Lands	Load	2.8	5.0%	0.1
Agricultural	Crop and Pasture	Load	40.0	25.9%	11.0
	Farm	Wasteload	0.6	80.0%	0.5
Developed	Developed Lands	Wasteload	18.1	17.8%	3.1
	Paved Road	Wasteload			
	Unpaved Road	Wasteload			
Stream Channels[14]	All Streams	Load	2.9	51.6%	1.5
Wastewater	WWTF Discharges	Wasteload	10.2	57.5%	5.8
	CSO Discharges[15]	Wasteload	0.9	11.8%	0.1



[13] The LC TMDL provides P loading estimates for each lake segment and the North Lake Basin is comprised of portions of seven lake segments as shown in Figure 7. The P loading estimate for the basin, is based on the percentage of each lake segment's watershed contained in the North Lake Basin.

[14] Individual stream loads not established for Burlington Bay, Northeast Arm, or Isle La Motte
[15] Burlington Bay only

Phase II Update 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 8 sets out the reductions that would be needed in the North Lake Basin to meet TMDL allocations by sector. Additional explanation regarding Table 8 follows:

- The values are based on HUC12 watershed load estimates that have been assigned to lake segments and aggregated at the tactical basin-scale.
- the TP load estimate is the watershed load, not the delivered load to the lake segment.
- the TMDL percent reduction is an average value because seven lake segments are represented in Basin 5, and different lake segments often have different percent reductions.
- the stream channel TP estimates are based on the SWAT watershed models used as part of the LC TMDL modeling framework; and
- the TMDL doesn't assign stream channel loads for several lake segments in Basin 5 (Burlington, Northeast Arm, Isle La Motte).

This plan updates Phase II information regarding progress on newly enacted regulatory programs that address the policy commitments identified in Phase I. These regulatory programs, listed in the first section of this chapter, were initially outlined in the 2017 North Basin TBP Phase II content. Chapter 4 of this plan expands on the 2017 North Basin TBP Phase II content by describing progress made towards the development of the programs including permitees' activity towards compliance and where available, outcomes of sector-based assessments. Chapter 4 and the implementation table in Chapter 5 also provides recommendations for delivery of financial or technical resources as well as additional geographic specificity to increase efficacy in the state's and partners' efforts to reduce nutrient loading. The implementation table also identifies strategies outside the scope of permit programs that will provide the greatest return on investment for nutrient load achieved.

Progress made towards meeting phosphorus reduction goals was significant and is shown in the Agricultural sector description, broken down by practices to help direct work over the next five years. The factors leading to the documentable decrease in phosphorus loading in this sector compared to others include earlier permit compliance dates as well as earlier focused efforts by partners to direct resources. The status on progress towards meeting the phosphorus reduction goals for the other sectors can be found in the Vermont Clean Water Initiative 2019 Performance Report., also see section on Accountability Framework.

Subsequent TMDL Phases

The next rendition of the North Lake Basin Plan (anticipated for development in 2025) will include Phase III content that provides estimates of load reductions expected to be achieved through regulatory programs as well as 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 and systematically met through support of non-regulatory projects, including natural resource restoration.

Chapter 4 –Remediation Strategies by Land use and Natural Resource Sector

The ANR's approach towards remediation of degraded surface waters includes use of both regulatory and non-regulatory tools with associated technical and financial assistance to incentivize implementation[16]. In this plan, the approach is spelled out as objectives and associated strategies (e.g., Best Management Practices) in Table 9 and 10, respectively. Objectives are organized by land use and natural resource sectors. Land use sector improvements will be achieved through regulatory compliance as well as the communities' voluntary actions, while the restoration of natural resources will happen primarily through voluntary actions. Strategies in the plan identify geographic areas and appropriate practices to help ensure that resources are effectively directed to areas where pollution mitigation results in greatest efficiencies.

This chapter summarizes progress made in each of the basin's sectors through early 2020 that collectively contribute to meeting the Plan's objectives. Objectives and strategies relating to nutrient reduction mirror those in the LC TMDL Phase I Implementation plan. The Vermont Surface Water Management Strategy (VSWMS) provides direction for addressing other pollutants and alterations that threaten surface waters. Recommendations provide specificity as to how best to meet objectives through improvements to delivery of technical and financial assistance (part of LC TMDL Phase II content).

The objectives, strategies and recommendations inform the development of the Implementation Table in Chapter 5. Strategies are further expanded in the Implementation Table to include priority geographic location and appropriate BMPs based on modeling results that identify high pollutant loading areas, as well as previous planning and assessment efforts. Potential partners and funding sources are also included.

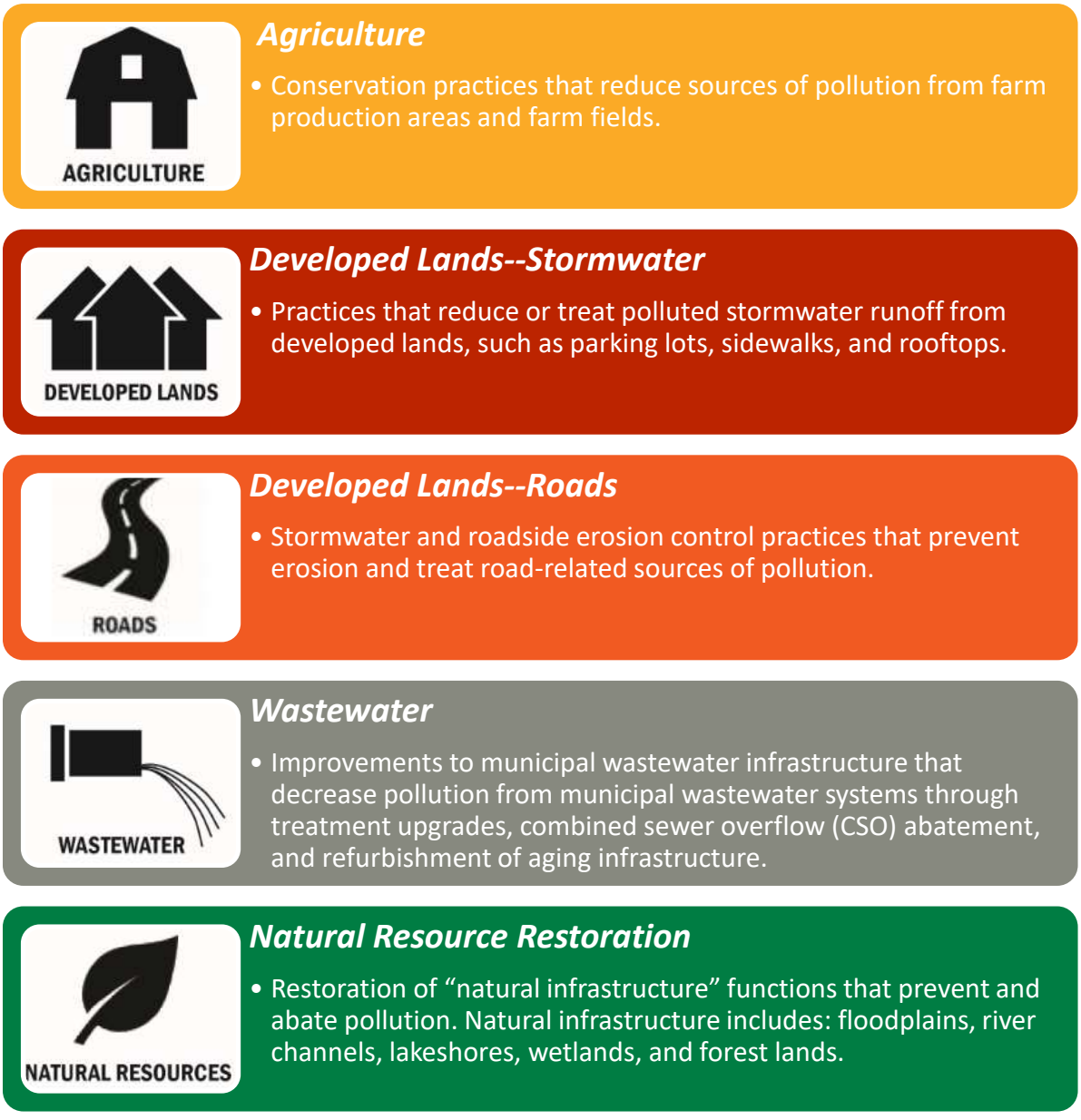
The ANR and partners use the plan's strategies to identify and develop funding for specific actions. The unfolding of a new process supported under Act 76 for enhanced collaboration among partners and ANR is described in Chapter 5. Once identified, the actions for immediate or future implementation (e.g., bioinfiltration of stormwater at Shelburne Community School) are uploaded into the ANR Watershed Projects Database and the Clean Water Project Explorer.

The reports on progress, outcomes and recommendations within each sector also serve to meet LC TMDL reporting requirements for Phase II (see Chapter 3, Section B and 2017 Basin 5 TBP) 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 ANR's Clean Water Initiative 2019 Performance

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

report. The ANR 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.

Table 9. 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 in Table 10 address additional stressors responsible for impairments or physical alterations to the water bodies identified in Tables **2**,**3** and **7**



A. Priority Areas for Restoration

The following table organizes priority surface waters for restoration by land-use or natural resource sector. Each land use sector is associated with an objective identified in Table 9 and specific strategies (see last column in Table 10. Priority areas are identified based on ANR's monitoring and assessment results and sources identified within the watershed as well as modeling results. Sectors include Agriculture, Developed Lands—Stormwater, Developed Lands--Roads, Wastewater, and Natural Resources.

Table 10. Focus areas for implementation of water quality strategies by sector in the North Lake Basin to meet sector objectives in Table 9. Details for strategies for each sector are provided in Chapters 4 and 5.

Focus Areas (HUC12 in Bold)	Priority Strategies*
Agriculture	
Mud Creek, St. Albans Bay (and Swanton shoreline**), Jewett Brook, Lake Champlain, LaPlatte River, Hoisington Brook,**	• Support outreach and technical and financial assistance for Best Management Practices and Required Agricultural Practices to reduce erosion off fields, manage stormwater off production areas, enhance riparian buffers, develop, and implement nutrient management plans. Promote adoption of stewardship practices through award program, • Continue nutrient management planning • Coordinate with agricultural service providers to provide cross training
Developed Lands – Stormwater	
Stormwater impaired streams and those trending towards impairment: Allen, Munroe, McCabes and upper LaPlatte. Malletts Bay: Smith Hollow and Crooked Creek; Islands: Keeler Bay Areas with high landslide potential,	• Develop and implement stormwater master plans, Flow Restoration and Phosphorus Control Plans • Support landowners in meeting compliance with the Three-Acre General Permit • Use social marketing tools[17] to encourage adoption of residential Best Management Practices • Assist landowners in managing stormwater off private roads • Assist road crews and contractors in adopting winter ice management that results in reduced use of chlorides (also below)
Developed Lands – Roads	
All town roads have a complete Road Erosion Inventory (REI) Private roads in priority HUC12s like	• Complete Road Erosion Inventories (REIs) and implement BMPs on high priority road segments. • Provide and support training for road crews on

[17] https://www.epa.gov/sites/production/files/2016-09/documents/socialmarketingguide_overall.pdf

Focus Areas (HUC12 in Bold)	Priority Strategies*
LaPlatte River and Islands.	culvert replacements and maintenance of road BMPs
Wastewater	
Hinesburg, South Burlington, Residential Septic health: Lake Iroquois, Lake Champlain Islands	• Support upgrades and optimize phosphorus removal from WWTF to meet TMDL allocation • Assist communities in addressing inadequate onsite wastewater treatment through the planning and development of solutions • Promote proper septic system maintenance
Natural Resources – Rivers	
All Rivers with following priorities: Jewett Brook, Stevens Brook Mil River, LaPlatte River, See Table 18 for dams	• Develop and implement river corridor remediation projects including shoreline reforestation, floodplain restoration, dam removal • Assist towns with culvert replacement to improve geomorphic compatibility with streams • Provide outreach to communities on floodplain and river corridor protections • Identify river corridor and wetlands easements, and riparian area restoration
Natural Resources – Lakes	
Lake Iroquois, Lake Champlain shoreline	• Restore forest cover on shorelands, improve septic system performance, reduce erosion from shoreland residential properties and roads • Support aquatic invasive species spread prevention and management efforts
Natural Resources – Wetlands	
Class I Wetland Candidate: Mud Brook Priority **Conserve: Wetlands adjacent to Vermont Wildlife Management Areas** **Restoration: see the DEC RCPP Wetland Restoration Site Prioritization Map**	• Conduct studies on potential Class I candidates and support local outreach to municipalities and landowners to gauge interest in supporting Class I designations • Provide technical support for parties interested in submitting petitions • Support wetland restoration and conservation
Natural Resources – Forests	
High TP loading watersheds in Phase II plan including **Mill River, Malletts Creek, LaPlatte river**	• Identify and remediate erosion from logging roads and landings with high erosion potential • Provide outreach, technical assistance, and workshops on Acceptable Management Practices and Current Use Program • Support forestland conservation and skidder bridge program

*Project leaders and partners, funding and specific activities are identified in Chapter 5.

B. Agriculture

The agricultural landscape in the North Lake Basin is managed predominantly by dairy operations to raise animals and grow corn and hay. Other agricultural operations in the basin grow fruit and vegetables and more recently, hemp. In addition, sugaring and equine operations are common. Agricultural land use can be a source of nutrients, sediment, pathogens and toxins to surface waters without proper management of fields and farmsteads.

Improving the soil health of fields as well as managing application of nutrients through use of Agricultural Best Management Practices (BMPs) address water quality concerns and protect surface waters. Soil management activities include reduced tillage and the use of cover crops to increase organic matter, reduce compaction, promote biological activity, and reduce erosion. On farmsteads, BMPs such as improved waste storage facilities, clean water diversions, and improved barnyards can help reduce and eliminate nutrient laden runoff to nearby surface waters. As the farming community adopts both field and farmstead BMPs to protect water quality and improve soil health, the Agency of Agriculture, Food and Markets (AAFM) and partners support the research, development, and tracking of BMPs and potential improvements in meeting state water quality goals.

The ANR and AAFM address agricultural water resource impairments by facilitating the agricultural community's adoption of BMPs. Strategies direct financial and technical assistance to support regulatory compliance. Strategies in the plan (Chapter 5 Implementation Table) prioritize subbasins or HUC12 for agricultural assistance where modeling results indicate high phosphorus loading from agricultural land use (Figure 17 in 2017 Basin 5 plan), or where degraded surface waters are within a predominantly agricultural land scape. The prioritized HUC12s (bold), see Figure 11 or specific streams for remediation follow (subbasins in parentheses):

- **Jewett Brook, St. Albans Bay**: The ANR and NRCS have already identified the watershed as a focus for agricultural-related strategies based on modeling results (see LC P TMDL Phase I plan, as well as the Vermont NRCS priority watershed planning approach)
- **The LaPlatte River,** including Mud Hollow (Shelburne Bay): Monitoring and landuse data indicate bacterial-impaired streams in part from agricultural landuse.
- McCabe's Brook, which is part of the **LaPlatte River** HUC12, (Shelburne Bay) and **Hoisington Brook** (Charlotte direct drainages): Land use and monitoring and assessment data indicate degradation in part from agricultural land use.
- **Lake Champlain**, specifically Islands, Swanton and Georgia shoreline: Land use, modeling results and lake segment monitoring results suggest degradation in part from agricultural land use.

In addition to the streams listed above, other geographic areas may become priorities based on agricultural inspections or further assessment of land use and/or surface waters. Surface waters that warrant additional assessment to determine whether agriculture is a stressor include:

- Streams in the Islands
- Streams in Malletts Bay Subbasin:
  - Smith Hollow Brook
  - Malletts Creek

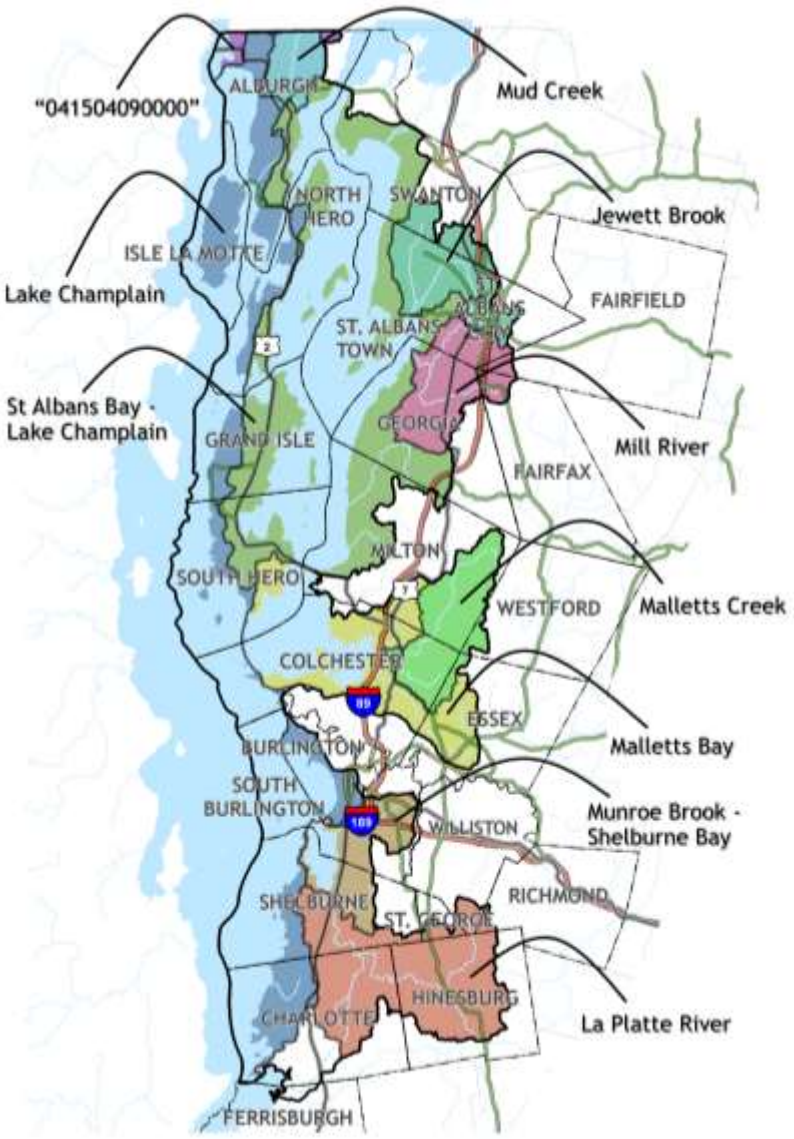


Figure 11. Location of HUC12s and towns in the North Lake Basin

Recent updates to state regulations are expected to result in a significant increase in conservation practice implementation over time. In addition, the ANR with Lake Champlain Basin Program (LCBP) is investigating the feasibility of an engineered ecosystem that would withdraw water from Jewett Brook, treat the water with one or more phosphorus removal techniques, and return water with lower phosphorus concentration to the stream. Visualized as a short-term practice, such a project could alleviate high phosphorus loading until watershed phosphorus reduction goals were met in the agriculturally dominated watershed of Jewett Brook.

To facilitate regulatory compliance or voluntary adoption of conservation practices, AAFM and partners are providing technical and financial assistance to farm producers. Partners include USDA Natural Resource Conservation Service (NRCS), Natural Resource Conservation Districts (NRCDs),

University of Vermont Extension (UVM Extension), Farmers Watershed Alliance (FWA), Champlain Valley Farmers Coalition (CVFC), and Friends of Northern Lake Champlain (FNLC).

This plan provides additional direction to improve effectiveness of technical and financial assistance based on modeling results, data analysis as well as observations collected from partners during the tactical basin planning process. These recommendations, located in the Outcomes and Recommendation section, informed the development of agricultural sector strategies in the Chapter 5 Implementation Table.

Progress

The farms in the North Lake Basin are adopting BMPs to meet regulatory requirements as well as to voluntarily improve water quality in adjacent lakes and rivers. The most significant progress to date towards meeting phosphorus reduction goals of the LC TMDL (Chapter 3) has been achieved through adoption of BMP field practices (Figure 12). Financial and technical assistance has helped facilitate adoption. In addition, the changing climate may have also become a factor in a farmer's decision to adopt conservation practices. With the new precipitation pattern of drought and deluge, farmers are finding that many of the practices that improve soil health and reduce erosion provide weather resilience often leading to increased crop yields over conventional practices. The following sections provide an overview of progress made by AAFM and partners in supporting programs that lead to BMP implementation as well as progress made by the agricultural community in actual implementation.

Regulatory Programs

Vermont Agency of Agriculture, Food, and Markets (AAFM) regulatory programs work towards protecting surface waters by setting baseline farm management practices to ensure environmental stewardship. The recent revisions of the Required Agricultural Practices (RAPs) in 2016 and 2018 are leading to significant phosphorus reduction as permit programs are adopted and farmers meet compliance requirements. Revisions include new requirements for nutrient management planning, reduction in maximum soil erosion rates as well as increased protection of surface waters with perennially vegetative buffer zones and manure spreading setbacks.

The RAPs apply to different types of farms and farming activities beyond dairy and livestock farming, such as maple operations. As maple operations remain a staple to the agricultural community, RAP compliance may have a different focus for these operations, for example,

construction of farm structures and effluent management[18]. An additional strategy regarding management of roads in sugarbushes is included in Section G of this Chapter.

In addition to the RAPs, Vermont farms are regulated by additional sets of rules promulgated by the AAFM based on farm animal numbers (see Table 11). The permit program requirements also aim to reduce the amount of phosphorus (P) and other nutrients entering state waterways. Although the Large (LFO) and Medium (MFO) Farm Operation Programs have been operating under a permit for more than 10 years, the Certified Small Farm Operations (CSFO) began on July 1, 2017. Table 12 lists the numbers of each operation type by HUC12. The new certification of 22 CSFOs with AAFM in the North Lake Basin as well as the RAP coverage of approximately 48 Small Farm Operations (SFOs) in the basin, who do not need to certify, is expected to lead to enhanced field management by these operations and therefore improved surface water.

Generally, CSFOs, MFOs, and LFOs are concentrated in the northern half of the North Lake Basin in the St. Albans Bay, Jewett Brook, and Mill River HUC12 watersheds, with additional CSFOs and SFOs concentrated in the Lake Champlain, La Platte River, and Mallets Bay HUC12 watersheds (Table 12).

Table 11. Information by farm size in the North Lake Basin as of 10/22/2019 (AAFM).

Farm size	Animal units	Inspection	Facilities/ Operations (#)
Large Farm Operation (LFO)	700 or greater mature dairy cows or equivalent	Annually	14/3
Medium Farm Operation (MFO)	200-699 mature dairy cows or equivalent	Every 3 years	17/12
Certified Small Farm Operation (CSFO)	50 -199 mature dairy cows or equivalent; or Growing more than 50 acres of annual cropland; or Growing more than 50 acres of vegetable	Every 7 years[19]	25/22
Small Farm Operation (SFO)	Operate 4 or more acres for farming; or Annual gross income more than $2,000; or Have filed a 1040(F)tax form once in the last 2 years	N/A	49/48

[18] The direct discharge of wastes to surface waters, including reverse-osmosis permeate, is not allowed under the RAPs. Options for managing waste discharges that may access streams from sugar houses are currently being researched. The results of this research will inform future recommendations.

[19] CSFO inspections will be prioritized in critical areas of the watershed due to the 7-year inspection cycle, whereas MFOs and LFOs are inspected more frequently

AAFM programs support farmers to ensure their clear understanding of the RAPs and program rules, while helping assess, plan, and implement any necessary conservation and management practices necessary to meet water quality goals. Inspections by AAFM (see Table 11 for inspection frequency) include assessments of farm nutrient management plans (NMPs), production area assessments of all facilities associated with the permitted operation, and cropland management assessments in accordance with RAPs and permit rules as applicable.

Table 12. Farm facilities by HUC12 watershed by farm size as of 10/22/2019 (AAFM). One Farm Operation may have multiple facilities within the operation permit or certification. See Table 1 for association between HUC12 and North Lake subbasins.

HUC 12	# Farm Operations	Total Farm Facilities	LFO Facilities	MFO Facilities	CSFO Facilities	SFO Facilities
St Albans Bay-Lake Champlain	27	35	9	8	6	12
Jewett Brook	13	19	5	2	4	8
Mill River	15	18		1	8	9
Lake Champlain	8	8		1	1	6
La Platte River	7	7			4	3
Malletts Creek	4	5				5
Mud Creek	3	5		3		2
Hoisington Brook-Lake Champlain	3	3		2	1	
Malletts Bay	3	3			1	2
Munroe Brook-Shelburne Bay	2	2				2
Total	85	105	14	17	25	49

Agricultural Assistance and Outreach Programs

The increased availability of technical and financial assistance throughout the Basin provided by AAFM, NRCS, and other partners helps to facilitate adoption ahead of regulatory requirements as well as voluntarily. AAFM and NRCS -funded programs provide the majority of support directly to farmers as well as to agricultural partner organizations such as UVM Extension, NRCDs, Farmers Watershed Alliance and Friends of Northern Lake Champlain. The agricultural community in the St. Albans Bay watershed has received additional federal and state support as directed by the NRCS St. Albans Bay Watershed Action Plan for 2018-2020 as well as the AAFM North Lake Farm Survey.

AAFM is also coordinating with agricultural partners throughout the watershed to streamline outreach to farmers where multiple resources may be available through the Multi-Partner Agricultural Conservation Practice Tracking and Planning Geospatial Database (Partner Database) launched in 2019. This coordination ensures no duplicative actions and reduces confusion for

farmers when dealing with multiple organization. The Partner Database is also expected to improve planning and tracking of voluntary as well as AAFM and partner agricultural field and farmstead BMP implementation across the state.

A summary of resources provided by AAFM and other partners are described in the AAFM's 2019 Report on Clean Water Investment to the Vermont Legislature as well as in the annual Clean Water Initiative Annual Reports.

The following sections describe the focus of technical and financial assistance and subsequent progress made in BMP adoption, but also identifies areas where increases or a redirection in assistance may result in additional BMP adoption.

Outcomes and Recommendations

The last four years of tracked data shows that the majority of agricultural load reductions for this basin come from annual field practices that need to be continued each year going forward to meet the TMDL load reduction targets. In 2019, the acres of field practices implemented were estimated to show that a 28% reduction of the calculated TMDL load reduction target for agricultural fields in the basin had been achieved. AAFM understands from discussions with agricultural community that these practices are seen as beneficial not only to water quality, but to soil health and crop yields, and it is expected that the community will be willing to continue implementing these practices. The continued financial and technical assistance will further ensure that operators continue to implement these practices as well as serve to encourage the adoption by others in the farming community.

The increased technical and financial assistance provided to the agricultural community statewide between 2016 and 2019, (see Vermont Clean Water Initiative 2019 Performance Report's Figure 10) helped farmers address obstacles that may have otherwise reduced their rate of adoption. A comparison of Figures 12 and 13 also illustrate how newly adopted practices are focused in areas with highest potential for P load reduction (see also priority areas listed at beginning of section). The LC TMDL Phase II plan promoted the geographically targeting of these areas for effective distribution of AAFM and partner resources.

Outreach Efforts

Although not all outreach and technical assistance efforts are tracked, those funded through AAFM Agricultural Clean Water Initiative Program (AgCWIP) grants to partners have been tracked since FY19. As a result of this funding, 81 site visits were conducted in FY19 by 3 partners – NRCDs, VACD and UVM extension, the latter providing the majority of the visits. The areas served were predominately in priority areas: 53 around the Islands and St. Albans Bay Subbasin, with the lowest number of visits in the Malletts Bay Subbasin (see Table 1 for associated HUC12s).

Directing additional outreach in the following HUC12s could further increase rate of BMP adoption in HUC12s modeled as high phosphorus loading.

- Mud Creek,
- Mill River and
- LaPlatte River

Additional outreach focus is warranted for farms identified at the CSFO threshold and below to help operators understand the applicable RAP requirements, and implement the resulting farm management, infrastructure, or cropping system changes as applicable.

The Implementation Table strategies reflect the state's continued support of agricultural BMP adoption through education, financial and technical assistance. The changing nature of farming in Vermont may require creative approaches and more cross trainings to facilitate BMP adoption. Changes include loss of large farms, while smaller operations, including equine and beef operations remain and new crop specialties, including hemp operations have been increasing. The North Lake Farm Survey found that smaller operators have fewer free hours to apply for assistance and less access to state and federal programs, limiting their adoption of BMPs/FAPs. Partner discussions have included the following recommendations to enhance effectiveness of outreach efforts:

- Provide assistance to equine operators regarding RAPs, BMPs, and navigating funding resources such as NRCS EQIP.
- Provide assistance to specialty crop operations regarding the RAPs, BMPs, and navigating funding resources such as NRCS EQIP.

- Provide more cross trainings for partners to provide additional resources to farmers. As an example: NOFA could provide additional resources to organic operations including sugarbushes with additional training from partners, like UVM Extension. DFPR and DFW staff interest in providing training to agricultural planners regarding farm roads and culvert inventories.

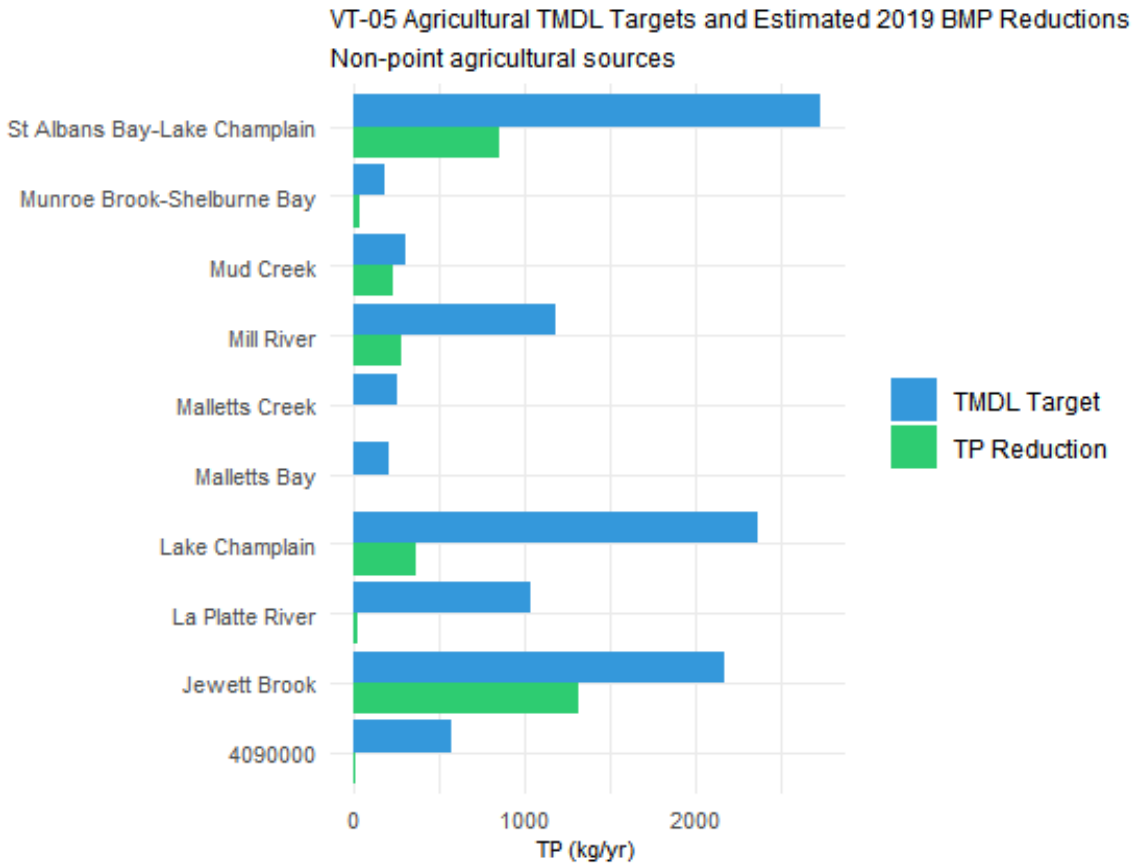
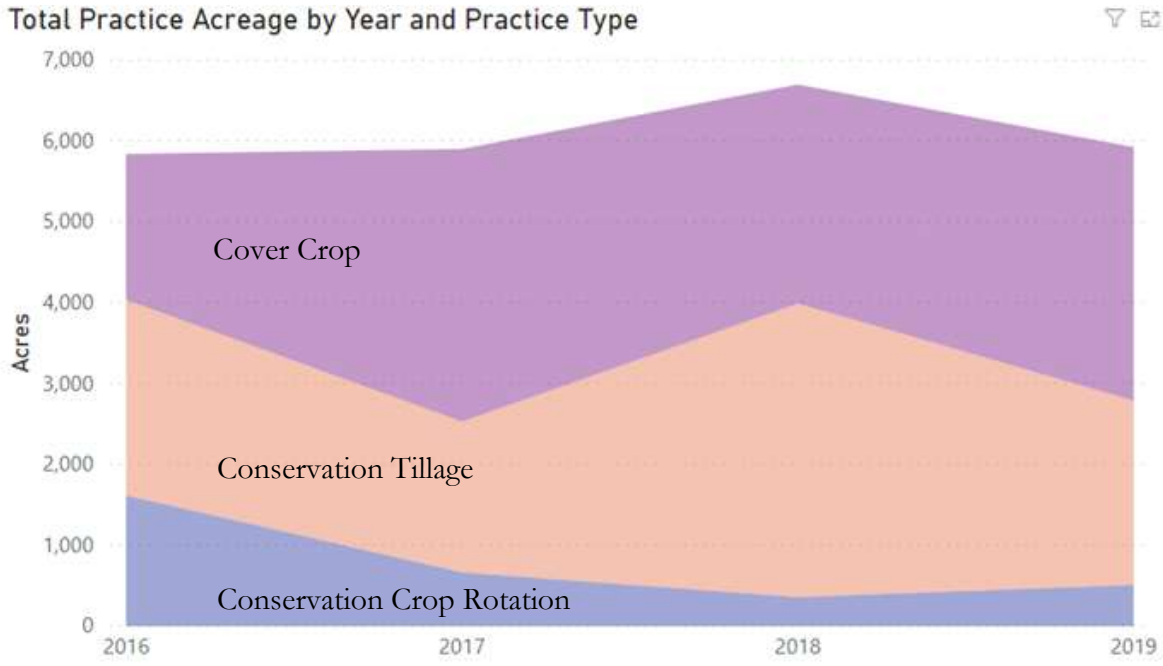


Figure 12. Phosphorus reductions achieved through implementation of field BMPs in FY2019 compared to TMDL annual load reduction targets for non-point agricultural sources

Field BMPs

In the North Lake Basin, as well as across the state, farmers have accelerated their adoption of BMPs that benefit water quality and soil health. This section highlights field BMP adoption through state and federal cost-share programs. The modeled phosphorus reduction achieved for FY2019 by field BMP adoption related to associated TMDL goals are shown in Figure 12. A detailed breakdown of agricultural land use, estimate TP loading rates, annual acreage of conservation practice implementation and annual TP load reduction estimates between FY2015 and FY2019 can be found in the online North Lake Basin Power BI Report.

Between 2016 and 2019, the field BMPs most prevalent on farms were cover cropping, conservation tillage, and conservation crop rotation. Acreage in cover crops increased during this time period from 1,801 acres to 3,137 acres, a nearly 2-fold increase (Figure 13). In FY19, 26.1% of all annually tilled fields were planted to a cover crop in the fall, a significant increase in both total acreage and percentage of fields cover cropped since 2016 (Figure 13).



BMP Type	2016	2017	2018	2019
⊞ Conservation Crop Rotation	1,614	664	361	509
⊞ Conservation Tillage	2,420	1,865	3,629	2,278
⊞ Cover Crop	1,801	3,371	2,709	3,137
Total	**5,836**	**5,900**	**6,698**	**5,924**

Figure 13. Changes in adoption of conservation crop rotation, conservation tillage, and cover crop annually between 2016 and 2019.

The adoption of conservation tillage practices, such as reduced till and no till, has fluctuated over this time period, but has averaged around 2,500 acres per year (Figure 13). Cover cropping, conservation tillage and conservation crop rotation together, provide the vast majority of TP reductions, accounting for approximately 93% of cumulative TP reductions estimated from BMPs in the Basin between 2015 and 2019 (North Lake Basin Power BI Report). These figures, in actuality, may be higher as DEC's accounting does not include practices that farmers may implement on their own without state or federal assistance or continue to adopt annually beyond the original cost-share agreements

The HUC12s with the highest modeled TP loading from agricultural practices are the St. Albans Bay, Lake Champlain, Jewett Brook, and La Platte River. Two HUC12s with limited land area, but high TP loading rates include Mud Creek and Hoisington Brook (North Lake Basin Power BI Report.). Except for the LaPlatte, these are also the areas that contain the majority of acres in the basin covered by field BMPs that work towards TP and sediment reductions. Figure 12 shows the phosphorus reduction associated with practice implementation in FY2019. For a further breakdown of BMP adoption by HUC12 and annual TP reductions see the following link to the North Lake Basin Power BI Report.

Additional field BMPs are being adopted by farms throughout the Basin that do not yet have TP reduction efficiencies assigned. One of these practices gaining popularity in the Basin that benefits soil health and water quality is manure injection. Partners are currently promoting and assisting with manure injection on annual cropland and hayland. Increased adoption of manure injection could result in increased manure application efficiency, which could help to ensure adequate manure pit storage capacity through the winter months.

The injection of manure on crop and hayland may be held back due to high initial investment costs of the specialized equipment as well as gaps in operator knowledge and experience. In FY18, AAFM began cost sharing specifically on the manure injection practice, rather than incorporation of manure more broadly, through the Farm Agronomics Practices (FAP) program and cost sharing manure injection equipment through the Conservation Equipment Agricultural Program (CEAP).

BMPs requiring additional outreach include pasture management and grazing practices, and winter feedlot management practices. Pasture, although currently only approximately 1% of agricultural land use in the Basin, is an area local conservation partners have identified to focus outreach and education efforts. The focused outreach may also include winter feedlot management practices, especially in the clay soil of the Champlain Valley where winter pasturing may concentrate animals near a feeding area. If not sited correctly or moved often, these areas can be sources of runoff in April during spring thaws.

Nutrient Management Plans

The CSFOs' adoption of Nutrient Management Plans has also increased in the basin. Timely adoption of the plans in accordance with the RAPs has been facilitated through increased technical assistance. The FNRCD and the WNRCD have provided CSFOs NMP assistance in the basin with support from AAFM, NRCS, and courses lead by UVM. As of June 2019, 10 of the 22 known CSFO have full NMPs with others in development (Table 13). To assist in ensuring accurate implementation of NMPs across all farm sizes and to reduce the risk of manure runoff from fields to surface waters, 88 custom manure applicators in the state have been certified through 683 hours of training by AAFM between December 2016 and June 2019.

Table 13. Status of Nutrient Management Plans for Certified Small Farm Operations in North Lake Basin as of 10/22/2019 (AAFM 2019).

CSFO NMP Status - Based on 2019 Certifications	
Full NMP	10
Partial NMP	2
None	2
Unknown	8

The adoption of field BMPs on corn land, such as cover cropping, conservation tillage and manure injection, has become more common in the last 5 years. The LaPlatte River HUC12 would be an area to direct resources as progress towards meeting P reduction goals is not as far along as in other HUC12s with high P loading. Additional resources could facilitate adoption of additional BMPs for hayland and pastures. Based on discussion with partners, the following recommendations were developed regarding how best to direct technical and financial assistance to meet the needs of farmers adopting field BMPs in the Basin over the next five years:

- Support reduced tillage and no-till as part of comprehensive conservation planning.
- Support cover cropping, with active follow-up to ensure the successful establishment of high-quality cover crops; and support efforts to develop cover cropping management systems that can improve spring planting through overwintered cover crops and minimize use of herbicides).
- Promote winter pasturing BMPs: increase distance between hay bales and water resources to avoid concentrating of livestock and promote distribution of manure. A focus area could include the LaPlatte river as it includes two bacteria-impaired streams with winter pasturing sites located near streams.
- Promote the appropriate use of manure injection: Continue to provide partners grants for technical assistance and farmers grants (capital funds) for equipment to support manure injection capability on more farms

Production Area BMPs

Production area compliance has risen from 2017 to 2019[20] in the North Lake Basin. Associated implementation of farmstead practices is concentrated in the St. Albans Bay, Mud Creek, Jewett Brook, and Lake Champlain HUC12s (see North Lake Basin Power BI Report. .) and have resulted in phosphorus reductions as shown in Figure 14.

[20] Aggregated tracking and reporting of production area compliance became available in FY2017.

The highest concentration of farms is in the St. Albans Bay and Jewett Brook HUC12s. Of these areas, St. Albans Bay and Jewett Brook show reductions closest to TMDL goals than in other HUC12s. As both of these HUC12s were identified in the LC TMDL Phase I plan as a priority area, initial outreach by AAFM began in 2016 as part of the North Lake Farm Survey, earlier than for other areas in the Basin. The LaPlatte HUC12 shows lower P reductions achieved than other HUC12s and that may be associated with the higher numbers of CSFOs who have more recently come under regulatory requirements (see RAPs described above). Continued outreach in other areas of the Basin is expected to result in increased production area compliance as well as associated farmstead practice implementation.

Production area compliance is assessed through AAFM's inspection process. As explained earlier, while routine inspections of LFOs and MFOs have been ongoing for 10 years, inspections for CSFO just started in 2017. Annual production area compliance and TP reductions by HUC12 can be viewed in detail in the North Lake Basin Power BI Report. The LaPlatte HUC12 shows lower P reductions achieved than other HUC12s and that may be associated with the higher numbers of CSFOs who have more recently come under regulatory requirements (see RAPs described above).

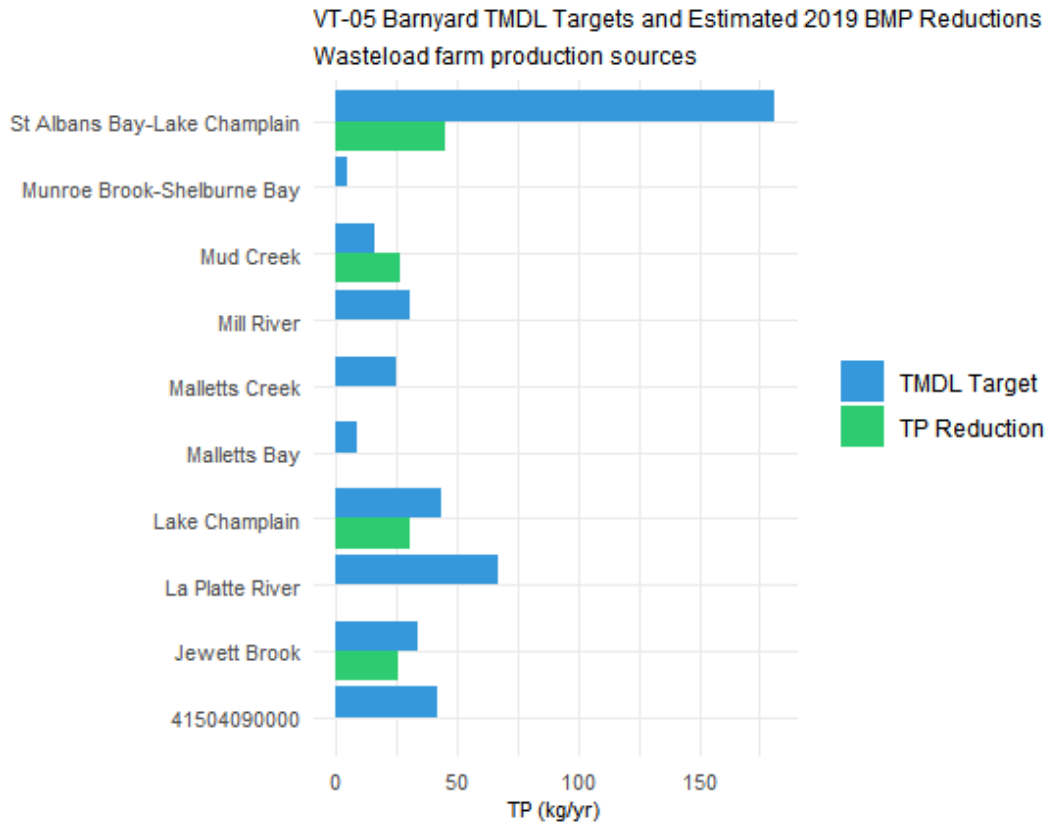


Figure 14. Barnyard TMDL load reduction Targets and Estimated FY2019 BMP reductions from barnyard production sources

In addition to work completed to meet regulatory requirements, farm operators have and will continue to voluntarily adopt farmstead BMPs based on the increased availability of technical and financial assistance. Between FY2016 -19, 32 farmstead practices were implemented in the North Lake Basin, with the most popular farmstead practices being waste storage facilities and barnyard management. AAFM and NRCS both fund programs that assist farmers with implementing farmstead practices.

Summary

The Chapter 5 Implementation Table strategies describe the state's plan to continue supporting efforts that lead to BMP implementation and RAP compliance. The additional recommendations that are provided in previous paragraphs were developed with partners to more effectively direct existing resources.

In addition, the support of a collaborative process with agricultural partners will help increase BMP implementation. The current challenges facing the agricultural community, including changing climate, financial loss due to COVID-19, and low milk prices can be debilitating for farm operators. In certain circumstances, adoption of BMPs can provide other co-benefits for the farm in terms of improved management and efficiency or related costs. To persuade an operator to take the economic risk of adopting new practices during tight fiscal times; however, partners will need to continue to work together to provide creative and persuasive approaches when offering education, outreach, technical assistance. The ANR and AAFM will facilitate the collaborative process through the support of the Multi-Partner Agricultural Conservation Practice Tracking and Planning Geospatial Database (Partner Database) as well as the Clean Water Road Map and other modeling tools. Sustaining and coordinating with these groups will lead to effective targeting of agricultural BMP implementation to improve and protect water quality.

C. Developed Lands -- Stormwater

Stormwater runoff from developed land contributes pathogens, sediment, nutrients, toxins, and chlorides to waterways as well as high volumes of water that lead to eroding streambanks. The North Lake Basin has the highest concentration of developed land in Vermont and subsequently, the highest number of streams impaired by urban stormwater. These stormwater-impaired streams include high phosphorus concentrations to the extent that the developed areas produce 28% of the North Lake Basin's phosphorus loading to Lake Champlain while only comprising about 13% of the basin.

Stormwater from developed area in the North Lake Basin may also contribute to sediment loads from eroding gullies and landslides. A DEC landslide report of Chittenden County associates gullies and landslides in developed areas with areas of highly erodible soils. The report also suggests that stormwater runoff from development or forest roads may have initiated gullying in some areas.

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

- Stormwater-impaired surface waters: 7 urban streams in Burlington, South Burlington, Shelburne and St. Albans (Table 7).
- Other surface waters in predominantly developed areas:
    - Surface water assessment data indicates degradation from stormwater - Stevens Brook, tributary 7, Allen Brook, upper Munroe, upper LaPlatte (see Chapter 5 C).
    - High phosphorus loading modeled - Swanton shoreline, Georgia village and shoreline; South Hero Keeler Bay drainage and Hinesburg village (see Figure 19 in 2017 Basin 5 plan).
    - Bacterial impaired streams - Smith Hollow and Crooked Creek (Table 7).
- Mapped areas showing high concentrated of gullies and landslides in developed areas: Smith Hollow, Crooked Creek, Indian, Bartlett, Munroe and McCabe Brooks, LaPlatte River, The shoreline of the municipalities of Georgia, and Burlington.

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

Low Impact Development (LID) policies and Green Stormwater Infrastructure (GSI) practices are supported by the ANR and partners. These practices strive to manage stormwater and pollutants by restoring and maintaining the natural hydrology of a watershed. Rather than funneling stormwater off site through pipes and infrastructure, these systems focus on infiltration, evapotranspiration, and storage as close to the source as possible to capture runoff before it gets to surface waters.

State and federal stormwater permits provide for stormwater management in developed areas. Areas developed before stormwater permitting, and therefore lacking effective stormwater management practices, are the focus of strategies in this section. Improved stormwater management will be carried out primarily through new regulatory processes. In addition, the ANR supports landowners in voluntary efforts to address stormwater through development of stormwater master planning and grants for implementation.

Stormwater impaired streams (Table 2) will be addressed through the Municipal Separate Storm Sewer System Permit (MS4 permit) as well as the Transportation Separate Stormwater System (TS4 permit)t. MS4 entities and VTrans via TS4 are currently involved in implementing projects to reduce nutrient loadings, see Vermont Clean Water Investment 2019 Performance Report for TP reduction to date, including rates of increase since 2016.

Other stormwater-degraded surface waters (Table 2) will benefit from the implementation of actions to meet the new stormwater operational permit (3-9050) aka, 3 acre permit, the six-minimum measures required in the MS4 and TS4 permit as well as voluntary action. Compliance with the new Municipal Roads General Permit, discussed in the next section, along with other strategies to address private roads will also work towards remediating these surface waters.

This plan provides additional direction to improve effectiveness of technical and financial assistance along with other outreach efforts based on modeling results, data analysis as well as observations collected from partners during the tactical basin planning process. These recommendations, located in the Recommendation section, informed the development of Developed Lands Stormwater sector strategies in the Chapter 5 Implementation Table.

Progress

The ANR is developing and administering regulatory programs and with partners providing education and outreach to permitees and other community members. As a result, landowners are working towards regulatory compliance as well as voluntarily implementing projects and practices that will improve waterways degraded by urban runoff.

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 14). 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 supporting education and outreach programs to encourage community involvement and voluntary adoption of practices to meet the MS4s requirements under Minimum Control Measures #1 and #2. The programs include Rethink Runoff in Chittenden County and Franklin County Stormwater in Franklin County.

Table 14. Municipality progress in addressing stormwater

	Town	MS4/FRP[21] completed	Stormwater Infrastructure Conveyance Mapping	Stormwater Master Plan[22]	IDDE[23]
Municipal Separate Storm Sewer System (MS4)	Burlington	Englesby and Potash Brooks.	Yes	N/A	2018/ 7 illicit discharges, none have been corrected
	Colchester	Indian Brook	Yes	Water Tower Hill (10 Yr flood control stormwater master plan); and Stormwater scoping report (2019)	2018/1found and corrected
	Essex Junction	Indian Brook	Yes	N/A	2018/1 found and corrected
	Milton	NA	Yes	Yes	2018/0 found
	Shelburne	Munroe Brook and Bartlett Brook	Yes	LaPlatte Scorecard Map,	2018/0 found
	St. Albans City	Stevens and Rugg Brooks	Yes	N/A	2018/2 found
	St. Albans Town	Stevens and Rugg Brooks	Yes	Yes	2018/0 found
	South Burlington	Potash Brook, Munroe and Bartlett Brook	Yes	N/A	2018/0 found
	Williston	None in Basin	None in Basin	None in Basin	None in Basin
Non – MS4	Alburgh	NA	Yes	Yes	Statewide study 2019/1found
	Charlotte	NA		Yes and LaPlatte Scorecard Map	
	Fairfield	NA	Yes	Yes	Statewide study 2019/East Fairfield discharge

[21] FRP – flow restoration plans
[22] SWMP – Stormwater Master Plans or similar
[23] IDDE – Illicit Discharge and Detection Elimination program

Town	MS4/FRP[21] completed	Stormwater Infrastructure Conveyance Mapping	Stormwater Master Plan[22]	IDDE[23]
Georgia	NA	Yes	Yes (village) Plan for shoreline is in progress	2014/1 found and corrected
Grand Isle	NA		Need not identified	
Hinesburg	NA	Yes	Yes and LaPlatte Scorecard Map	Statewide study 2019/0 found
Isle La Motte	NA		Need not identified	
North Hero	NA		Need not identified	
St. George	NA	No	LaPlatte Scorecard Map	
South Hero	NA	Yes	Suggested	Statewide #4 contract
Swanton	NA	Yes	Yes	2011/2 found and corrected

Operational Three-Acre Impervious Surface Permit Program

The General Permit 3-9050 serves as the "Three-Acre General Permit" as required under the Vermont Clean Water Act. A "three-acre site" is a site with three acres or more of impervious surface 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 (Table 15) and notified owners of the permit requirements. The North Lake Basin parcels, along with others in the Lake Champlain Basin, will need to obtain permit coverage by 2023. General Permit 3-9050 includes a schedule for submitting the required application.

Table 15. Estimated three-acre parcels and associated impervious cover by Lake Segment.

Lake Segment	Towns	Unique 3-acre IDs	Individual Parcels	Pre-2002 Permitted[24] (Acres)	Post-2002 Permitted (Acres)	Total impervious area[25] (Acres)
Burlington Bay	Burlington, South Burlington	24	144	55.7	9.2	181.8
Isle La Motte	Alburgh	1	1	0	0	8.9
Main Lake	Burlington, Colchester, Grand Isle, Shelburne	4	55	16.2	11.4	43.8
Malletts Bay	Colchester, Essex, Milton	26	740	82.7	23.2	188.4
Northeast Arm	Georgia, Grand Isle, South Hero	3	55	6.6	0.3	33.8
Otter Creek	Charlotte	2	11	0	3.1	10.6
Shelburne Bay	Burlington, Charlotte, Hinesburg, Shelburne, South Burlington	69	1637	284.0	47.5	498.9
St. Albans Bay	Georgia, St. Albans City, St. Albans Town	37	305	123.3	23.4	276.2

Table 16 provides an example of how stormwater-degraded streams in the North Basin will benefit from additional treatment when the expected acreage comes under the 3-acre permit. A calculation of all the untreated acres within 3-acre parcels in the watersheds of stormwater-degraded streams shows that an additional 900 acres could receive treatment. Although not identified as stormwater impaired, monitoring data indicates that urban runoff is a factor in the degraded condition of the streams listed in Table 16. The increase in stormwater treatment will be important in efforts to remediate these streams and avoid having the municipalities manage their recovery under a stormwater TMDL.

[24] Acres in lake segment watershed where stormwater is managed according to standards in place prior to the 2002 Vermont Stormwater Management Manual (manual). The next column identifies number of acres managed using the manual or subsequent revisions where additional treatment practices may not be required under General Permit 3-9050.
[25] Calculated using GIS information that includes both pre and post-2002 permitted impervious surfaces, as well as unpermitted impervious surfaces.

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[26]
Allen Brook (from Milton town line)	Milton	48.7
McCabe's Brook (to Shelburne town line)	Shelburne	30.6
LaPlatte River	Shelburne, Hinesburg, Charlotte, St. George, Williston, Richmond	69.8
Indian Brook	Colchester, Essex	89.9
Crooked Creek	Colchester	10.2
Smith Hollow Brook	Colchester	28.4

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 ANR reviews these applications as they come in.

It is anticipated that the "three-acre impervious surface" program will address the stormwater developed lands Phosphorus (TP) reductions necessary to achieve the Lake Champlain Phosphorus TMDL (LC TMDL). Once the program is implemented, this projection will be verified by tracking TP reductions achieved through implementation using the Clean Water Reporting Framework. 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.

Public Private Partnership

Through a pilot project, DEC is currently investigating how best to assist private landowners with permit compliance where it will also result in public entities meeting other water quality or public-interest goals by limiting private runoff to publicly managed stormwater systems. This Public Private Partnership project seeks to identify partnership opportunities with the goal of moving ten private properties that come under jurisdiction of the 3-acre permit forward to the 30% design phase. These can then be shared as models on how to bring closer to compliance with the new rule while simultaneously meeting some outcomes for public good.

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

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 or 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. DEC also supports IDDE studies for non-MS4 communities, see Table 14 for results of studies. Eliminating an IDDE can address a 4 to 7 kg/yr per residential or commercial source of TP to waterways.

Stormwater Master Planning - Lake Wise and other Outreach Efforts

The ANR supports voluntary efforts to manage stormwater primarily through development 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. The ANR and partners also provide technical and financial assistance for voluntary implementation of projects including lake friendly landscaping practices.

Partner organizations 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, Lewis Creek Assn 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 (Table 14). In addition, the Town of Colchester completed a Malletts Bay Initiative Stormwater & Transportation Project that identifies discharge points of untreated stormwater, some directly to lake, as well as proposals for stormwater treatment projects. Addressing the stormwater discharges will work towards reducing both nutrient and bacteria levels in Malletts Bay as well as bacterial impaired tributaries to the bay.

The Lewis Creek Association has also developed a LaPlatte scorecard map that depicts stream channel as well as water quality conditions identified through DEC supported assessments. These

results assist in the identification of pollutant sources and therefore can be used to prioritize placement of remediation projects.

Towns with completed plans are located in Table 14 and Appendix D. Additional plans could be considered for Keeler Bay in South Hero where the most appropriate plan would focus on agricultural ditching as well as developed surfaces that drain to Keeler Bay. The plan could also be included in a larger Village water management plan that looked at drinking water as well as wastewater treatment. The need for additional stormwater master plans will be assessed by ANR upon request.

The Lake Wise Program is focused on improving lake health and includes addressing stormwater. More about this program is addressed in Chapter 4, Section H.

The Vermont Green Infrastructure Toolkit is a project of the ten Regional Planning Commissions of the Vermont Association for Planning and Development Agencies (VAPDA) and the Agency of Natural Resources' Water Investment Division. The toolkit is a clearinghouse of information useful to Vermont municipalities to explore how to promote the adoption of Green Infrastructure policies and practices.

Other collaborative outreach efforts that include the ANR as a partner are listed below:

- Raise the Blade and Don't P on your Lawn campaigns (DEC and partners)
- The MS4 related campaigns described above, including support of the Chittenden County Rethink Runoff Stream Team and Franklin County Stormwater Collaborative.
- Ahead of the Storm (DEC and partner grants)
- Support the use of Green Stormwater Infrastructure through the Green Infrastructure Round Table, (a collaboration of partners facilitated by Lake Champlain (LC) Sea Grant and DEC)
- Resource for landslide or gully stabilization, Lake shore stabilization handbook led by NRPC (DEC and LC Sea Grant assistance,); and The Landslide Handbook by USGS

Recommendations

Implementation Table strategies for developed land reflect the ANR's continued commitment to working with local, regional, and federal partners to accelerate the community's voluntary adoption of stormwater-related BMPs and lake-friendly landscaping practices in addition to achieving regulatory compliance.

The following recommendations for ANR and partners will further support the community's efforts over the next five years:

- Support use of Green Stormwater Infrastructure where feasible.
- Support lake friendly lawn care practices to limit use of pesticides and fertilizers, for example, "Raise the Blade" or "Don't P on Your Lawn" campaigns as part of the Lawn to Lake collaborative partnership and the stormwater best management practices promoted by the Chittenden County Rethink Runoff and the Franklin County Stormwater Collaborative.
- Support development of an agricultural and developed lands stormwater plan for South Hero, specifically drainages to Keeler Bay.
- Help communities understand landslide potential during development considerations.
- Include landslide locations, as a proxy for landslide prone areas, in Municipal Hazard Mitigation plans.

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 ANR's approach to addressing public road-related impairments is primarily regulatory with guidance and financial assistance provided through existing partnerships. 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). To date, permitees, including municipalities as well as VTrans are prepared to meet permit deadlines, if not already exceeding established timelines.

Private roads, although not subject to state regulations, can comprise a significant percentage of the road network in a town. As an example, approximately 45% of the gravels roads in Hinesburg are private. Addressing runoff from private roads requires education and outreach to landowners to encourage them to adopt effective maintenance practices.

Priority areas for focus are hydrologically connected roads. The ANR developed a methodology to prioritize these road sections based on level of road erosion expected for public roads with catch basins and outfalls as well as a variation that suits gravel and dirt roads. Municipalities are using the assessment to meet the Municipal Road General Permit (MRGP) criteria. Additional criteria for prioritizing private road projects include areas where high phosphorus loading from roads have been modeled.

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.

Road work to meet MRGP standards includes crowning of roads, stabilizing drainage ditches and turnouts, and upgrading drainage culverts and intermittent stream culverts. DEC has established a timeline with milestones to guide towns through the MRGP requirements (Figure 15). It is anticipated that all towns will have a completed inventory by December 2020, that is updated every five years thereafter. Towns will use the REI results to prioritize road upgrades with goal of all municipal roads meeting the MRGP standard by 12/31/2036.

Results of the MRGP Road Erosion Inventory will be uploaded to the online MRGP database after the December 2020 deadline. DEC will use the database to calculate phosphorus reduction expected from roads addressed by the MRGP. As municipalities complete road assessments, DEC will use road mileage to model calculation of TP reduction achieved by town as well as by basin.

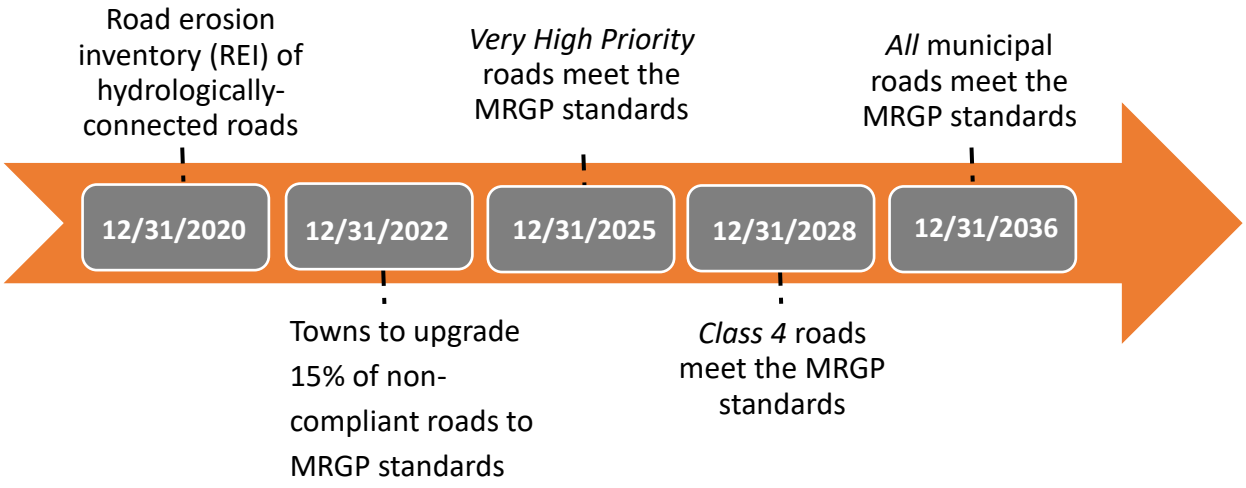


Figure 15. MRGP timeline and milestones

Training and Financial Assistance

DEC 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/VTrans Municipal Road Grants-in-Aid programs support the development of municipal REIs and project implementation. For additional information see the DEC Municipal Roads Program

In addition to the MRGP, towns can voluntarily adopt the Vermont Road and Bridge Standards. These standards are administered by VTrans and go above and beyond MRGP standards. For example, municipalities may adopt MRGP standards for non-hydrologically connected roads. Towns adopting the Vermont Road and Bridge Standards, may be entitled to higher cost-share rates in federally declared flood event reimbursements.

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

The Transportation Separate Storm Sewer System (TS4) General Permit covers stormwater discharges from all Vermont Agency of Transportation (VTrans) owned or controlled impervious surfaces. The TS4 general permit combines the stormwater requirements for VTrans associated with its designated regulated small municipal separate storm sewer systems (MS4s); industrial activities, commonly regulated under the Multi-Sector General Permit (MSGP); and previously permitted, new, redeveloped, and expanded impervious surface, commonly regulated under State Operational Stormwater permits.

Additionally, to meet the requirements of the Lake Champlain Phosphorus TMDL and to ensure water quality protection across the entire state, the permit requires VTrans to develop a Phosphorus Control Plan (PCP) for its stormwater discharges in the Lake Champlain Basin. 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.

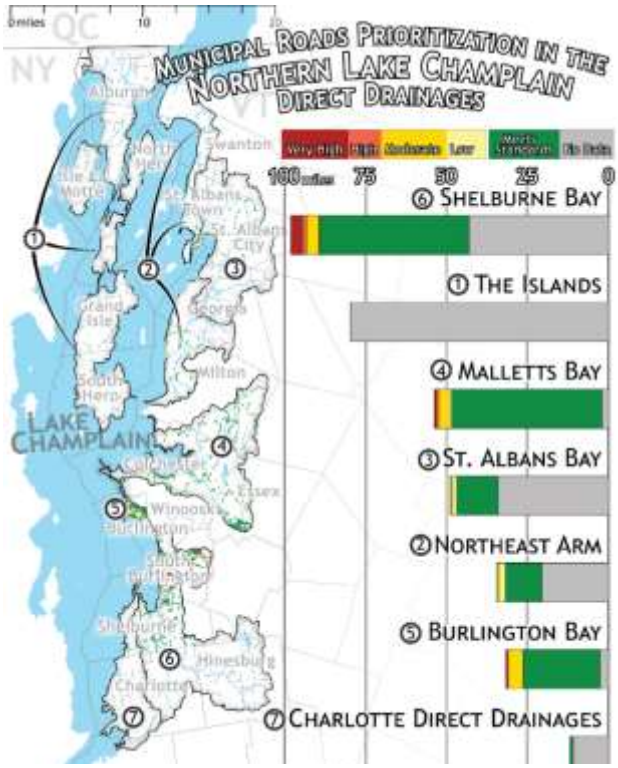
The permit also requires VTrans to reduce the discharge of pollutants from the TS4 to the maximum extent practicable (MEP) through compliance with the six minimum control measure requirements throughout the entire state.

Private Roads Outreach

The ANR and its partners support outreach efforts to private landowners to encourage effective road maintenance practices. In addition to encouraging landowners to participate in efforts to protect surface waters, the message also points to the personal benefit of reducing overall maintenance costs. The ANR's most recent tool will also help to prioritize road projects. The ANR's road erosion inventory App for forest access roads can be used for private driveways assessment as well. 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.

Previous outreach efforts by partners have been directed towards landowners in specific towns or lake watersheds. The towns and HUC12s in Appendix F, Table 15 of the 2017 North Lake TBP would be the priority areas for directing resources towards private roads outreach and financial assistance as they are highest loading areas for non paved roads. Associated catchment areas identified in the table would provide an additional focus for the highest TP reduction. Currently, TP loading estimates for roads only exist from the Lake Champlain TMDL SWAT model, which distinguishes only between paved and unpaved roads. Assuming that many of the unpaved roads are private, encouraging private landowners to improve management of stormwater on areas modeled

for highest TP loading from unpaved roads will provide the opportunity to achieve the greatest TP reduction achieved for dollar spent. Beginning with the onset of Act 76 Formula Grants, Clean Water Service Providers and their Basin Councils may elect to prioritize funding to non-regulated private roads to achieve on-going pollution reductions.



. Hydrologically connected roads by subwatershed in Basin 5.

Outcomes

Municipalities are currently involved in addressing non-compliant roads to meet the MRGP by increasing knowledge of road maintenance practices and implementing upgrades on applicable road segments to meet required practices. Almost half of the municipalities have taken advantage of financial assistance to address non-compliant roads since 2018. Of the 23 towns in the basin, 11 towns have enrolled in Grants-in-Aid Program to address hydrologically connected roads. From SFY 2018 to SFY 2019 the number of towns enrolling increased from 8 to 10. Improvements to hydrologically connected roads are expected to accelerate now that the REIs are completed for all but one municipality in the basin.

With regard to the TS4 permit, on April 1, 2019, VTrans submitted the TP baseload analysis from their owned and controlled land. A TP target is part of the analysis to be achieved by 2036. By October 1st in 2020, 2024, 2028, and 2032, VTrans will submit a detailed PCP that achieves on average 25% of the total reduction to Lake Champlain in each 4-year period. Projects on the VTrans roads, rights-of-way, and facilities in the Basin will be prioritized to include highly hydrologically connected road segments, existing road drainage deficiency or localized erosion

Recommendations

Implementation Table strategies for developed land reflect the ANR's continued commitment to work with local and regional partners to assist municipalities in meeting the MRGP. The following recommendations provide additional direction to partners for providing support to municipalities and other private road owners over the next five years:

- Continuing support of private landowners in their maintenance of roads will assist municipalities efforts, especially where private roads contribute stormwater to public roads. Appropriate trainings would benefit contractors as well as the landowner.
- Encourage towns to meet the Road and Bridge standards, including use of standards for intermittent stream culvert sizing
- Work with towns to identify, add projected costs to capital budget, seek additional funding sources.

E. Developed Lands—Toxic Substances

The ANR and other state and federal organizations control, reduce and/or eliminate toxic substance releases. Vermont Surface Water Management Strategies provides an overview of toxic substances management. Partners also participate in programs to reduce use of toxins. As an example, municipalities covered under the MS4 permit and VTrans under its TS4 permit continue to meet housekeeping criteria that result in reduction of toxins.

In the North Lake Basin, chloride is a contaminant in surface waters from the developed landscape. In addition, the ANR is currently managing two sites in the basin for toxics contamination due to historic activity. A recently discovered legacy contaminant from historic manufacturing processes, PFAS, is currently under investigation as to extent of contamination in surface waters.

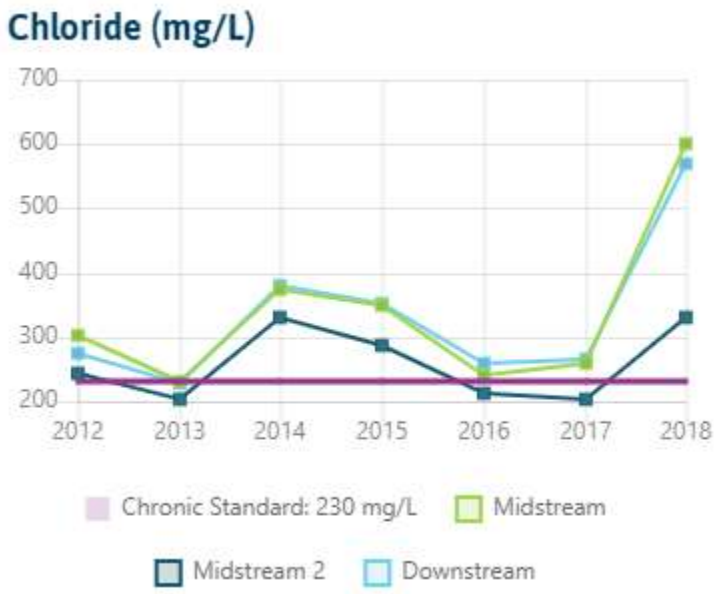
Chloride

Chloride is a pollutant originating primarily from the use of deicing salts in winter management activities on roads and other developed areas; however, residential and business wastewater discharges are also a source. The north south crossing of a major transportation corridor across the basin, as well as the concentration of large parking lots for shopping plazas and businesses with large numbers of employees leads to high chloride inputs to the basin's streams. Elevated chloride levels in surface waters can negatively impact the health and reproduction of aquatic species

In the North Lake Basin, monitoring results from the Chittenden County Stream Team (see Appendix A), include exceedances of the state's chronic standards of 230 mg/l in Bartlett, Englesby, Potash (Figure 17), Munroe and Indian Brooks, with Englesby Brook exceeding the acute standard of 860 mg/l on one occasion in 2018. Over the six years of monitoring with biweekly grab samples, the majority of streams have shown an upward trend. Periodic grab sampling such as this is most effective at identifying problematic chloride levels in various streams but is oftentimes insufficient to establish impairment. The frequency is usually insufficient to properly establish the 4-day average exceedance for the chronic criterion. However, given the acute value exceedances and the consistent exceedance of the chronic criterion in multiple streams (and past historical data), Potash Brook, Englesby Brook and Centennial Brook are being considered for impairment listing during the 2020 303d listing cycle. Other streams that show somewhat less elevated levels with grab sampling, but still high, will be considered for further continuous monitoring by DEC in the coming years as resources allow.

DEC has begun to collect data to develop a Chloride TMDL for Sunnyside Brook in Colchester using in stream monitoring probes in urban streams to allow continual data collection.

To operate the transportation system in a cost-effective and environmentally responsible manner, VTrans and municipalities have already adopted practices that reduce use of deicing salt. VTrans has developed a Snow and Ice Control Plan to address source control and reduction in usage of Chlorides to protect surface waters. The goals of the plan are "to provide for the safe and efficient movement of people and goods; and to preserve, maintain, and operate the transportation system in a cost effective and environmentally responsible manner."



Stream Team project (WNRCD, 2019)

Private businesses, in contrast, often dependent on contractors to decide appropriate application of salt to parking lots and walkways. Partners, including Winooski Natural Resource Conservation District and the Lake Champlian Sea Grant Program have supported education and outreach efforts to reduce the use of chloride 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

Toxins – Legacy

Toxin-contaminated sediments from historic industrial activity can lead to contamination of surface water. The Vermont Surface Water Management Strategy describes the Agency's strategy for addressing legacy toxins in surface waters. The following provides an overview of North Lake Basin surface waters as well as an update on the ANR's evolving strategy to address Per- and poly-fluoroalkyl substances (PFAS) contamination.

North Lake Basin Surface Waters Contaminated by Legacy Toxins

The barge canal in Burlington Bay as well as Stevens Brook in St. Albans are degraded due to contaminated sediment 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 to help to identify movement outside of existing area.

Contamination to Stevens Brook (see ID 3 in Table 2) from the St Albans Gas and Light hazardous waste site was the subject of a 2012 EPA site investigation. The investigation found that toxins

including PAHs in soil had been released to surface and ground water. Subsequently, EPA removed most surface soils on the property and capped the area to address direct contact risk. This effort also included a limited area of stream bank excavation and covering with rip rap.

ANR will follow up with the landowner to continue the site investigation to determine current extent of contamination, including delineation of subsurface coal tar and groundwater contamination followed by an evaluation of cleanup strategies.

PFAS chemicals in Surface Waters

Since the discovery of PFOA contamination in Bennington in 2016, the Agency of Natural Resources (ANR) through the Department of Environmental Conservation (DEC) has undertaken a proactive, systematic investigation to identify the most likely sources of per- and polyfluoroalkyl substances (PFAS) contamination and to confirm the presence or absence of contamination through site investigation and characterization

PFAS, 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.

Under S.49, the Secretary of Natural Resources was directed to publish a plan for public review and comment to complete a statewide investigation of potential sources of PFAS contamination. The PFAS Statewide Sampling Plan was submitted in June 2019 to fulfill that requirement. The report also provides an update on PFAS investigations that have been completed since 2016 as reported in its July 2018 Contamination Status Report, as well as other efforts the DEC has completed in response to this emerging contamination issue.

As part of the work obligated by S.49, the DEC has analyzed the advisability of establishing surface water criteria for five PFAS compounds: perfluorooctanoic acid (PFOA), perfluorooctanoic sulfonic acid (PFOS), perfluoro hexane sulfonic acid (PFHxS), perfluoro nonanoic acid (PFNA), and perfluoro heptanoic acid (PFHpA). Developing a surface water standard is a multi-faceted process and involves significant research, investigation, and scientific analysis. Therefore, the first step required by S.49 was to develop a plan for public review and comment; the Plan for Deriving Surface Water Quality Criteria for the (5) PFAS was submitted to the legislature in January 2020.

The Agency of Natural Resources is working to ensure drinking water as well as rivers, lakes, ponds wetlands, fish and wildlife are not at risk from PFAS contamination. Recent PFAS monitoring has targeted approximately 700 public water systems, and hundreds of private wells. Industrial facilities

that use PFAS have been targeted including electroplating facilities, wire coating facilities and semi-conductor manufacturing. PFAS in waste streams have also been investigated and characterized including landfill leachate, WWTF influent and effluent, surface waters and biosolids. Fish tissue testing is proposed for 2020.

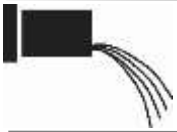
Of particular interest to surface waters, 23 WWTFs were recently sampled to determine PFAS concentrations in influent and effluent, these results as well as results from other PFAS sources are presented in the Wastewater Facility and Landfill PFAS Sampling Summary Report. The wastewater effluent concentrations at all 23 WWTFs for the (5) regulated PFAS were sufficiently low that instream concentrations were less than 20 ppt.

Additional information on the PFAS Statewide Sampling Plan and Sampling Results can be found at DEC PFAS Investigation and Response site and PFAS Surface Water Updates can be found here.

Recommendations

The following recommendations will further support the community's efforts to reduce discharge of toxins over the next five years:

- Support partners efforts to provide winter ice and snow management strategies to landowners, snowplow contractors.



F. Wastewater

Controlling Phosphorus from Wastewater Treatment Facilities and Other Industrial Discharges

The Agency of Natural Resources supports improvements made by municipal wastewater infrastructure that decrease nutrient (e.g., phosphorus and nitrogen) and other pollutants from municipal wastewater systems through treatment upgrades, optimization, combined sewer overflow (CSO) abatement, and refurbishment of aging infrastructure.

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[27] before discharge into a receiving water.

As of the issuance of this plan, all facilities have been reissued permits in accordance with the Lake Champlain Phosphorus TMDL except for Burlington Main. Burlington is working on an integrated plan for meeting multiple Clean Water Act requirements – the city is looking at stormwater and wastewater together to come up with a long-term plan for reducing phosphorus in both types of discharge. The goal will be issuance of an integrated permit that includes all three wastewater facilities and the MS4/stormwater.

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 17.

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

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

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. With support from the Lake Champlain Basin Program, DEC initiated a wastewater optimization and technical assistance program in 2018. Optimization assistance will remain available to facilities through this program through at least 2020.

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 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 17) use 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 available 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.

DEC will employ flexibility in helping municipalities meet LC TMDL targets for their WWTF by:

- Expressing effluent TP 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 TP treatment facilities will be required when actual TP loads reach 80% of the TMDL limits.
- Establishing TP 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

Table 17. Summary of permit requirements for the wastewater treatment facilities in the North Lake Basin. MGD - Million Gallons/day; WL – Waste Load Allocations; LMM - Low monthly mean, CSO - Combined Sewer Overflows

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 62.5%	2.76 (until upgrades completed or July 1, 2020)	47.7%	0.97/.06 1	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 Village- Treated wastewater is dispersed via spray irrigation on two land application areas that are under drained. Treated wastewater that infiltrates into the soil and groundwater is collected in the underdrain system and discharges to the lake. Total phosphorous annual effluent loads from this facility are far less than the wasteload allocation (WLA) of 0.108 MT/year. However, the hydraulic loading being higher than the design flow is a concern for this facility. The Department is initiating a desktop inspection to closely review the flow data to support subsequent discussions and requirements.

St Albans City - Following primary clarifiers, rotating biological contactors, trickling filter, and secondary clarifiers, the effluent is treated in flocculation tanks with alum and polymer for phosphorus removal by means of cloth disk filtration. Effluent then undergoes a by chlorination/dichlorination process for disinfection. An $18M upgrade project is currently completing construction that improves the ability of the facility to remove Phosphorus and repaired or replaced other equipment. Associated with the collection system for the WWTF is the presence of one active combined sewer overflow (CSO). This overflow occurs near Lower Weldon Street and flows to Stevens Brook. The ANR 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 - 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 - 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 Burlington Main WWTF has a conventional activated sludge treatment process. Burlington has started separate projects to upgrade the disinfection systems; and SCADA and PLCs at each of three wastewater treatment facilities. The City is evaluating this WWTF for additional age and nutrient related projects. The City is also currently drafting a Long-Term Control Plan to address the Combined Sewer Overflows. Burlington is currently developing an integrated plan for the stormwater and the three Burlington wastewater facilities. The plan is scheduled to be completed in 2021.

South Burlington – Bartlett Bay - 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 ultraviolet disinfection. Bartlett Bay WWTF is undergoing their twenty-year evaluation in preparation of their next age-related refurbishment project and is on the CWSRF Project Priority List for a $19M project in 2022.

Shelburne 1 – Crown Rd. - 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. - 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. Shelburne has recently received financing from the State Revolving Loan Fund to study the feasibility of consolidating these two facilities into Shelburne 1, eliminating Shelburne 2. Costs related to the Shelburne facilities has not been determined pending the project selected. A decision is anticipated in summer of 2020.

Hinesburg - consists of three aerated lagoons, chemical addition for phosphorus removal and chlorination/dechlorination for disinfection. Hinesburg gets good phosphorus removal for the technology. However the most recent permit includes reduced limits on both total phosphorus and ammonia. The facility's current discharge permit includes a compliance schedule that requires an upgrade of the treatment system to address total phosphorus removal and ammonia removal by December 31, 2022. The town is currently entering the design phase one of this upgrade. Their phosphorus load now exceeds the allowed phosphorus discharge, and their wasteload allocation would require a .2 MT/YR reduction to meet their target permitted load going forward. Hinesburg is planning to replace the lagoon technology with sequenced batch reactor technology that can address the nitrogen reductions paired with cloth disc filtration and chemical addition to address the phosphorus removal at a cost of $11.5M.

Financial Assistance

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 through Clean Water State Revolving Fund, Vermont Pollution Control Grants, USDA Rural Development's Water Environment Program, and the Vermont Clean Water Fund. The significant increase in spending on these facilities since 2018 based on funding awarded by state agencies is illustrated on page 75 of The Vermont Clean Water Investment 2019 Performance Report. Priorities highlighted above for each of the wastewater treatment facilities are included in the Project Priority List articulated in the FFY20/FFY21 DEC's "Intended Use Plan" as developed by the Water Investment Division.

The increase in funding coincides with the recent permit approvals for all North Lake WWTF except Burlington's (see above) beginning in 2017. Once permits were issued, municipalities were able to plan to update and improve facilities to meet permit requirements. 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.

Village Wastewater Solutions

Many villages and rural communities lack community wastewater disposal systems and municipal wastewater collection and treatment, hampering revitalization efforts while adding to bacterial contaminations when existing systems are failing. In the North Lake Basin, communities with dense development near the lake may be important areas to consider for alternative wastewater treatment solutions. DEC supports communities in planning and installation of wastewater solutions.

In general, new village wastewater solutions are decentralized and involve in-ground disposal systems (e.g., leach fields). Projects can range in size from serving just one property, to small clusters of users sharing a system, to connecting a whole village. Funding for design and construction may also be decentralized, with solutions implemented through a variety of means to reduce costs, including:

- State and federal infrastructure grants and loans
- Local bonds
- Coordinating with construction projects (housing, public buildings, business expansion etc.) to address the new wastewater needs along with the existing village needs.
- Funds to replace individual systems can be applied to a community system instead

Vermont has formed an interagency Village Wastewater Initiative Committee (VWIC) led by the Department of Environmental Conservation (DEC). The committee meets biweekly to discuss progress of the villages, development of tools and resources, and coordination between funders and service providers. VWIC has designed a workbook to help in organizing a village wastewater committee first step in initiating solutions.

Recommendations

The Chapter 5 Implementation Table includes strategies that supports the ANR's efforts described above. In addition, proposed assistance that could be provided by partners is provided below:

- Support additional community education around consumer actions that increase efficiency and reliability of wastewater treatment facilities, e.g., "Don't Flush This" brochure

G. Natural Resource Restoration--Forests

Forests provide multiple environmental benefits that contribute to the protection of surface waters. As the very high-quality waters in Vermont are predominantly forested, the protection of the forested watershed logically leads to the continued protection of those waters (see Chapter 2). In addition, forests also provide economic benefits by supporting silviculture and sugaring operations. Although these practices lead to increased stormwater runoff that can erode soils and stream channels, the adoption of best management practices (BMP) limits impacts to surface waters. By managing roads, logging areas, and other discharges, the stormwater runoff is reduced, and river channels are protected, allowing the working forests to provide environmental as well as economic benefits.

Vermont Department of Forest, Parks, and Recreation (VDFPR) oversees regulatory programs that work towards reducing runoff and erosion of forest lands, including, Acceptable Management Practices for Logging Jobs, and the Heavy cutting rule. Implementation of these practices will also work towards meeting the LC TMDL's 5% reduction target for the forestlands sector that applies to most of the North Lake Basin.[28]

The DFPR, the DEC, and partner organizations facilitate regulatory compliance as well as voluntary implementation of BMPs through education and outreach and by offering technical and financial assistance. Examples include the 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

Priority areas for directing resources include forested landscapes modeled for high TP export, include the HUC12s Mill River, Malletts Creek, LaPlatte, Mud Hollow (see Appendix F's Figure 16 and Table 7 in the 2017 North Basin Plan). While TP loading rates are generally low in forested areas, areas with steep slopes and thin soils could be problematic for forest road building and harvest activity. These areas are priorities for implementation of forest management practices to control downstream effects of erosion. A current ANR-supported study to identify priority areas for the targeting of forestland BMPs will provide the opportunity to further enhance efforts to direct technical and financial resources towards highest TP exporting areas (see below).

[28] As the watershed for the Burlington Bay lake segment is predominately urbanized, the LC TMDL does not include a forestland TP reduction target for that lake segment.

Progress

Regulations

The Acceptable Management Practices (AMP) for Maintaining Water Quality on Logging Jobs in Vermont were adopted for Vermont's water quality statutes and became effective in 1987 and were subsequently revised effective August 11, 2018. The purpose of the AMPs is to provide measures for loggers, foresters, and landowners to use, before, during and after logging operations to comply with the Vermont Water Quality Standards and minimize the potential for a discharge from logging operations in Vermont in accordance with 10 V.S.A section 1259. The 2018 AMP updates provided significant regulatory modifications to address forestry practices and phosphorus loading as part of the 2016 Lake Champlain TMDLs Phase I Implementation Plan. Included in the update were new specifications for the sizing of culverts and bridges for permanent crossings on intermittent streams. Perennial stream crossing is regulated under the DEC Rivers Program.

The AMPs apply to all logging operations in Vermont. While implementing the AMPs is voluntary, except where noted below, preventing discharges is mandatory. When the AMPs are implemented, the landowner/logger are presumed to be in compliance of Vermont's water quality laws.

The AMPs are required for about 60% of the forest land in Vermont. These include Forest Legacy program lands, state-owned lands and forest lands enrolled in the Use Value Appraisal Program (UVA). A forest management plan that is required by UVA becomes another technical resource for landowners, facilitating implementation of AMPs.

Sugarbushes are enrolled in UVA as either agricultural or forest land but are only required to develop a forest management plan if enrolled as forest lands. In addition, NOFA certification requires a forest management plan on organic sugaring operations.

Resources

In addition to providing regular trainings on AMPs, the DFPR aided by other programs in ANR provide financial and technical assistance to landowners and loggers with AMP compliance. Updates to these efforts as they relate primarily to road erosion and stream channel protection are described below.

Portable skidder bridges -DFPR promotes and demonstrates the use of portable bridges on timber harvesting operations to reduce erosion in stream channels. In addition, DFPR Temporary Skidder Bridge cost-share program is available to loggers and foresters who wish to own bridge. DFPR also has steel bridges for rent.

Forest Road Assessments - A Road Erosion Inventory App is currently being developed by ANR that will assist in the identification and prioritization of erosion issues along hydrologically connected forest roads. Once field tested on public land, this App may potentially become a resource for contractors and volunteers on private land. Downloadable to smart phones and smart screens, the app will used to assessed and priority road segments in the field. Landowners may also use to prioritize their own efforts as well as for supporting funding requests.

Regional Conservation Partnership Funds - Efforts to address the LC TMDL also made available additional funding. The Regional Conservation Partnership Program (RCPP) funding is available to "close-out" eroding historic logging roads/trails and improve permanent stream crossings required on sugarbush and forestry roads/trails. In addition, Clean Water Funds have also been available. Since, 2016, none of these funds have been directed towards work in the North Basin.

Study to improve Ability to Estimate Phosphorus and Sediment Reduction Potential -The ANR is currently supporting work to identify priority areas for the targeting of forestland BMPs in the Lake Champlain and Lake Memphremagog basins. The final product 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.

Reforesting areas infested with terrestrial invasives - The Town of Hinesburg with Vermont Youth Conservation Corps and the Winooski Natural Resources Conservation District worked in the LaPlatte Headwaters Town Forest in 2007 to restore the floodplain and wetland by plugging ditches and planting trees and shrubs with varied success due to intense deer browse and interference from reed canary grass (RCG). With the help of Ethan Tapper, the Chittenden County Forester, Hinesburg worked with The Nature Conservancy (TNC) and the Partners for Fish and Wildlife program of the US Fish and Wildlife Service (USFW) to conduct 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 Reed Canary Grass to establish an experimental area, testing the response of RCG to different treatments of plowing, planting, seeding and herbicide application. This experimental work will seek to restore areas of the LHTF to natural communities native to the site, in addition to providing insight on how to deal with RCG infestations elsewhere.

Outcomes and Recommendations

Although private land owners in the North Basin are improving management of forest roads with assistance from DFPRs (DFRP county foresters), the RCPP fund or Clean Water fund has not

helped supported this work (see Clean Water Initiative 2019 Performance Report. The DFRP AMP compliance records suggest that BMPs are in place during silvicultural activity; however, ensuring that landowners have opportunities to improve management will lead to increased protection and remediation of surface waters. The following recommendations will help direct more resources to encourage landowner involvement in management of surface runoff and protection of streams during silvicultural and sugaring operations.

- Assist sugar bush owners with annual road maintenance and stream crossing improvements.
- Find opportunities to use forest road App described above to help landowner identify road sections for improvement.
- Encourage forest landowners with eroding forest roads/trails to apply for RCPP funding where appropriate.
- Assess success of the LaPlatte Headwaters Town Forest reforestation techniques and replicate in other areas to allow reforestation where invasives are present
- Encourage protection of riparian buffers

H. Natural Resource Restoration--Lakeshore

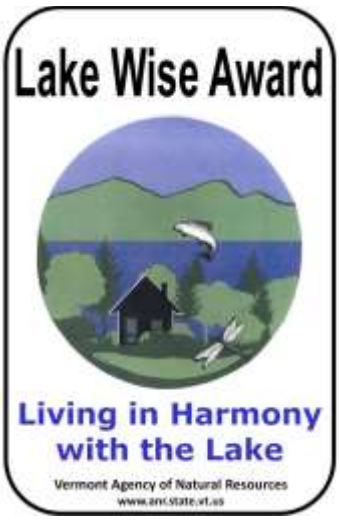
Naturally vegetated shoreland prevents water quality degradation, maintains healthy habitat, and promotes flood resilience. The conversion of forested shoreland to lawns, houses and driveways may contribute more runoff, TP, and more sediment to lakes than undeveloped sites. Remediation and restoration practices along developed shorelands can reduce impacts through the management of stormwater runoff and restoration of native vegetation.

The DEC WSMD promulgates protection regulations primarily through the Shoreland Protection Act[29], but also facilitates restoration in partnership with watershed groups and lake associations. The DEC Lake Wise program provides landowner education and trainings to encourage voluntary adoption of shoreline restoration and protection practices. In addition, the program promotes bioengineering techniques to address shoreline erosion through contractor training and demonstration projects. 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).

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

Progress

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.

Inland lakes with poor or fair shoreland score and shoreline residential development would benefit from implementing Lake Wise Program BMPs, including Lake Iroquois, Lower Pond, and Long Pond (see Figure 5). Most areas of Lake Champlain shoreline would benefit as well.

To date, Lake Iroquois is the only inland lake in the North Basin with participating shoreland properties, where 11 landowners 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.

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. Areas along Lake Champlain where there has been some involvement with the program could gain additional participants if it were to be promoted again, as involvement could be fueled by initial efforts to develop a community norm.

Aquatic Invasive Species Monitoring

Lake Champlain, as well as three inland lakes, support Aquatic Invasive Species (AIS), including Lake Iroquois (Hinesburg, Williston), Lower Lake (Hinesburg), and Indian Brook Reservoir (Essex Junction) (Figure 5). The specific AIS (both plant and animal) and associated strategies to address existing population can be found in Table 3 and the WSMD Lakes and Pond Program AIS Map.

Once any aquatic invasive becomes established in a waterbody, eradication becomes difficult. The ANR'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. No additional spread to inland lakes or ponds has been

identified. Current monitoring and outreach messages are focused on current threats, including, but not limited to zebra mussels and the spiny and fishhook water flea.

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 seven boat launches in the basin, and as resources allow, should be expanded to all public boat launches.

For established AIS population, the ANR provides financial (DEC Grant-in-Aid Program) and technical assistance to lake associations and municipalities to manage populations to allow for continued recreational uses. Removal efforts are prioritized based on interests of community groups, except for the removal of water chestnut, where the ANR coordinates efforts to reduce northward advancement of populations. Current management efforts that have received support from ANR include:

- The Lewis Creek Assn. has coordinated community members in hand pulling harvesting operations for Frog Bit, an aquatic nuisance species, in Town Farm Bay and watershed for last 12 years
- Community groups coordinate long-term management harvesting operations for Eurasian watermilfoil (Myriophyllum spicatum) in St. Albans Bay, Pelot's Bay, and Carry Bay, and Lake Iroquois.
- ANR coordinates hand pulling harvesting operations for water chestnut (Trapa natans) in Black Creek Marsh, Missisquoi National Wildlife Refuge, and Sand Bar State Park (new introduction of water chestnut found in 2019).

Recommendations

Assistance to encourage shoreline protection and remediation could be directed as follows:

- Continue to encourage adoption of Lake Wise Practices where communities have already become involved, including Lake Iroquois, on Lake Champlain shoreline in the Town Farm Bay, Malletts Bay and St. Albans Bay area. Introduce Lake Wise Program at Lower Pond, Long Pond and other Lake Champlain shoreland communities when interest arises.
- Continue to offer Shoreline Erosion Control workshops to build local knowledge of shoreland best management practices among contractors, landscapers and other shoreland site workers

I. Natural Resource Restoration - Rivers

Natural riparian systems include streams that can meander and access floodplains. When a stream is channelized and becomes encroached upon, it becomes vertically unstable and erodes downward (i.e., incising), furthering its loss of floodplain access. Without the ability to reduce velocity during flooding events by flowing out onto its floodplain, the contained stream becomes more energized and destructive during flooding. In addition, the opportunity for floodwaters to deposit sediment is also lost. Floodplain function has been lost along 75% of Vermont stream miles where channels have become moderately to severely incised[30]. The incision also results in increased erosion of phosphorus laden sediment and the loss of the opportunity for the sediment to be deposited on the floodplain, leading to water quality and habitat degradation in the stream.

The ANR River Management Program manages instream activities and riparian land uses to achieve vertically stable streams and naturally functioning floodplains. The ANR is also under statutory mandate to promote the adoption of these protections at the municipal level.

In addition to administering regulatory programs, ANR contributes technical assistance and funding to public and private landowners to enhance stream equilibrium and flood resilience. Practices supported include removal of berms and dams, traditional floodplain restoration as well as the construction of nature-based practices, e.g., inset flood benches, installation of beaver analogues, regenerative stream conveyance, and strategic wood additions. In addition, ANR supports municipal and state culvert replacement with geomorphologically compatible ones or bridges where resources allow.

The Lake Champlain Phase I Implementation Plan supports the protection of stable streams with naturally functioning floodplains as well as their restoration to achieve the phosphorus load reduction targets. Protection efforts are discussed in Chapter 2, including municipal protection of flood plain and river corridors.

Progress

Stream Geomorphic Assessments

River corridor planning assesses the physical integrity of rivers and develops management strategies in support of stream equilibrium. The work is completed through stream geomorphic assessments

[30] Functioning River and Floodplain Systems: Vermont's Management Standard Prepared by Mike Kline, Vermont Rivers Program Manager (December 2015)

(SGA) and associated corridor plans, which can be found here., organized by basin. The North Basin assessments and plans are extensive and at this time, the Jewett Brook would be the only remaining candidate for a geomorphic assessment. In agricultural landscapes, where Jewett Brook is located, the greater input of sediment may be within the ditch itself, making it an important part of any future geomorphic assessment. Where community interest would lead to restoration or project activities, updates of existing plans would be beneficial. Basin planning discussions with partners in Hinesburg, suggested that the community would be interested in pursuing additional protection as well as increasing floodplain access of the LaPlatte River.

Functioning Floodplain Initiative

To help communities and watershed organizations identify and track priority projects, the ANR 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, habitat and flood hazard mitigation. The ANR's Functioning Floodplain Initiative is envisioned to augment current state river corridor planning. Phase I of the deliverables are due by 2020 and Phase II are expected by 2023.

Dams of the North Lake Basin

While some of the dams in the Basin can be aesthetically or culturally important, others may be obsolete, providing little or no public benefit, or constituting a hazard. Removal of dams provides benefits to stream stability and run of stream opportunities for boating as well as aquatic organism passage. Removal is considered when dams no longer provide benefits or have become structurally unsafe. Table 18 includes a list of dams in the basin that may no longer be serving a useful purpose and have a significant ecological impact based on an analysis by The Nature Conservancy (TNC). Most will require further evaluation and consultation with the owner before determining potential for removal. If the owner is interested in removal, state funding may be available. In 2019, the Mill Pond dam on Indian Brook in Colchester was removed and the area restored as a stream channel.

The ANR 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, DEC 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.

Table 18. Vermont dam inventory with ecological priorities ranking by TNC as well as hazard class ranking by DEC

State ID	Dam Name	Stream	Town	TNC Rank	Dam Haz Class	Dam Status	Comments
79.01	Stone Bridge Pond	Stone Bridge Brook	Georgia	High		Breached	Breached status as well as downstream bedrock AOP barrier reduces priority status
97.04	Cemetery Pond	Patrick Brook	Hinesburg	Low		Breached (Partial)	
128.04	Milton Pond	Malletts Creek-TR	Milton	High	3	In Service	Landowner has not been interested in past

Recommendations

In addition to ongoing support of programs and activities described above by the ANR and partners, projects based on the following recommendations will contribute to the enhancement of river channel stability and floodplain connection:

- Assess drainage network (ditches and tile drains)
    - when addressing sediment accumulation in any remediation project to identify sources from the drainage network (ditches and tile drains) and address as part of the larger project.
    - during Stream Geomorphic Assessments in hydrologically altered landscapes.

J. Natural Resource Restoration—Wetlands

As recently as the 1950s, wetlands were considered 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 TP export from the landscape to meet the state's clean water goals.

Wetland protection or restoration is prioritized based on greatest potential for TP removal through restoration as well as benefits identified through wetland conservation 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.

Progress

Wetland Restoration

A Lake Champlain wetland restoration site prioritization modeling was updated in 2018 utilizing Regional Conservation Partnership Program funds. The DEC RCPP Wetland Restoration Site Prioritization Map, which identifies potential wetland restoration areas with the highest likelihood of phosphorus attenuation are now available on the ANR Natural Resource Atlas and the Wetland Inventory Mapper. DEC coordinates a wetland round table where the Agency and partners meet annually to identify highest priority sites for contractor outreach and partner collaboration. Partners such as NRCDs, NRCS, VLT, TNC and DFW are involved and use these maps and a subset of project packets to help target wetland restoration outreach.

Recently acquired resources have allowed DFW to initiate wetland restoration and acquisition 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.

Wetland Conservation

Based on incidental reports by ANR fisheries biologists and ecologists, a number of deciduous forested swamps, a threatened wetland type that exists in the North Lake Basin, may be hydrologically disconnected from the lake. The connection with the lake to these Red or Silver Maple-Green Ash Swamps can be limited by undersized road culverts. During periods of low lake levels, this would lower the natural level of surface waters in the swamps. The resulting change in hydrology can reduce critical spawning habitat for fisheries as well as other wetland functions. During culvert replacement, culvert sizing could include providing the opportunity to restore natural lake influenced hydrology to adjacent forested swamps..

Recommendations

In addition to ongoing support of programs and activities described above by the ANR and partners, projects based on the following recommendations will contribute to the enhancement and restoration of wetlands:

- Enhance wetland enhancement with the appropriate plantings, and removal of invasive species.
- Include passive wetland restoration during river corridor protection projects
- Address road culvert impacts to hydrology when restoring shoreline wetlands
- Organize a meeting with the Wetlands Round Table to prioritize wetland restoration opportunities in the basin.

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 and very high-quality waters. The list of strategies in the Implementation Table (Table 19) covers projects that protect or remediate surface waters. The Monitoring Needs Table (Table 20) describes assessment and monitoring needs to ensure that degraded waters or those that are close to pristine condition are identified for restoration or protection.

The Implementation Table is organized by the sectors described in Chapter 3. The Chapter 3 discussions and recommendations for each of the sectors provide background and support for the strategies. The strategies will be addressed through specific project located in the online Watershed Projects Database (WPD). Not all strategies or associated 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.

The process for identifying strategies and associated projects includes a comprehensive compilation and review of both internal ANR monitoring and assessment data and reports (see Chapter 1), and those of our watershed partner organizations (see Appendix A). Modeling of high phosphorus loading areas by sector (see Chapter 4) provides the priority subbasins or catchments for sector-specific project implementation. The monitoring and assessment reports include additional priorities at a finer spatial level. They include, but are not limited to, stormwater mapping reports, geomorphic assessments, river corridor plans, bridge and culvert assessments, Hazard Mitigation Plans, agricultural modeling and assessments, road erosion inventories, TMDL reports, biological and chemical monitoring, lake assessments, fisheries assessments, and natural communities and biological diversity mapping.

The Watershed Projects Database, and the Implementation Table are resources to North Lake Basin stakeholders in their efforts to pursue and secure technical and financial support for implementation of high priority projects. Together, these resources include location information, project description, the assessment report of the project if a sector-based assessment supports the project, any partners that may have expressed interest in implementing the project, and potential funding sources. The database allows for the addition of new actions as DEC identifies them with the assistance of partners.

The Vermont Clean Water Funds are expected to provide a significant source of support to project implementations. As projects are developed, priority for state grants supported with Vermont Clean Water Funds will be given to those projects that achieve the highest phosphorus removed benefit per cost ratio. 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.

Keeping track of progress

The Water Investment Division's 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 Division's reporting on progress occurs annually for the basin regarding financial investments made and phosphorus loads addressed. The 2019 summary for the North Lake Basin is found on page 70 of the Vermont Clean Water Initiative 2019 Performance Report. In addition, an interim basin report will be submitted to EPA on progress towards meeting Lake Champlain TP TMDL commitments in 2023. Progress made in addressing all the strategies in the Implementation Table will be reported on in the next tactical basin plan scheduled for 2025.

B. The North Lake Basin Implementation Table

Table 19. Strategies and associated actions direct regulatory, technical assistance, and funding to highest-priority sub-watershed areas. These address sector objectives in Tables 9 and 10 for the North Lake Tactical Basin Plan (LC TMDL associated strategies are identified by *). Additional recommendations as to how to best direct resources can be found in Chapter 4 under the appropriate sector.

Strategy	Priority HUC12 (bold) or Subbasins, see Table 1	Partners (see Appendix A)	Funding
AGRICULTURE			
1. Provide education, outreach, and technical assistance to farms on water quality regulations, RAPs, agricultural BMPs and cost-share programs: * **a. Make available to farmers at least one workshop or training annually,** **b. Provide technical assistance visits, and** **c. Support partners in development and distribution of education materials**	**Mud Creek, St. Albans Bay and Jewett Brook**(critical[31]), **Lake Champlain, LaPlatte River, Hoisington Brook**	AAFM, Farmers Watershed Alliance (FWA), FNLC, NRCD, VACD, UVM extension	AAFM, Clean Water Fund (CWF), LCBP
2. Inspect approximately 70% of CSFOs at least once, per the 7-year inspection cycle outlined in the RAPs.*	**Mud Creek, St. Albans Bay and Jewett Brook**(critical), **Lake Champlain, LaPlatte River, Hoisington Brook**	AAFM,	AAFM
3. Promote nutrient management:* **a. Expand offerings of small farm NMP development courses and workshops, trainings for farmers, manure applicators and technical service providers**	**Mud Creek, St. Albans Bay and Jewett Brook**(critical), **Lake Champlain, LaPlatte River, Hoisington Brook**	VACD, WNRCD, FNLC, FNRCD, UVM extension	CWF

[31] The NRCS and ANR identified critical subbasins as a focus for NRCS's Lake Champlain Strategic Watershed Planning Approach.

Strategy	**Priority** HUC12 (bold) **or Subbasins, see Table 1**	**Partners (see Appendix A)**	**Funding**
4. Increase BMP implementation*, including conversion to reduced tillage and no till crop management; cover crops; winter feedlot management and other pasture management BMPs; and grassland manure injection: **a. Continue and expand technical and financial assistance available through state and partner programs**	**Mud Creek, St. Albans Bay and Jewett Brook**(critical), **Lake Champlain, LaPlatte River, Hoisington Brook**	AAFM, UVM-Extension, DEC, FWA, FNLC, NRCD, NRCS. LCBP	RCPP, USDA, AAFM, LCBP
5. Improve agricultural partner coordination and cross trainings to increase productivity and effectiveness of outreach efforts: **a. Hold a meeting with partners annually**	All, Swanton shoreline	AAFM, NRCDs, NRCS, UVM-Extension, FNLC, FWA, LCBP, USFWS, VAWQP	LCBP, AAFM
6. Identify potential agricultural sources of *E. coli* and address using Bacterial TMDL as guide: **a. Survey stream for locations of potential inputs and identify agricultural activity in watershed**	Mud Hollow Brook, LaPlatte River	AAFM, DEC	
7. Continue the development and support of alternative conservation incentive programs to incentivize and support land stewardship for clean water through innovative approaches outside of the historical pay for practice models:* **a. Increase participation in the Environmental Stewardship Program**	All	AAFM	AAFM

Strategy	Priority HUC12 (bold) or Subbasins, see Table 1	Partners (see Appendix A)	Funding
8. Increase adoption of field agronomic practices for reducing gully and rill erosion, such as grassed waterways, strip cropping, or crop to hay conversions: * **a. Increase workshops and targeted outreach**	**Mud Creek, St. Albans Bay and Jewett Brook**(critical), **Lake Champlain, LaPlatte River, Hoisington Brook**	AAFM, NRCD, FNLC, FWA, LCBP	AAFM, LCBP
DEVELOPED LAND			
9. Assist all municipalities in developing a Road Erosion Inventory by 12/2020	All	ACRPC, CCRPC, NRPC,	VTrans; grant-in-aid
10. Assist municipalities in meeting the Municipal Roads General Permit: * **a. Towns will address at least 15% of their connected non-compliant municipal road segments by 12/31/22.** **b. Towns will bring their Very High Priority segments (Paved and gravel roads with drainage ditches and paved roads with curbs and catch basins) up to standards by 12/31/25 and Class 4 Very High Priority segments up to standards by 12/31/28.**	All	ACRPC, CCRPC, NRPC, NRCD	CWF: VTrans; grant-in-aid
11. Provide technical assistance to road crews on culvert replacements, and installation and road maintenance BMPs: **a. Hold one training annually**	All	Vermont River and Roads workshops; DEC; VTrans and county road foreman workshops, MRGP workshops	

Strategy	**Priority** HUC12 (bold) **or Subbasins, see Table 1**	**Partners (see Appendix A)**	**Funding**
12. Promote best winter ice and snow management practices on public and private roads and parking lots by providing technical assistance	All with focus on Englesby Brook, Potash Brook	LC Sea Grant, WNRCD, NRPC, CCRPC	LCBP, Watershed Grants
13. Identity priority stormwater management projects **a. Support development of a Stormwater Master Plan (SWMP) for the impervious areas draining to Keeler Bay and Georgia shoreline. Also identify contributing stormwater from other landuses as well as IDDE outcomes**	Keeler Bay, Georgia shoreline	FNLC, GINRCD	CWF
14. Assist municipalities in meeting the April 1, 2021 deadline for development of Phosphorus Reduction Plans	MS4s, Milton	NRPC, CCRPC, NRCDs	CWF, VTrans
15. Support implementation of priority projects, based on cost benefit of phosphorus removal, identified in SWMPs and Phosphorus Reduction Plans	Towns with stormwater master plans, PRP or similar noted in Table 14	FNLC, LCA, WNRCD, NRPC, CCRPC, LCBP	SRF, CWF, LCBP
16. Encourage adoption of residential and landscaping practices by providing technical assistance and using social marketing practices	All.	CCRPC, NRPC, FNLC, FNCRD, WNRCD, LCA, LC Sea Grant, LCBP, SAAWA	LCBP
17. Assist landowners in managing stormwater off private roads and making progress in priority areas: a. **Develop methods and tools to inventory private roads**	Priority HUC12s are identified in Table 19 or road erosion inventory results	CCRPC, NRPC, FNLC, FNCRD, WNRCD, LCA, LC Sea Grant, LCBP	LCBP

Strategy	**Priority** HUC12 (bold) **or Subbasins, see Table 1**	**Partners (see Appendix A)**	**Funding**
b. Complete pilot inventory for private roads			
18. Assist municipalities with obtaining "Three-acre" permit* coverage and making progress in priority areas	Municipalities. Following lake segment by 2021: Main, Burlington, Shelburne Bay	DEC	CWSRF, CWF
19. Assist schools with obtaining "Three-acre" permit* coverage and making progress in priority areas.	Following lake segment by 2021: Main, Burlington, Shelburne Bay	DEC, FNLC	LCBP, CWF
20. Facilitate public private partnership to improve stormwater management of large parcels that fall under the three-acre permit by conducting a pilot project	Private lands, whose runoff contributes to public land stormwater issues	DEC, CCRPC, NRPC	CWF
21. Ensure wastewater treatment facility (WWTF) meet their TMDL allocations and optimize phosphorus reductions through facility operations by providing financial and technical assistance to municipalities *	Hinesburg (high priority), Burlington, Shelburne	DEC WID, LCBP	CWSRF, CWF, LCBP
22. Assist communities in addressing inadequate individual onsite wastewater treatment on small, challenging sites through the planning and development of solutions, including community wastewater systems or innovative/alternative onsite systems in addition to use of WWTF: **a. Continue to support Colchester's access to State Revolving Loan Funds and related funds to support the preferred solution to documented failing septic systems in Malletts Bay,**	Interested community including Colchester, Lake Iroquois, and Champlain Islands	DEC WID, WNRCD, LCBP	CWSRF, EPA Engineering Planning Advance

Strategy	Priority HUC12 (bold) or Subbasins, see Table 1	Partners (see Appendix A)	Funding
which may include construction of the Malletts Bay Sewer Project. **b. Discuss support available through the ANR Village Wastewater Solutions Initiative with one priority municipality annually.**			
RIVERS			
23. Identify river and floodplain restoration opportunities through geomorphic assessments: **a. Update existing stream geomorphic assessments where community interest exists.** **b. Develop a stream geomorphic assessment for Jewett Brook** **c. Develop Functioning Floodplain criteria**	**St. Albans Bay, Jewett Brook, Lake Champlain**, Malletts Bay, **LaPlatte River, Hoisington Brook**. When criteria developed, river segments meeting Functioning Floodplain criteria	DEC, FWD, TNC, FNLC, LCA, NRPC, FNRCD, CCRPC, LCBP,	CWF. LCBP, WISPr
24. Support floodplain restoration*, including nature-based floodplain restoration practices: **a. Provide trainings annually**	**St. Albans Bay and Jewett Brook(critical), Lake Champlain, LaPlatte River (upper), Hoisington Brook, Malletts Bay**	DEC, TNC, USFWS, VLT	CWF, USFW, WISPr
25. Support reforestation of riparian buffers*	All	FNRCD, WNRCD, LC Sea Grant's Watershed Forest Partnership, USFWS, VLT	CWF, LCBP, USFWS, Watershed grants, WISPr

Strategy	**Priority** HUC12 (bold) **or Subbasins, see Table 1**	**Partners (see Appendix A)**	**Funding**
26. Support municipal efforts to increase number of geomorphologically compatible culvert and bridges:* **a. Meeting with municipalities to review opportunities and assist with funding through capital budget development**	All	VTrans, ACRPC, NRPC, CCRPC, LCA, FNRCD, WNRCD, TNC (for AOP), USFWS (for priority AOP)	federal hazard mitigation funds, Municipalities, USFWS, VTrans grants, SWG, Great Lakes Fisheries Trust
27. Remove nonfunctional dams that will result in ecological benefits where there is landowner interest	See Table 18	VT Dam Task Force, DEC, FWD, FNRCD, USFWS (for priority AOP)	CWF, CWSRF, LCBP, USFWS, Watershed Grant
28. Provide assistance to towns to increase adoption of local protection to protect and improve surface water quality and decrease fluvial erosion * **a. Work with towns identified in Table 8**	See towns listed in Table 8	DEC, NRPC, CCRPC, ACRPC, LCBP	ACCD, LCBP
FORESTS			
29. Provide technical and financial assistance to landowners to address erosional features on logging roads and landings. Prioritize based on contribution of erosion features to water quality impairment using ANR assessment tools*	**Mill River, Malletts Creek, LaPlatte River,**	DFPR	RCPP, CWF
30. Increase usage of forest skidder bridges*	**Mill River, Malletts Creek, LaPlatte RIver**	DFPR,	DFPR, CWF
31. Increase number of forest management plans that include Ecologically Sensitive Treatment Areas*.	All	DFPR	

Strategy	**Priority** HUC12 (bold) **or Subbasins, see Table 1**	**Partners (see Appendix A)**	**Funding**
32. Hold workshops or provide other technical assistance to sugaring operations on AMP compliance, and benefits of adopting forest management plans.*	Malletts Creek, LaPlatte, Mill River	DFPR, UVM extension	DFPR
LAKESHORE			
33. Support community efforts to manage and control invasive species	Where community interest exists	DEC, FWD, LCA, LCC, LCBP	DEC AIS Grant-in-Aid, LCBP, Watershed Grants
34. Increase number of boat launch sites with stewards who provide education and outreach efforts to reduce spread of AIS	All public boating accesses (8 currently exist)	DEC, LCBP, LCA	LCBP
35. Hold workshops and trainings to promote lake-friendly shoreline property maintenance	Lake Iroquois, Lake Champlain shoreline	DEC, FWD, LC Sea Grant, WNRCD, NRPC, LCBP	LCBP
36. Stabilize eroding shorelines or gullies by addressing stormwater runoff followed by use of bioengineering techniques where necessary.	Lake Iroquois, Georgia shorelines, Island shorelines and see VT Geologic Survey Land slide Inventories	DEC, watershed and lake groups, LC Sea Grant, VYCC,	CWF, LCBP
37. Promote improved maintenance of on-site wastewater systems: Conduct septic socials	Lake Iroquois; Georgia shorelines, Island shorelines	DEC, WNRCD, FNLC	DEC, LCBP, LC Sea Grant,

Strategy	**Priority** HUC12 (bold) **or Subbasins, see Table 1**	**Partners (see Appendix A)**	**Funding**
WETLANDS			
38. Conserve wetlands	Wetlands adjacent to WMAs for EPA funding: Black Creek, Malletts Creek and Mud Creek, Maquam.	DEC, FWD, TNC, USFWS, LCBP, FNRCD, WNRCD	EPA,USDA, RCPP, LCBP, Act 76 CWF, WISPr
39. Restore wetland*.	See above. Islands, Use site prioritization map to prioritize restoration sites: DEC RCPP Wetland Restoration Site Prioritization Map	DEC, FWD, TNC, USFWS, LCBP, FNRCD, WNRCD	USDA, USFWS, RCPP, LCBP, Act 76 CWF, WISPr
PROTECTION			
40. Support conservation easements or land purchases that protect existing condition of surface waters by protecting natural communities as well as river corridors	Specific waterbodies: Trout River, Upper LaPlatte River, including Lake Iroquois and see Table 7.	Town, LIA, DFRP. LCBP	Federal town forest land program, CWSRF and WISPr, LCBP, CWF
41. Provide technical support to parties interested in submitting petitions for wetlands that meet Class I criteria.	Mud Creek	DEC, FWD, watershed groups	

*With the passage of Act 76 in 2019, the Agency anticipates that CWSPs (and BWQCs) will be established in the North Lake Champlain Basin and will be actively developing and implementing non-regulatory (clean water) projects to meet LC P TMDL targets for the lake segments addressed in this plan and related high priority sub-basins and the attendant sector-based target allocations.

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. In addition, other programs will feed monitoring data into the planning process on an ongoing basis. The ANR's Water Quality Monitoring Program Strategy describes the monitoring programs supported by both the ANR 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 Lake Basin

Watershed	Stream	Monitoring Type	Needs
St. Albans Bay	South Pond	Chemistry	Potential reclassification**:** Possible A1 for aesthetics, but needs more study as TP data is from spring sampling
St. Albans Bay	Mill River	Biomonitoring	Data gap: Lower station consistently fails VWQS criteria. Upper reaches are under sampled, including possible low gradient reaches.
	Jewett Brook	Chemistry	Monitor for improvement: Continue chemistry. Conduct biomonitoring when improvement seen.
	Stevens Brook trib 7	Biomonitoring	Update status: Urban tributary with potential pollutant sources
Northeast Arm (Georgia shoreline)	Trout Brook	Biomonitoring	Potential reclassification: Update bugs and fish to verify condition and for potential reclassification as B1 for aquatic biota

Watershed	Stream	Monitoring Type	Needs
	Stone Bridge Brook	Biomonitoring	Update status: confirm 2012 delisting from impaired waters list.
Islands	Mud Creek (below wetland)	Chemistry	Potential reclassification: assist with data gathering for wetland reclassification to Class I. Lake level affects stream, cannot do biomonitoring.
	Sucker Brook	Biomonitoring	Data gap.
	Keeler Bay tributaries	Chemistry	Determine impact to bay from land use
	Folsom Harbor tributary	Chemistry	Data gap
	Whipple road, South Hero	Chemistry	Data gap.
Malletts Bay Malletts Creek	Milton Pond	Chemistry	Potential reclassification: Possible A1 but needs more study as TP is from Spring
	Malletts Creek Trib crossing 480 Duffy road	Biomonitoring	Potential Reclassification: possible B1 based on forested condition,
	Malletts Creek	Biomonitoring/Chemistry	Update status: determine land use contributions
	Allen Brook	Biomonitoring	Update status:2016 bug data failed. Additional years data needed to determine if stormwater impaired
	Crooked Brook/Creek	Biomonitoring/ chemistry (metals)	Update status: 2011 was "very good" but fair poor from 2004-2006
	Smith Hollow Brook	Biomonitoring/Chemistry	Update status: High sedimentation load identified from field
	Pond Brook	Biomonitoring	Update status: RM 1.4 and 1.5, below Middle Road not sampled since 1999 and both scored "fair". RM 1.6 above Middle Road scored Very Good in 2011.
	Indian Brook	Continuous conductivity monitoring	Confirmation of impairment extent: Chloride TMDL development

Watershed	Stream	Monitoring Type	Needs
Shelburne Bay	Lower Pond (Hinesburg)	Chemistry	Potential reclassification: Existing data confirms B1 for aesthetic, but data is from 2007-2010 so would need more study
	Upper LaPlatte River	Biomonitoring	Update status to use to support protection strategies
	Mud Hollow Brook	Biomonitoring/ chemistry	Update status from 2009
	McCabe's Brook	Biomonitoring	Identify sources: Bracket agric from urban area
Charlotte Direct drainages	Holmes Brook	Biomonitoring/chemistry	Identify sources: Previous chem data shows high TP near beach
	Thorp Brook	Biomonitoring	Determine listing: Previously failed
Basin Wide			
	Stormwater Impaired streams	Biomonitoring	Update baseline as resources allow

*List of partner acronyms below.

.

List of Acronyms

AAFM	Agency of Agriculture, Food, and Markets
ACWIP Program	Agricultural Clean Water Initiative Grant
AIS	Aquatic Invasive Species
AMPs	Acceptable Management Practices
ANR	Agency of Natural Resources
ANS	Aquatic Nuisance Species
AOP	Aquatic Organism Passage
BASS	DEC Biomonitoring&Aquatic Studies Section
BR	Backroads program
BMP	Best Management Practices
CREP	Conservation Reserve Enhancement Program
CWI	Clean Water Initiative Grant Funding
CWIP	Clean Water Initiative Program
CWSP	Clean Water Service Provider
CWSRF	Clean Water State Revolving Fund
DEC	Department of Environmental Conservation
DFPR	Department of Forests, Parks &Recreation
EQIP	Environmental Quality Incentive Program
ERAF	Emergency Relief and Assistance Fund
FAP	Farm Agronomic Practices
FEH	Fluvial Erosion Hazard
FNLC	Friends of Northern Lake Champlain
FOVLAP	Federation of Vermont Lakes and Ponds
FWD	Vermont Fish and Wildlife Department
GIS	Geographic Information System
IDDE	Illicit Discharge Detection & Elimination
LC	Lake Champlain
LCA	Lewis Creek Association
LFO	Large Farm Operation
LiDAR	Light Detection and Ranging
MFO	Medium Farm Operation
MPG	Municipal Planning Grant
MRGP	Municipal Roads General Permit
NFIP	National Flood Insurance Program
NMP	Nutrient Management Plan
NPDES	Nat'l Pollution Discharge Elimination System
NPS	Non-point source pollution
NRCD	Natural Resource Conservation District
NRCS	Natural Resources Conservation Service
ORW	Outstanding Resource Water
PCP	Phosphorus Control Plan
PDM	Pre-Disaster Mitigation
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
SAAWA	Saint Albans Area Watershed Assn
SFO	Small Farm Operation
SGA	Stream Geomorphic Assessment
SWMP	Stormwater master plans
TBP	Tactical Basin Plan
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TS4	Transportation Separate Storm Sewer System General Permit

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
VAWQP	Vermont Agricultural Water Quality partnership
VDH	Vermont Department of Health
VHCB	Vermont Housing and Conservation Board
VIP	Vermont Invasive Patrollers
VLCT	Vermont League of Cities and Towns
VLT	Vermont Land Trust
VTrans	Vermont Agency of Transportation
VRC	Vermont River Conservancy
WISPr	Water Infrastructure Sponsorship Program

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Appendix A. Partners

Watershed Partners

Partners in the tactical planning process include multiple state and federal agencies. They can play multiple roles, including 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. In addition, the following list of non-government organizations partners are undertaking watershed monitoring, assessment, protection, restoration, and education and outreach projects in The North Lake Basin. Table 21 provides a description of the geographic range for groups that are involved in basin plan development as well as project development.

Table 21. Watershed partners in the North Lake Basin and their geographic range by Subbasin.

Subbasin	CCRPC	NRPC	WNRCD	FNRCD	Lewis Creek Assn.	Lake Iroquois Assn.	Local Land Trusts[32]	St. Albans Areas Watershed Assn.	Friends of Northern Lake Champlain
Northwest Arm (Swanton and Georgia Shoreline)		X		X					X
Islands		X		X			X		X
St. Albans Bay		X		X				X	X
Burlington Bay	X		X						
Malletts Bay	X		X		X				
Shelburne Bay and Charlotte Direct Drainages	X		X		X	X	X		

[32] E.g., South Hero Land Trust, Charlotte Land Trust, Hinesburg Land Trust

Clean Water Service Provider (CWSP) – Established under the Vermont Clean Water Delivery act (Act 76), CWSP's are part of the Clean Water service delivery framework to support Vermont's clean water goals. CWSPs are responsible for establishing and coordinating with Basin Water Quality Councils to identify, implement, operate, and maintain non-regulatory projects to meet non-regulatory pollution reduction targets for the Lake Champlain and Memphremagog TMDLs, and for other impaired waters in Vermont as pollution budgets are established. They anticipate being operational by November 2021.

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, citizens' group dedicated to the rehabilitation and protection of Missisquoi Bay and northern Lake Champlain. Through educational programs and community involvement, they strive to foster public and governmental awareness of the environmental issues affecting water quality.

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.

Lewis Creek Association's mission within the LaPlatte River watershed is to protect significant ecological values and natural systems for wildlife, plants and human cohabitation. This citizen's group, made up of people from Charlotte, Hinesburg, and Shelburne, works with other organizations to provide resources and information that will facilitate conservation improvement activities in the watershed towns. The group also coordinates volunteer water quality monitoring.

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

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. The group is also supporting the Watershed Forest Partnership, a collaboration among UVM Extension, Lake Champlain Sea Grant, and American Forests. The Partnership is working to identify priority research topics and engage in efforts that help to establish riparian forests.

Watershed Municipalities and the Regional Planning Commissions - The basin includes 23 municipalities as well as the Chittenden County, Northwest, and Addison County 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. 2017 The North Lake Basin Report Card

Table 21 provides specific information as to the status of the work completed by the Agency and partners to implement strategies that appear in the 2015 basin plan. Almost 70% of the strategies were addressed between 2015-2019. The final column includes the status of the action. Definitions used to describe status as well as associated number of strategies falling under the definition follows:

Status	**Definition**
19 Completed	Discrete strategy that has been completed
63 In progress	Discrete strategy that is in progress or in the queue (includes projects that are on hold due to funding, timing, etc.)
24 Ongoing	Programmatic strategy that is in progress, but has no defined end date
2 Discontinued	A discrete or programmatic strategy that was started, but then stopped or never pursued because of certain circumstances and is no longer planned
48 Not started	A discrete or programmatic strategy that has not been initiated or taken up for various reasons - no funding, no partner, no interest, not as high a priority

A summary of the basin's nutrient reduction projects completed between 2016-2019 by the Agency and certain partners is found on page 70 of the Vermont Clean Water Initiative 2019 Performance Report. The summary of work completed for each sector addresses strategies in the 2017 TBP, see Table 5 in the 2017 TBP. The Agency of Natural Resources' Water Investment Division tracks and summarizes project implementation supported by Clean Water Funds and leveraged partner funding as well as associated phosphorus reduction.

Table 21. 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 segment	Priority	Project Description	Status
Town Farm Bay and Charlotte shoreline	Charlotte	All waters	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.	In Progress

Subbasin	Town	Stream segment	Priority	Project Description	Status
Town Farm Bay and Charlotte shoreline	Charlotte	All waters	High	Identify and implement needed. Better Backroads BMPs for roads identified in Appendix B	In Progress
Town Farm Bay and Charlotte shoreline	Charlotte	All waters	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	In Progress
Town Farm Bay and Charlotte shoreline	Charlotte	All waters	Medium	Identify need for improved pump out facilities for boats and apply for funding	In Progress: Point Bay Marina using federal Clean Vessel Act funding with DFPR assistance
Town Farm Bay and Charlotte shoreline	Charlotte	All waters	Medium	Support geomorphic assessments Phase 2 light to identify opportunities for regaining floodplain connection and potential gully remediation.	Not started
Town Farm Bay and Charlotte shoreline	Charlotte	All waters	Medium	Support community's efforts to control aquatic invasive plants (e.g. yellow flag iris, purple loosestrife, European frogbit)	In Progress
Kimball Brook	Ferrisburgh	railroad crossing	Medium	Manage Kimball Brook cow crossing under railroad	Not Started
Kimball Brook	Charlotte	T8. s2.01	Medium	Manage stormwater and replace culvert on townline road	Completed
Holmes Brook	Charlotte	T3 S4.01 T3-05 to T3-07, and all tributaries	High	Install riparian buffers and enhance nutrient management on agricultural land	Ongoing
Shelburne Bay	Williston, St. George, HinesburgCharlotte, Shelburne	All waters	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	In Progress
Shelburne Bay	Williston, St. George, Hinesburg, Charlotte, Shelburne	All waters	High	Identify and implement needed Better Backroads BMPs for roads identified in Appendix B as at moderate to high risk for erosion	In Progress

Subbasin	Town	Stream segment	Priority	Project Description	Status
Shelburne Bay	Williston, St. George, Hinesburg, Charlotte, Shelburne, S. Burlington	All waters	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.	Ongoing
Shelburne Bay	Williston, St. George, Hinesburg, Charlotte, Shelburne, S. Burlington	All waters	High	Replace geomorphologically incompatible culvert and bridges: At least 8 priority replacements in subbasin, see Appendix C of 2017 TBP	In Progress
Shelburne Bay	Shelburne	Munroe Brook	High	Finalize and implement Flow Restoration Plan for stormwater-impaired waters in Shelburne pursuant to MS4 permit.	In Progress
Shelburne Bay	Burlington	Bartlett Brook	High	Finalize and implement Flow Restoration Plan for stormwater-impaired waters in Burlington pursuant to MS4 permit.	In Progress
Shelburne Bay	South Burlington	Potash Brook	High	Finalize and implement Flow Restoration Plan for stormwater-impaired waters in South Burlington pursuant to MS4 permit.	In Progress
Shelburne Bay	Williston, St. George, Hinesburg, Charlotte, Shelburne, South Burlington	All waters	High	Manage stormwater runoff from private and town roads (see Appendix B)	In Progress
Shelburne Bay	Hinesburg, Charlotte, Shelburne	All waters	Medium	Discussion w/ agricultural producers about Lewis Creek Assn water quality sampling results	Not Started
LaPlatte River	Williston, St. George, Hinesburg	Lake Iroquois subwatershed	High	Manage stormwater runoff from private and town roads, including Dynamite Hill and Mt. Prichard Roads.	In Progress
LaPlatte River	Williston, Hinesburg	Lake Iroquois subwatershed	High	promote the Lake Wise Program and associated Lake Leaders training sessions to encourage lake-friendly shoreline property maintenance	In Progress (shoreline stabilization projects completed with ERP grant 2017)

Subbasin	Town	Stream segment	Priority	Project Description	Status
LaPlatte River	Williston, Hinesburg	Lake Iroquois subwatershed	High	Support community's efforts to control aquatic invasive plants (e.g. European frogbit),	Ongoing
LaPlatte River	Williston, Hinesburg	Lake Iroquois subwatershed	High	Assist development of a bluegreen algae volunteer monitoring program develop a plan for response and communication for cyanobacteria blooms	Completed
LaPlatte River	Williston, Hinesburg	Lake Iroquois subwatershed	High	Assist in analyzing data collected on the Lake Iroquois tributaries by the LIA,	Ongoing
LaPlatte River	Hinesburg	Beecher Brook T5.01D	Medium	Relocating town garage, old access road and sand pile to divert runoff away from town gravel pit, reducing stormwater runoff to river	Completed
LaPlatte River	Hinesburg	Beecher Brook T5.01B, C	Medium	Protect River corridor, FEMA buyout potential	Not Started. Owner currently not interested
LaPlatte River	Hinesburg	M17	Medium	Replace geomorphologically incompatible culvert at crossing used for agriculture and silviculture	Not Started
LaPlatte River	Hinesburg	M16	Low	Investigate potential for berm removal.	In Progress. LCA investigating
LaPlatte River	Hinesburg	M16	Medium	Swale improvement at gas station/Lyman Meadows	In Progress. LCA Watersheds United of Vermont project development block grant.
LaPlatte River	Hinesburg	M16-M12	High	Work with town to review flood resiliency status and improve stormwater infrastructure planning and regulation	In Progress. Some updated town regulations, see Municipal Protection Matrix, Appendix D
LaPlatte River	Hinesburg	M15S2.02 and upstream	High	Assess adequacy of CVU field drainage practices to protect stream	Completed
LaPlatte River	Hinesburg	Patrick Brook M15 S2.01	Medium	Protect stream corridor to allow for passive geomorphic restoration	In Progress; evaluating 2020
LaPlatte River	Hinesburg	Patrick Brook M15 S2.01	High	Detain stormwater on south side of Route 116	Not Started
LaPlatte River	Hinesburg	Patrick Brook M15 S2.01	High	Support a collaborative town led process in developing a management plan for Patrick Canal, incorporating local knowledge and river science.	Not Started
LaPlatte River	Hinesburg	Patrick Brook T4.03	High	Allow lawn area to naturalize and function as wetland at entrance road to cemetery	Not Started
LaPlatte River	Hinesburg	Patrick Brook T4.03, T4.04 and T4.06	Low	Investigate removal of old mill footings and partial dams. Bedrock may provide more flow restriction than dams.	Not started

Subbasin	Town	Stream segment	Priority	Project Description	Status
LaPlatte River	Hinesburg	M15	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	In Progress
LaPlatte River	Hinesburg	M15	High	Plant riparian area with woody vegetation and fence out cattle on M15A, and improve management of pastures	Discontinued. Land managed for crops
LaPlatte River	Hinesburg	M15	Low (Clay Soils)	Investigate active stream restoration especially if predicted channel adjustment towards WWTF requires active protection	Not Started
LaPlatte River	Hinesburg	T3.01 and T3.02	High	Fence out livestock and plant riparian buffer	Complete
LaPlatte River	Hinesburg	M12, 13, 14	High	Protect undeveloped stream corridor to allow for continued flow and sediment attenuation and to improve water and habitat quality.	In Progress. Some riparian easements in progress
LaPlatte River	Hinesburg	M13	High	Plant riparian area with woody vegetation	Not Started
LaPlatte River	Hinesburg	M12, 13, 14	High	Encourage Agricultural BMPs for grazing in flood plain, pasture management, and surface water drainage practices	In Progress, beginning 2020
LaPlatte River	Hinesburg	M12	High	Plant woody riparian buffer and investigate wetland restoration of agric. ditches to stream	In Progress, beginning 2020
LaPlatte River	Hinesburg	M12	Medium	Floodwaters crossing road is community concern. Develop alternatives for managing flooding over Leavensworth Rd that includes allowing flows to cross over road	Not started
LaPlatte River	Charlotte	M9a	Medium	Riparian plantings near Habitat for Humanity property	Completed by Vermont River Conservancy
LaPlatte River	Charlotte	M08-01	Medium	Protect river corridor to allow for passive restoration	Not Started
LaPlatte River	Shelburne	M06-4	High	Restore incised reach and address stormwater inputs with GSI practices	Not Started
LaPlatte River	Shelburne	M01-M02	Medium	Assist with petition for Class I designation for LaPlatte wetland	Completed
LaPlatte River	Shelburne	M06-M01	High	Complete stormwater management planning, including Gardenside Condo area	In Progress. Landowner outreach starting
LaPlatte River	Shelburne	M01	Medium	support community efforts to control aquatic invasive plants (e.g., European frogbit)	In Progress
Bingham Brook	Charlotte	head waters of T2	High	Wetland restoration or riparian buffer	Not Started
Bingham Brook and Mud Hollow	Charlotte	T2	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	In Progress. Discussions with AAFM occurred in 2019

Subbasin	Town	Stream segment	Priority	Project Description	Status
McCabes Brook	Shelburne	T1	High	Identify highest priority resource concerns and implement BMP practices	Ongoing
McCabes Brook	Shelburne	T1.08	Medium	Remove partially breached dam	Not Started
McCabes Brook	Shelburne	T1.08	Medium	Protect wetland and river corridor	Not Started
McCabes Brook	Shelburne	T1.07B/A T1.06B	Medium	Work with landowners to secure specific protections for the forested river corridor. VLT has easement	In Progress
McCabes Brook	Shelburne	T1.05B/A	Medium	Determine benefit of increasing floodplain and stabilizing mass failure for benefit of protecting Route 7	Not Started
McCabes Brook	Shelburne	T1.05	Medium	Divert stormwater from running over bank failure south of vineyard.	Completed (no mow area added)
McCabes Brook	Shelburne	T1	Medium	Investigate landowner interest in removing private bridge over brook	Not Started
McCabes Brook	Shelburne	T1	High	Day light and restore tributary on community school play fields	In Progress
McCabes Brook	Shelburne	T1	High	Address stormwater related issues at school street neighborhood, include work with residential homeowners to implement GSI	In Progress
McCabes Brook	Shelburne	T1.04B	Medium	Protect corridor to allow the river to reach equilibrium and become attenuation asset.	Not Started
McCabes Brook	Shelburne	T1.03	High	review LWP stormwater study projects and identify treatment options, expand village stormwater management plan/hydrologic study to protect McCabe from Impairment status	Ongoing - Shelburne has stormwater utility that will support stormwater remediation work in McCabe
McCabes Brook	Shelburne	T1.03	Medium	Plant stream buffer/restore flood plain at the Shelburne Town Garage and Wastewater Treatment Facility on Turtle Lane	Not Started
McCabes Brook	Shelburne	T1.03	Medium	Assess agricultural BMP needs for diverse farmstead north of Harbor Rd	In Progress. WNRD visited 2019
Munroe Brook	Shelburne	T1.02 Upstream	High	address 136-foot eroding grass swale on Brook Lane replace w/ perforated pipe, add infiltration trench and a raingarden	Completed
Burlington Bay	Burlington	Englesby Brook	High	Assist Burlington in developing a flow restoration plan (FRP) for Englesby, due October 2016	Completed
Burlington Bay	Burlington	As applicable	Medium	Replace geomorphologically incompatible culvert and bridges: at least 5 priority replacement in basin, see Appendix C	Ongoing

Subbasin	Town	Stream segment	Priority	Project Description	Status
Burlington Bay	Burlington	As applicable	Medium	Reduce stormwater to Combined Sewer (CSO) using GSI practices	Ongoing
Small directs to lake	Burlington, South Burlington	All waters	Medium	Manage stormwater using GSI practices	Ongoing
Small directs to lake	South Burlington	Nesti Brook	High	Stabilize Nesti Brook, create gravel wetland to treat Rt 7 stormwater	In Progress. Velco Gravel Wetland Basin treats 115 acres with 38% impervious surfaces with partners funded by multiple sources including Transportation Alternatives grant.
Malletts Bay	Colchester/ Milton, Essex	All waters	High	Identify and implement needed Better Backroads BMPs for roads identified in Appendix B	In Progress as MRGP
Malletts Bay	Colchester, Essex Junction	All	High	Replace geomorphologically incompatible culvert and bridges: at least 1 priority replacement in basin, see Appendix C	Ongoing
Malletts Bay	Colchester	Bay	Medium	If need determined for improved pump out facilities for boats, apply for funding to address	In Progress. Champlain Marina using federal Clean Vessel Act funding with DFPR assistance
Malletts Bay	Colchester	All	High	Continue sampling of shoreline and enhance program to gage degree of contribution of pathogens from shoreline wastewater systems	In Progress
Malletts Bay	Colchester	All	Medium	Develop and implement sampling program to better understand sources of bacteria from natural source	Ongoing
Malletts Bay	Colchester	Inner Bay,	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.	In Progress
Malletts Bay	Colchester	Smith Hollow Brook	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	In Progress. Town continuing to collect data
Malletts Bay	Colchester	Smith Hollow Brook M03	High	Provide small farms, including horse farms, with resources to reduce nutrient and pathogens, including opportunities to compost animal waste	Ongoing WNRCD has reached out

Subbasin	Town	Stream segment	Priority	Project Description	Status
Malletts Bay	Colchester	Crooked Creek adjacent and downstream of Rte. 7	High	address runoff to the multiple (10) gullies and stabilize erosion from hayfields and Route 7 stormwater runoff	In Progress (5/10 gullies addressed)
Malletts Bay	Colchester	Crooked Creek (west of I-89)	High	Address erosion associated with stormwater runoff to small culverted tributary by addressing private camp road management and stormwater management off campground.	Not started
Malletts Bay	Colchester	Crooked Creek, Pond Brook and Smith Hollow Brook	High	Manage residential stormwater through education and outreach include dog waste reduction strategies	Ongoing. Town provides
Malletts Bay	Colchester	Crooked Creek, Pond Brook and Smith Hollow Brook	High	Implement GSI practices with goal of diverting runoff to streams	In Progress. Town implementing stormwater plan.
Malletts Bay	Colchester	Pond Brook M02 to M06	High	Provide small farms, including horse farms, with resources, including opportunities to compost animal waste	Ongoing WNRD reaches out to equine community
Malletts Bay	Colchester	Pond Brook M05	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.	Not Started
Malletts Bay	Colchester	Indian Brook	Medium	Assess potential for dam removal at Mill Pond Road	Complete
Malletts Bay	Colchester	Indian Brook M01-1 and M02-1	Medium	Develop river corridor conservation easements for parcel occupying entire reach	Not Started
Malletts Bay	Essex Junction	Indian Brook M09-A-1	Low	Develop conservation easements for parcels occupying entire reach	Not Started – town focus is on FRP and PRP
Malletts Bay	Essex Junction	Indian Brook M10-A-2	Medium	Remove derelict structure associated with old crossing	Not Started – town focus is on FRP and PRP
Malletts Bay Indian Brook	Essex Junction	Indian Brook M11	Medium	Plant stream buffer along right bank south of the intersection with Grove St. and Educational Drive.	Not started – town focus is on FRP and PRP
Malletts Bay	Essex Junction	Indian Brook M11-A	Medium	Restore incised reach to reestablish meanders and create equilibrium profile and geometry along section adjacent to school.	Not started – town focus is on FRP and PRP
Malletts Bay	Essex Junction	Indian Brook M11-B	High	Plant stream buffer along right bank east of the Route 15 crossing.	Not started – town focus is on FRP and PRP

Subbasin	Town	Stream segment	Priority	Project Description	Status
Malletts Bay	Essex Junction	Indian Brook M11-C	High	Develop conservation easements for parcels occupying river corridor.	Not started – town focus is on FRP and PRP
Malletts Bay	Essex Junction	Indian Brook	High	Assist Essex Junction in developing a flow restoration plan (FRP) for Indian Brook, due October 2016	Complete
Malletts Bay	Essex Junction	Indian Brook reservoir	High	Continue to support water quality monitoring in the lake through the Lay Monitoring program	In Progress
Malletts Bay	Colchester, Milton	Malletts Creek, Allen Brook	Medium	Provide education and outreach to encourage the use of the portable skidder bridge housed at Cyr lumber for silvicultural activity	Discontinued. WNRCD decided stop program.
Malletts Bay	Colchester/ Milton	Malletts Creek M04-M13	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	Ongoing
Malletts Bay	All	all	High	Identify and implement needed Better Backroads BMPs for roads identified in Appendix B	In Progress
Malletts Bay	Colchester	Malletts Creek M01	Medium	reclassify Munsons Flats wetland to Class I	Not Started
Malletts Bay	Milton/Colchester	Malletts Creek M14-M17, T6	Medium	Prioritize and Implement projects identified in corridor plan for upper watershed;	In Progress. Milton developed a Stormwater Master Plan which will address some of stormwater inputs identified
Malletts Bay	Milton	Malletts Creek M15-B #1	High	plant woody riparian buffer	Not Started
Malletts Bay	Milton	Malletts Creek M17-A	Medium	Investigate corridor protection	Not Started
Malletts Bay	Milton	Milton Pond	Medium	Follow the recommendations of the past inspection reports and retain an engineer to help with either the repair or removal of the dam.	Not Started, town not interested
Malletts Bay	Milton	Malletts Creek T6.01	Medium	Investigate corridor protection and plant woody riparian buffer	Not Started
Malletts Bay	Milton/Colchester	Allen Brook	High	Identify and implement needed Better Backroads BMPs for roads identified in Appendix B	In Progress. MRGP permit requirementss
Malletts Bay	Milton	Allen Brook T1.1 - T1.08	High	Develop a stormwater management plan that includes stormwater infrastructure drainage	Completed
Malletts Bay	Milton	Allen Brook T1.07	High	Assess water quality below village with additional biomonitoring sites and water quality sampling sites	Completed

Subbasin	Town	Stream segment	Priority	Project Description	Status
Malletts Bay	Milton	Allen Brook T1.02 and T1.03	High	Investigate corridor protection	Not Started
Malletts Bay	Milton	Allen Brook T1.04	Medium	Stabilize gully near the outfall to Allen Brook with additional stone	Not Started
Malletts Bay	Milton	Allen Brook T1.06-B	Medium	plant woody riparian buffer	Not Started
Inland Sea	Georgia	Champlain shoreline / Georgia	Medium	Support Lake Wise practices	Not Started
Inland Sea	Georgia	Stonebridge Brook	Medium	Address residential stormwater runoff	Not Started
St. Albans Bay	St. Albans city/town/Georgia	all waters	Medium	Increase awareness of water resource issues and promote adoption of residential, business and agricultural BMPs	Completed
St. Albans Bay	St. Albans Town and City	Stevens Brook	High	Assist in St. Albans City and Town and VTrans in implementing a flow restoration plan	In Progress
St. Albans Bay	St. Albans Town and City	Rugg Brook	High	Assist St. Albans City and Town and VTrans in developing a flow restoration plan, due October 2016.	Completed
St. Albans Bay	St. Albans Town and City	all waters	High	Replace geomorphologically incompatible culvert and bridges: at least 2 priority replacements in basin, see Appendix C	Ongoing
St. Albans Bay	St. Albans town, Georgia,	Lake Champlain shoreline	Medium	Inspect and maintain (and where needed, replace) on-site septic systems. Consider a feasibility study for alternative onsite treatment if needed.	In Progress
St. Albans Bay	St. Albans Town, City	all waters	High	Encourage use of salt brine instead of salt to reduce overall use of salt and sand	Ongoing
St. Albans Bay	St. Albans Town	all waters	High	Support community's efforts to control aquatic nuisance plants and Eurasian Water Milfoil	In Progress
St. Albans Bay	All	all waters	High	Review agricultural practices on every farm and identify AAP and BMPs needs. Use CSA maps (NRCS, 2015) and EPA scenario tool	In Progress (agric meeting)
St. Albans Bay	All	all waters	High	Develop a plan and identify partners to work with agricultural producers to ensure implementation of needed practices	Completed
St. Albans Bay	All	Mill Brook	High	Identify and implement needed Better Backroads BMPs for hydrologically connected roads	In Progress. MRGP permit

Subbasin	Town	Stream segment	Priority	Project Description	Status
St. Albans Bay	Georgia	Mill Brook M2T2.2S1; M2T2.06; M03-M06	High	Identify BMP needs for fields in priority CSA and where geomorphic assessment identifies sediment regime departure	Ongoing
St. Albans Bay	Georgia	Mill Brook M2T2.2S1.3S 3.01	High	Identify and address source of channel erosion including channel adjustment, stormwater and sediment inputs	Ongoing. Stormwater project at Georgia Elementary school by FNLC
St. Albans Bay	Georgia	Mill Brook M2T2.2S1.03	High	At elementary school manage stormwater discharge to streams using infiltration at source where possible	In Progress
St. Albans Bay	Georgia	Mill Brook	Medium	Assist towns in defining appropriate slope failure risks for future development, and map	Not Started
St. Albans Bay	St. Albans Town	Rugg Brook	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.	In Progress MRGP
St. Albans Bay	St. Albans Town	Rugg Brook	High	Identify and implement needed stormwater management for roads identified in Appendix B.	In Progress MRGP
St. Albans Bay	St. Albans Town	Rugg and Stevens Brooks	High	Prioritize and implement needed stormwater management identified in the St. Albans Town stormwater master plan and NRPC NPS project list	In Progress Flow Restoration Plan
St. Albans Bay	St. Albans Town	Rugg Brook	Medium	When landowner interested investigate 2-tiered channel off Bronson Road and river corridor easement	Not Started
St. Albans Bay	St. Albans Town	Stevens Brook	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.	Ongoing
St. Albans Bay	St. Albans Town	Stevens Brook	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	In Progress MRGP
St. Albans Bay	St. Albans City	Stevens Brook 1	High	protect flood plain and wetlands between city limits and mouth	In Progress CREP plantings
St. Albans Bay	St. Albans City	Stevens Brook 3	High	Reduce stormwater flow into Weldon street CSO with GSI practices	In Progress FRP
St. Albans Bay	St. Albans City	Stevens Brook	Medium	Daylight section of stream and install stormwater best management practices	Not Started
St. Albans Bay	St. Albans Town	Stevens Brook (tributary 7)	Medium	Provide golf course with technical assistance to achieve ANR "Green Links" certification	Not Started
St. Albans Bay	St. Albans Town	Stevens Brook (tributary 7)	High	Develop and implement a stormwater management plan for watershed urban area along Route 7	In Progress Flow Restoration Plan
St. Albans Bay	St. Albans Town	Jewett Brook	High	Identify locations for tile drainage BMP's based on AAFM survey of 2015	In Progress

Subbasin	Town	Stream segment	Priority	Project Description	Status
St. Albans Bay	St. Albans Town	Jewett Brook	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.	Ongoing
St. Albans Bay	St. Albans Town	Jewett Brook	High	Identify and implement needed Better Backroads BMPs for roads identified in Appendix B, and NRPC Road erosion risk maps	In Progress MRGP
Islands	All	All waters	High	Identify and implement needed Better Backroads BMPs for roads identified as hydrologically connected	In Progress
Islands	Alburgh	All waters	High	Conduct sanitary survey on Cedar drive and East shore road	Not Started
Islands	Alburgh	All waters	Medium	reclassify Mud Creek Marsh to Class 1	Not Started
Islands	Alburgh	All waters	High	Prioritize and implement projects in the Alburgh Stormwater Master Plan	In Progress
Islands	All	All waters	Medium	Determine effectiveness of a fire district for shoreline owners to fund AIS management projects.	Not Started
Entire Basin	All	All waters		Incorporate materials specific to spiny water flea into signs, greeter program. Place spiny water flea spread prevention information at all lake accesses	Completed
Entire Basin	All	All waters	High	Develop a pilot network of hot waterpower wash stations at selected high priority Lake Champlain accesses to assist boaters with decontamination of watercraft and gear	In Progress: Continue building the network of hot water power wash stations at selected high priority Lake Champlain accesses to assist boaters with decontamination of watercraft and gear
Entire Basin	All	All waters	Medium	Identify potential wetland restoration sites based on Lake Champlain wetland restoration map	Ongoing
Entire Basin	All	All waters	High	Update AAP brochure and distribute during animal vaccinations	Complete see RAP handouts on AAFM website
Entire Basin	All	All waters	High	Assist wastewater treatment facilities in meeting TMDL goals to reduce phosphorus loading to Lake Champlain	In Progress
Entire Basin	See Figure 16 for specific towns	All waters	High	Protect river corridors to increase flood resilience and to allow rivers to reach equilibrium by assisting towns to adopt appropriate ordinances	In Progress
Entire Basin	See Table 7	All waters	High	Monitor and assess surface waters to gain better understanding of condition and potential sources	Ongoing

Appendix C. Existing Uses and Warm Water Fisheries in The North Lake Basin

EXISITNG USES

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 rights-of-way.

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 22 are rated significant for recreational boating (Jenkins, 1992) or were otherwise brought to DEC'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 22. 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 Mouth to RM 1	Shelburne	Lake Champlain Land Trust Shelburne River Park canoe and kayak launch at RM 1[33]. Majority of riparian buffer is part of a Nature Conservancy Preserve

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

Table 23 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 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 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 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 24 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

WARM WATER FISHERIES

Warm Water Fish Habitat. All wetlands, except those designated as cold-water fish habitats in § A-02 of this appendix, and the following waters are designated as warm water fish habitat for purposes of these rules.

(A) All streams, creeks, and brooks in Grand Isle County.
(B) Lake Carmi, Franklin
(C) Lake Champlain, between the Ferrisburgh-Charlotte town boundary and the Canadian boundary, where depths are less than 25 feet at Low Lake Level (93 feet NGVD) - June 1, through September 30, only.
(D) Bartlett Brook, South Burlington (E) Cutler Pond, Highgate (F) Englesby Brook, Burlington
(G) Holmes Creek, Charlotte,
(H) Indian Brook, Colchester from Vermont Routes 2 & 7 to its confluence with Lake Champlain.
(I) Jewett Brook, St. Albans Town
(J) Kimball Brook, Ferrisburgh
(K) Lake Iroquois, Hinesburg/Williston
(L) LaPlatte River from its confluence with Patrick Brook in Hinesburg extending downstream to the Spear Street extension bridge in Charlotte annually from the period June 1, through September 30, only.
(M) Long Pond, Milton
(N) Lower Lake, (Lake Sunset), Hinesburg
(O) Malletts Creek, Colchester, from Vermont Routes 2 & 7 to its confluence with Lake Champlain.
(P) McCabe's Brook, Shelburne
(Q) Milton Pond, Milton
(R) Mud Creek Pond, Alburgh
(S) Murr (Monroe) Brook, Shelburne
(T) Pond Brook, Colchester
(U) Potash Brook, South Burlington
(V) Rock River from the Canadian boundary to its confluence with Lake Champlain.
(W) Round Pond, Milton
(X) Rugg Brook, Georgia
(Y) St. Albans Reservoir
(N), Fairfax
(Z) Stevens Brook, St. Albans
(AA) Trout Brook, Milton

Appendix D. Municipal Protectiveness Matrix for The North Lake Basin

Table 25. Chittenden County Municipalities with Stormwater Master Plans (SWMP) or Flow Restoration Plans (FRP). * 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.

Town	SWMP / FRP †	Year filed	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
VTrans	Potash Brook FRP	2016	6
Underhill	Town-wide SWMP	2018	20
Williston	Allen Brook FRP	2016	29
Winooski	Morehouse Brook FRP	2016	6

Table 26. Municipal protectiveness matrix for towns with significant area in The North Lake Basin

	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. 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	Yes
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 II 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?**	Yes
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?

Table 27. Franklin County municipalities with Stormwater Master Plans or Flow Restoration Plans and municipal protectiveness matrix

Town	SWMP / FRP †	Year filed	Projects Identified*	# of High Priority Projects Identified	# with Conceptual Designs & Cost Estimates prepared
St. Albans Town	Stevens Brook FRP	2017	5	na	5
St. Albans City	Stevens Brook FRP	2017	11	na	11
St. Albans Town	Rugg Brook FRP	2017	15	na	6
St. Albans City	Rugg Brook FRP	2017	5	na	5
St. Albans Town*	Town-wide SWMP	2015	39	13	7 Concepts[1]
Alburgh	Town-wide SWMP	2015	14	7	5 Concepts[1]
Georgia*	Town-wide SWMP	2013	21	14	8 Concepts[1]
Swanton*	Town-wide SWMP	2013	28	15	8 Concepts[1]
** town wide SWMP projects could include more than 1 watershed*					
† FRP projects identified refer to locations; may need more than one "project" at location					
1-Completed Conceptual Solutions are not a true 30% design					

Table 28. Municipal protectiveness matrix for Franklin County Municipalities with significant area in The North Lake Basin

Franklin County	Status	Georgia	St. Albans Town	St. Albans City	Swanton Town
National Flood Insurance Program (NFIP)	Enrolled?	Y	Y	Y	Y
Road and Bridge Standards	Adopted?	Y	Y	Y	Y
Hazard Mitigation Plan (LHMP)	Adopted?	Y (Approved 2010)	In process	Y (Approved 2017)	In process
River Corridor Protection	Adopted?	N	N	N	N
Comments on River Corridor Protection		Existing regulations have stream buffers; Currently considering RC adoption	-	-	-
ERAF % from State	Percent	-	-	-	-
Flood Hazard By-law	Adopted?	Y	Y	Y	Y
	Comment	As part of Development Regulations	As part of Development Regulations	-	Single bylaw for both the Village and Town
Flood Resilience in Town Plan	Completed?	Y	Y	Y	Y
	Comment	Incorporated into the 2017 Town Plan update.	Incorporated into the 2018 Town Plan update.	2017	Incorporated into the 2015 joint Town/Village Plan
Municipal Bylaw or Zoning District for Water Resource Setback	Year	2013	2019	2019	2014
	River/ Stream	Y	Y	Y	Y
	Comment	Vegetated buffers - 50 feet of Type 1 streams (named streams and primary tributaries as shown on zoning map) and within 200 feet of Type 2 streams (Deer Brook)	Section 305. All structures, impervious roadways and parking, and permeable roadways and parking shall have a minimum setback of 50 feet from the center of all watercourses.	Section 534 & 524: 524: STREAM ALTERATION AND BANK MAINTENANCE. Pertains to perennial and intermittent streams and includes in-stream alterations, stream bank alterations, construction of bridges, and addition, replacement, or reconstruction of materials for stream bank armor or channelization. 523. STREAM CORRIDOR AREA: A special area within the City along perennial streams and with specific development restrictions and criteria. Defined as perennial stream and shall consist of the area within 30 horizontal feet of the stream centerline.	Section 3.14: Development near waterways. All rivers and streams are required to have a 50-foot buffer. The Missisquoi River requires a 100-foot buffer and the Hungerford Brook requires a 75-foot buffer
	Wetland	N	N	N	Y
	Comment	-	-	-	Section 3.14: Development near waterways. All wetlands (Class 1 & 2) are required to have a 50-foot buffer
	Lake/Pond	N	Y	N	Y

	Comment	-	75-foot setback required from highwater mark for lakes	-	Section 3.14: Development near waterways. Lakes & ponds require a 50-foot buffer
	Water Resource District	Y	Y	N	Y
	Comment	2 Shoreline Zoning Districts - Lakeshore District (L-1) measured from the mean water mark of Lake Champlain inland 500 feet; purpose is to protect the water quality of the lake and the recreational potential and natural beauty of the shoreline. Lakeshore Residential-Recreation District (L-2) beginning at the easterly border of L-1 District continuing inland 1500 feet; development within these districts must follow special provisions such as limiting disturbance to vegetation. The purpose of the district is to protect the water quality of the lake and the natural beauty of the shoreland area. Development within the district should preserve the contiguous open lands, and protect the view looking eastward from the lake.	Lakeshore District - To protect the shoreline of Lake Champlain from erosion, clearing, and hazardous development and to maintain its character of seasonal and year-round homes, open space, access to the Lake and commercial uses that support lakeshore recreational activities.	-	Shoreland/River District - to allow residential and seasonal recreational uses along portions of the Missisquoi River shoreline in a manner that protects water quality and riparian vegetation, minimizes adverse environmental impacts, and preserves and encourages public access to the river.
Potential actions to address gaps in Water Quality Protection		NRPC is working with Town Planning Commission in 2019-2020 on development regulation updates that will explore adoption of River Corridor Protection			

Grand Isle County	**Status**	**Alburgh**	**Isle la Motte**	**North Hero**	**Grand Isle**	**South Hero**
National Flood Insurance Program (NFIP)	**Enrolled?**	Y	Y	Y	Y	Y
Road and Bridge Standards	**Adopted?**	Y		Y		Y

Hazard Mitigation Plan (LHMP)	**Adopted?**	N	In process	Y (Approved 2019)	Y (Approved 2018)	Y (Approved 2018)
River Corridor Protection	**Adopted?**	N	Interim	N	N	N
Comments on River Corridor Protection		-	-	-	-	Town has drafted regulations that prohibits new development in river corridors
ERAF % from State	**Percent**	-	-	-	-	-
Flood Hazard By-law	**Adopted?**	Y	Y	Y	Y	Y
	Comment	-	-	-	-	-
Flood Resilience in Town Plan	**Completed?**	Y	N	Y	Y	Y
	Comment	2016	Do not have an adopted Town Plan	2015	2017	2015
Municipal Bylaw or Zoning District for Water Resource Setback	**Year**	na	Na	2014	2017	2011
	River/ Stream	na	Na	Y	Y	N
	Comment	-	-	A 50-foot setback on streams in any district as noted in dimensional standards table. Setback defined as the distance between any land development and the top of the natural bank of Lake Champlain or any stream, or the edge of a wetland.	Note a 50-foot setback that is buffered for streams without mapped river corridors	
	Wetland	na	Na	N	Y	N
	Comment	-	-	A 100 ft setback on Class 1 wetland and 50 ft setback on Class 2 wetland as noted in dimensional standards table. Setback as defined as distance between any land development and the top of the natural bank of Lake Champlain or any stream, or the edge of a wetland.	All Wetlands of 2+ ac, as marked on Town Wetland Map of October 1996, must be treated as Class 2 Wetlands, unless shown by evaluation not to be sufficiently significant to merit protection under Vermont Wetland Rules.	-
	Lake/Pond	na	Na	Y	Y	Y
	Comment	-	-	75-foot setback from lake in the following districts: Village, Shorelands, and Off Islands	75-foot setback for structures from Lake mean water level (95.5ft) in Shoreland District	75-foot setback from Lake mean water level (95.5ft) in Shoreland District
	Water Resource District	na	Na	Y	Y	Y

	Comment	-	-	Shoreland District - all land above the mean water mark of Lake Champlain (elevation 95.5 feet) inland for a distance of five hundred (500) feet. The purpose of the Shoreland District is to preserve water quality, prevent erosion, and regulate the visual character and aesthetic setting of shorelines.	The three (3) Shoreline Districts include all land within five hundred (500) feet of the Lake Champlain mean water mark (95.5-ft. lake level).	Shoreland District includes land within 500 horizontal feet measured from the mean water level on the shoreline of Lake Champlain within the Town of South Hero (95.5 ft). Purpose: control development in order to protect water quality, scenic beauty, conservation of total environment and related resources, and to control development along public waters in the best interest of the community.
Potential actions to address gaps in Water Quality Protection						

Appendix E. Responsiveness Summary

Vermont Department of Environmental Conservation
Agency of Natural Resources

Responsiveness Summary to Public Comments Regarding

Northern Lake Champlain (Basin 5) Tactical Basin Plan

On July 9, 2020, the Vermont Agency of Natural Resources (ANR), Department of Environmental Conservation (DEC) notified the public about the public-comment period for the draft Northern Lake Champlain Direct Drainages Tactical Basin Plan (TBP). A summary of the public comments that were received through the public-comment period ending August 7 for this TBP are included in the following section.

Due to Governor Scott's "Stay Home, Stay Safe" order, this year's public meetings were conducted online. Directions and links to participate were posted on the Basin 5 website and included in a press release. The virtual public meetings were held on the following dates:

- July 15, 2020 - hosted by the Chittenden County Regional Planning Commission.
- July 20, 2020 - hosted by DEC
- July 29, 2020 - hosted by the Northwest Regional Planning Commission

The DEC prepared this responsiveness summary to address specific comments and questions submitted during the comment period and to indicate how the plans have been modified in response to those comments. The comments received from the Chittenden County and the Northwest Regional Planning Commissions were collected by staff from their Clean Water Advisory Committees and/or Board members. Some comments have been edited for brevity and clarity. The full text of the comments provided for each plan is available for review by contacting the Department of Environmental Conservation

Please note that page numbers referenced in comments refer to the DRAFT Plan rather than the final version.

<u>The Northwest Regional Planning Commission (NRPC) and the Chittenden County Regional Planning Commission (CCRPC) provided the following comments:</u>

Comment: The 50% match requirement imposed by the DEC for use of State grant funds is unfair and counterproductive. Depending upon the grant source, DEC is requiring only a 0% to 20% match for other municipalities. Much of the needed total phosphorous (TP) load reduction originates in these Municipal Separate Storm Sewer System (MS4s). Many MS4s have identified and scoped numerous Total Phosphorus (TP)-reduction projects in their Flow Restoration Plans and pending Phosphorous Control Plans and are eager to move forward with these projects to stay in permit compliance. Requiring a 50% match on both Design and Implementation projects seems arbitrary and ultimately slows progress towards meeting the Lake Champlain phosphorus TMDL

Response: The Clean Water Board recommends an annual clean water budget, including the Clean Water Fund and Capital Bill appropriations, based on statutory priorities. Statutory priorities mainly focus on restoration and protection of water quality across land use sectors. Under Act 76 of 2019, water quality restoration and protection initially focus on nutrient and sediment pollution, with a primary focus on meeting the pollution reduction targets identified in the Lake Champlain TMDL. To clarify, implementation of Flow Restoration Plans is part of municipal stormwater regulatory requirements and addresses nutrient and sediment pollution and is therefore currently a priority for clean water funding. Where water quality benefit is equal, other co-benefits may be considered to prioritize projects. Other funding mechanisms, such as FEMA Hazard Mitigation Grant Programs, are available to assist municipalities in specifically addressing hazard mitigation and transportation infrastructure.

Determination of DEC match requirements are beyond the scope of Basin Plans. Please refer to the DEC Clean Water Initiative Program Funding Policy for match requirements. The justification supporting the 50% MS4 match requirement is that it ensures equitable geographic distribution of clean water funds. Additionally, CWSRF loans and Pollution Control grants can be leveraged to cover the match requirement. The Clean Water Initiative Program is in the process of updating its Funding Policy for SFY 2021, which will include determinations of eligibility and match requirements for all stormwater regulatory programs.

Comment: CCRPC and NRPC request the following: projects that also provide co-benefits such as other TMDLs (i.e. Flow Restoration Plans, E.coli, mercury, etc.), hazard mitigation, transportation improvement, aquatic organism passage, and/or listed in municipal comprehensive plans and capital plans should also receive additional consideration in making funding decisions. We look forward to being able to participate

more fully as a partner in evaluating and scoring projects as required in Chapter 47 §1253(d)(3)(D).

Response: The Clean Water Board recommends an annual clean water budget, including the Clean Water Fund and Capital Bill appropriations, based on statutory priorities. Statutory priorities mainly focus on restoration and protection of water quality across land use sectors. Under Act 76 of 2019, water quality restoration and protection initially focus on nutrient and sediment pollution. By statute, the State of Vermont is required to establish a schedule for addressing other impairments (e.g., E. coli) by 2023. To clarify, implementation of Flow Restoration Plans is part of municipal stormwater regulatory requirements and addresses nutrient and sediment pollution and is therefore currently a priority for clean water funding. Where water quality benefit is equal, other co-benefits may be considered to prioritize projects. Other funding mechanisms, such as FEMA Hazard Mitigation Grant Programs, are available to assist municipalities in specifically addressing hazard mitigation and transportation infrastructure.

Comment: The CCRPC and the NRPCs, through their Clean Water Advisory Committees, recommend to be allowed to provide input to DEC's prioritization scoring system as intended by statute: Title 10, Chapter 47, §1253(d)(3)(D)

Response: The DEC is currently making modifications to the Watershed Projects Database to provide for the functionality and access to allow for enhanced input by statutory partners, and as stipulated by Act 76 to allow for CWSPs and BWQCs to provide additional prioritization metrics pertaining to local and regional priorities and, as applicable, to an anticipated co-benefit analysis. DEC anticipates that these tools and methods will be described in the forthcoming Act 76 Guidance Document(s) that will be developed in consultation with the state's statutory partners and other Act 76 Advisory Committee stakeholders.

<u>The CCRPC provided the following comments:</u>

Comment: The TBP could be greatly improved by a more expansive discussion of the role MS4 permitees will have in meeting the goals of the Plan due to the many requirements they must meet. The required and long-standing Stormwater Management Programs along with the six Minimum Control Measures should be described in greater detail as should the various Flow Restoration Plans (FRP) for the stormwater-impaired streams. For example, the Plan could note in the main body of the text the typical types of projects such as pond retrofits that are contained in the FRPs. A discussion of the FRP could also note the estimated costs for full implementation of

each FRP's projects. Additionally, the requirements of the municipal Phosphorus Control Plans (PCP) which must be submitted by April 2021 should be described in greater detail as the success of these PCPs is paramount to whether or not a significant portion of the Lake Champlain TMDL Total Phosphorus targets are met.

Response: In Chapter 4, section C, the TBP provides an overview of the programs and partners involved in addressing pollutant load, including the MS4 permit holders. To ensure that the plan does not become too lengthy, additional information is provided through links. These links are meant to provide the interested reader with a more expansive explanation of the MS4 roles if desired.

While relevant to meeting state and federal requirements to address impaired waters and TMDLs, the TBP focuses primarily on what can be achieved through the natural resource restoration allocation of these TMDLs, with decidedly less focus on the regulatory requirements for municipalities per MS4 permit obligations and other regulatory compliance requirements.

Comment: Readers of the TBP will also benefit from a few added paragraphs of text describing the anticipated costs for each sector to implement the strategies and actions endorsed in the Plan. Without such a description, the reader is unaware of first, the overall financial cost and secondly, and more importantly, the average costs per pound of phosphorus removed from each sector. For example, in the 2016 Lake Champlain TMDL, DEC estimated costs of $4,000 per kilo of phosphorus removed via upgrades to wastewater treatment facilities. However, in DEC's 2019 Clean Water Performance Report, forested riparian buffer restoration projects and agricultural pollution prevention projects have cost estimates per kilogram of phosphorus reduced of only about $100 per kilo and $200-$600 per kilo, respectively.

Response: In order to meet Act 76 (clean water) project valuation requirements, a standardized cost per unit of pollution reduction analysis is currently being undertaken to inform a cost range based on project type and sector. In order to inform the "Restoration Formula Grants" specified in the Act, target load reductions will be assigned for each major river basin and a standardized costing formula will be calculated to determine the allocation of annual funding to be assigned to each CWSP. The Agency expects to make public results of a study of costs based on phosphorus removed per project type in mid-2021; however, this information is not yet available to include in this TBP. With regard to actual costs, those are best obtained from the final cost for completed projects provided by the Vermont Clean Water Initiative Annual Performance Reports. Please find the link to those reports here.

Comment: CCRPC wishes to restate the concern of several of their member municipalities that requiring municipal wastewater treatment plants to engage in costly upgrades at poor Phosphorus Reduction Benefit to Cost Ratio will make it a challenge for Chittenden County to achieve key strategies of the ECOS Plan, namely:

o Strategy 2 [Strive for 80% of new development in areas planned for growth]

o Strategy 7 [Develop financing and governance systems to make the most efficient use of taxpayer dollars and reduce costs]

It is estimated that the Capital expenses alone for the required upgrades to municipal wastewater treatment to achieve phosphorus reduction optimization in Chittenden County alone would be in the tens of million dollars for relatively low amounts of additional phosphorus removal. Increasing these municipal operating costs will increase already high housing costs in Chittenden County, make it more difficult to build via infill or on brownfields, and drive development away from areas planned for growth. As the ECOS Plan notes: Considering development and growth comes with both costs and benefits, this Plan attempts to reach a balance by directing growth in such a way that new infrastructure and long-term maintenance costs are minimized. For example: Promotion of and incentives for compact development in areas planned for growth will help keep rural areas open; this can also minimize stormwater problems and prevent new watersheds from becoming impaired.

In the 2016 Lake Champlain Phosphorus Total Maximum Daily Load (TMDL), DEC estimated costs of $4,000 per kilo of phosphorus removed via upgrades to wastewater treatment facilities. Therefore, mechanisms need to be developed for municipalities and other property owners with permits to invest in Natural Resource or Agriculture sector phosphorus reduction projects. As documented in DEC's own 2019 Clean Water Performance Report, forested riparian buffer restoration projects and agricultural pollution prevention projects have cost estimates per kilogram of phosphorus reduced of only about $100 per kilo and $200-$600 per kilo, respectively. Developing a process for municipalities to invest in these types of projects would clearly provide much more phosphorus reduction per dollar spent as well as facilitate more appropriate housing and commercial development in line with the ECOS Plan."

Response: The State recognizes that centralized and decentralized wastewater infrastructure can be the most expensive asset owned by municipalities. The TMDL has imposed Federally binding baseline wasteload allocations for wastewater treatment facilities, and the related requirements for upgrade to those facilities are reflected by the basin plan as required in the accountability framework of the TMDL. However, there are also follow-on benefits to communities to maintaining and upgrading these assets

that transcend the important pollution reductions achieved. While costly, well maintained and capitalized wastewater infrastructure, such as is being pursued in Hinesburg or Shelburne, or recently constructed in St. Albans and South Burlington, puts communities in the position of promoting centralized growth that appears to directly support strategies 2 and 7 of the ECOS Plan. Further, the Village Wastewater Initiative, described in the Plan in page 85, presents opportunities to concentrate development in village core areas. The State has developed funding mechanisms within the State Revolving Fund (SRF) to support these efforts, and to further enhance the ability of municipalities to access capital for these upgrades. Please see the Federal FY 2020 Intended Use Plan, here. The General Assembly has also provided sustained ongoing investments into pollution control grants, which are allocated pursuant to Chapter 2 of the Environmental Protection Rules. While these programs do not come close to eliminating the need for municipalities to invest in their infrastructure, they do assist municipalities in setting the stage for long-term sustainability. Further, The State legislature has acknowledged the need to support natural infrastructure that provides higher benefit-cost ratio with the passage of Act 185 in 2018, which allows municipalities to support natural resource restoration projects at a substantially reduced cost through loan forgiveness over time when upgrading wastewater and infrastructure through the Clean Water State Revolving Loan Fund and DEC's "Sponsorship" Program. This new program will be added as a funding source to appropriate strategies in the Summary of Implementation Action (Table 37).

Comment: On Page 101, Developed Land, Strategy #10: correct to read "Address 15% of road segments."

Response: Duly noted. Strategy #10 will be changed to read, "Towns will address at least 15% of their connected non-compliant municipal road segments by 12/31/22. Towns will bring their Very High Priority segments (Paved and Gravel roads with drainage ditches and Paved roads with curbs and catch basins) up to standards by 12/31/25 and Class 4 Very High Priority segments up to standards by 12/31/28. "

The NRPC provided the following comments:

Comment: NRPC recommends that for project implementation, priority be given to those projects that reduce the most phosphorus per dollar spent. Additional weight should be given to projects located in catchment areas and sub-basins with multiple high-priority reduction targets for project implementation, priority be given to those projects that reduce the most phosphorus per dollar spent. Additional weight should be given to projects located in catchment areas and sub-basins with multiple high-priority reduction targets.

Response: DEC agrees with this comment. As a requirement of Act 76, DEC will provide standardized cost per unit of pollution reduction (for project type per each sector) to maximize the investments of clean water funding in order to achieve target load reductions within the natural resource sectors of the TMDL, namely river/ floodplain and wetland restoration, but also reductions from agricultural and forested lands. Text included in Chapter 5 describes prioritization for projects with highest water quality benefit. A sentence was added to clarify that priority for funding will be given to those projects that achieve a high phosphorus removed benefit per cost ratio. The section also states that projects that provide cumulative benefits, which would include multiple high priority reduction targets, should be given additional weight.

Comment: NRPC recommends that more funding be allocated towards project development at this early stage so that in subsequent years it will be easier to determine which projects reduce the most phosphorous per dollar. At this stage of Basin Planning to achieve the Lake Champlain TMDL, many projects do not have clear scopes, costs, or phosphorus reduction estimates. As these are developed, NRPC will offer more additional **Comment**s regarding specific project priorities.

Response: The Clean Water Board is responsible for developing the annual clean water budget that is subsequently integrated into DEC's proposed annual fiscal year budget that is reviewed and deliberated upon by the Legislature. For FY21 and as anticipated in subsequent fiscal years going forward, the clean water budget includes funding of sector-based assessments that can be used by partners to continue to identify and develop potential projects that may serve to inform the overall slate of project opportunities deemed necessary to meet target load allocations for each sector.

Specifically, in FY20, $475K was allocated towards project development and technical capacity block grants, and FY21 will see about 75% of this investment perpetuated. Further, the FY21 spending plan reserves funding for Clean Water Service Provider startup in FY21 and 22, and these funds may also be directed in part towards project development to set the stage for success by the Service Providers.

That said, we still need to achieve pollution reductions from all sectors to achieve TMDL target load reductions. Ultimately these projects will help to serve economic and community development goals, so there are additional benefits that will be accrued in achieving future growth allocations for both stormwater and WWTF.

Comment: In relation to rivers, the basin plan discusses protection strategies that are not in conflict with the regional plan provided the plan is not interpreted to prohibit development broadly in these areas in order to achieve a stable stream system. The basin plan should explicitly recognize this potential conflict and support municipalities

in their efforts to plan for and regulate new development or re-development in these areas

Response: Duly noted. It is the policy of the DEC River Management Program to allow for responsible development in densely settled areas of historic settlements along river corridors in a way that does not encroach upon the river corridor or result in additional and undue flood hazards that may pose a risk to neighboring properties and exacerbate existing flooding potential. Towns are required to adhere to their own municipal floodplain regulations in allowing for new or re-development projects to comply with municipal enrollment in the National Floodplain Insurance Program.

In addition, revisions to the Tactical Basin Plain include a section on "Resources for Enhancing Floodplain Protection" (Chapter 2) that includes the following language: DEC recognizes that Vermont's historic settlement have resulted in a significant level of river corridor encroachment in densely developed areas. The DEC River Management Program's model hazard bylaws contain provisions to facilitate infill and redevelopment in designated centers and densely developed areas within river corridors and flood hazard areas. DEC regional floodplain managers routinely provide technical assistance to municipal and regional planning staff on incorporating these provisions into town regulations

Comment: The tactical basin plan strategies focus on the management of stormwater as it pertains to existing development. Equal value should be placed on reducing stormwater impacts of new development. The progress made by the state to improve standards (2017 VT Stormwater Management Manual Rule & Guidance Chapter 2 and 4) and lower the threshold of applicability (effective July 2022) should be mentioned in the plan as well as the importance of green infrastructure and low impact development techniques.

Response: The Agency concurs. Updates to the 2017 Vermont Stormwater Management Manual require greater use of green stormwater infrastructure and result in decreased stormwater-related phosphorus contributions from new development and redevelopment, compared to previous design standards. Additionally, the impacts of stormwater from new development will be further mitigated when the permit threshold for operational stormwater permits for new development is lowered from the current threshold of one acre of impervious surface to one-half acre or more of impervious surface. These changes, by reducing pollutant load from new development, assist in limiting the extent of stormwater retrofits of existing developed land necessary to achieve the Lake Champlain TMDLs.

Comment: TBP should protect the intact-forested landscape and significant wetland communities to reduce resource fragmentation. This is important to minimize future increases in phosphorus from forested lands.

Response: The TBP strategies do support wetlands restoration and protection, which would minimize resource fragmentation for wetland, including forested wetland. It is a goal of ANR to protect intact, unfragmented forested landscapes, which with the passage of 2016 Act 171 is now also state policy. The Act 171 study committee is still undertaking work to identify regulatory pathways to limit fragmentation. The TBP does support the work of county foresters who provide the technical assistance and access to any financial assistance that supports the working forest landscape.

The Lewis Creek Association provided the following comment:

Comment: Since the LaPlatte River minus the McCabes Brook tributary has a stormwater master plan, please call out McCabes Brook as its own stream. LCA and towns are hoping to get funding for developing a McCabes Stormwater master plan for Shelburne and Charlotte"

Response: The following language was added to Chapter 4, page 70: "The need for additional stormwater master plans will be assessed by ANR upon request." The ANR will be happy to consider a request to support a McCabes Brook stormwater master plan.

Scott E. Mapes, P.E., provided the following comments:

Comment: I just don't see how the current plans are going to get us to the TMDL targets in the foreseeable future. I am not seeing TMDL performance metrics like there was in the 2019 performance report. In that report, it said that it thought your efforts had reduced phosphorus in 2019 by 16.4 metric tons per year, out of a target of a reduction of 212 by 2038. Looking at the graph, it looks like roughly 1700 metric tons of phosphorus were added in 2011. I couldn't not find the exact number. It says, "The target total phosphorus load is 418 metric tons per year, which is the maximum amount of phosphorus Lake Champlain can receive annually in order to meet State of Vermont water quality standards." It looks to me like your plan (page 42) for this region is targeting a reduction of 22.1 MT per year, eventually. That seems like a tiny number compared to the task at hand, and I found it hard to find much indication in the plan that we have made any quantifiable progress yet. For example, on page 61, it shows some progress in the farm sector, but it is measured in KG/year, not tons. Did I misunderstand the data or the units? If not, the chart makes it looks like there is good progress, but the units suggest that it is not significant.

Response: The Lake Champlain Phosphorus TMDL goals will be met over a 20-year period. This TBP describes goals for Phase II of the TMDL implementation. The achievements documented in the TBP describe the successful development of regulatory programs identified in Act 64, as well as a subsequently high degree of regulatory compliance within the community. The TBP also describes success of voluntary implementation of practices that go above regulatory requirements. The 2025 Northern Lake Champlain Direct Drainages Tactical Basin Plan will include the TMDL Phase III Implementation Plan, which will provide calculations of phosphorus reduction achieved through ongoing regulatory compliance and project Best Management Practices (BMP) implementation data, along with phosphorus reduction "targets" by sector for the next five years. The TBPs will continue to rely on the annual Clean Water Performance Reports published by DEC for additional information; those reports are linked here.

Comment: My comment is directed specifically to the 3-acre program #3-9050 permit. While I encourage DEC to fully support and promote and fund P3 opportunities, I am concerned we will not get the bang for the buck spent here. I think the program should be retooled to focus on the sub- to macro- watershed improvements and not based on who happens to own a 3 acre or more impervious parcel that has no permit or one issued pre-2002 standards. Here is why: Assume in a 40 acre watershed there are 20 property owners owning lots of various sizes all having impervious 30 acres total but only one lot has 3 acres or more of impervious and none of the properties in the watershed has a permit. So only one property owner is subject to #3-9050. No matter what that property owner does within that watershed will make a dent in the end water quality coming off the entire 30 acres of impervious within that 40-acre watershed. So why are we going to make someone spend a lot of money on doing something that will make no significant difference and allow 25-27 acres to go without participating?

Response: The concept of addressing "three-acre sites" was first identified in the draft Phase 1 Implementation Plan for the Lake Champlain TMDLs, and was subsequently adopted into statute in Act 64 of 2015, and incorporated into the Stormwater Permitting Rule in March of 2019. Any change in the current approach would require, at a minimum, substantial revisions to state statute.

The Agency acknowledges that most developed land in the state is not addressed by the requirements for "three-acre sites" in General Permit 3-9050. However, it is important to consider the effectiveness of requirements for "three-acre sites" in the context of all Stormwater Program regulations. When assessed in their totality, the combined effect of the Municipal Roads General Permit, MS4 General Permit, the TS4 General Permit, and General Permit 3-9050 is estimated to be sufficient to achieve phosphorus reductions

consistent with the Lake Champlain TMDLs, and to achieve the TMDLs for stormwater-impaired waters.

Addressing developed lands on a sub-watershed basis, as described in the comment, could potentially provide more localized water quality benefit than the current approach. However, regulating all developed land, or impervious surface within a given locale would require permitting a greater number of entities to achieve the same amount of phosphorus reduction basin wide, and require a significantly more geographic analysis to support the appropriate regulatory threshold, compared to focusing on "three-acre sites."

Comment: Nowhere in this report is there any mention of the real issue or consequences associated with residential development (seasonal or permanent) septic systems whose lack of proper functioning contributes directly to the degradation of surface waters near river or lake shore lines. Many newer homes and/or camp conversions since 2007 may have a DEC WW permit but many homes and camps on our shorelines do not. Does DEC consider impacts from poorly functioning septic systems not to be an issue in this context worthy of being included?

Response: The plan lists the Bacterial TMDLs that have been developed for surface waters where ANR has confirmed violations of the Vermont Water Quality Standards (VWQS) based on high bacteria concentrations, see Chapter 3, page 37 of the TBP. Language has been added to page 37 stating that failed onsite wastewater systems have or are a suspected source of bacterial contamination to the drainages to Malletts Bay. No other areas of failing systems are identified as contributing to a surface water violations, and DEC understands that a properly functioning onsite, soil-based wastewater system may require minimal maintenance for decades of use. The effluent water treated in these systems can reduce Nitrogen by more than 70%, Phosphorus by more than 80%, and viruses by more than 95% in the first 18 inches of soil, making these a critical component to the health of the environment. The plan does not include additional discussion about septic systems in outlining efforts to reduce phosphorus loading to degraded waters because studies have shown that soil-based wastewater systems are rarely the responsible component in the case of algae blooms, with fertilizer usage and direct animal waste contributing magnitudes more phosphorus to the environment. That said, failed systems do exist throughout Vermont as identified by the DEC Drinking Water and Groundwater Protection Division. When identified, often initially by a town health officer, they are addressed through current state regulations. To ensure that communities understand how to manage their systems to reduce impact to waterways, strategy #37 in the plan supports education and outreach to shoreline communities to ensure adequate maintenance of onsite system. In addition, the plan goes a step further to help communities provide a solution to areas seeing chronic

failure of onsite septic systems. Strategy # 22 supports the Agency's work to assist village sized communities to consider creation of onsite community wastewater disposal systems.

Comment: Simply harvesting Milfoil is a nonstop event and that you actually need to reduce and remove the nutrient loading in the bay or segment to significantly alter the growing climate to end the cycle.

Response: Limiting nutrient levels may help reduce Eurasian milfoil populations, but it would not control it. Eurasian milfoil is an aquatic invasive species that is able to outcompete native aquatic plants for habitat. Nutrient levels can increase growth; however, native aquatic plants have a natural range, regardless of increasing nutrient levels in currently mesotrophic and eutrophic environments where Eurasian milfoil populations will flourish. Harvesting of watermilfoil is integral to controlling the spread of this aquatic invasive species.

Comment: I have studied the CSO issues at Burlington main WWTP for years (see Discharge Permit #3-1331). And I have been perplexed and discouraged how we classify what counts as a ""CSO"" event and when there is a bypass or comprising storm event what is ""treated"" wastewater for purposes of Phosphorus loading from that event.

My understanding is that under dry weather full treatment is provided up to 13 MGD (Average day is 5.3 MGD). Once flows rise above 13 MGD gates are triggered to bypass full treatment and flow is directed to the Vortex solids separator (VS) - also referred to as wet weather treatment. The VS has a design capacity up to 75 MGD and once flow to the plant exceeds 75 MGD gate #1 is opened. I also understand that there are events leading up to 75 MGD when gate #2 is opened.

For reference a 1-year storm in Burlington brings flows at the WWTP to 115 MGD and 10-year storm 250 MGD. So, there are to be a number of less than 1 Year storm events that potentially may cause flows to exceed 13 MGD and 75 MGD where comprises to full treatment process results, in other words gates are opened.

I am told ""treatment"" means in these bypass (or gate opening) events is chlorination(?). This cannot be treatment as in removing Phosphorus or even closely meeting the TSS standard set by permit. What am I missing here? Burlington's main WWTP experiences many more events where these gates are caused to be open. What aren't these discharge events reported and counted toward TMDL loading? Surely many millions of gallons of WWTP effluent that has only been chlorinated contributes significantly to the problem."

Response: The discharge events that you refer do not provide a significant source of phosphorus as we discuss below in this Response. Records regarding these events are available to the public. Treatment for storm events through Burlington Main WWTF's wet weather system is primary treatment with chlorination. The primary treatment consists of a bar rack and vortex separator followed by a bromine/chlorine disinfection system. Some particulate matter should drop out in the swirl process allowing for TP removal at this step. However, it is true P attaches to clay particles better than sand and may pass into the lake on floaty material. The WWTF NPDES permit requires the Burlington International Airport to take a composite sample for every discharge event from the vortex separator event lasting over 30 minutes. Their self-reported monitoring data are public records that can be requested from the WW program. The May 2020 report included three storms, TSS and P coming out of the vortex separator were fairly consistent: averaging TSS=340 mg/L and TP=1.3 mg/L. The facility's SCADA system provides data on when each gate opens, the length of time it is open, and may also indicate how much it opens. If the facility discharges any effluent suspected to have an E. coli concentration above 235 CFU/100 ml, they must notify DEC and the public (https://dec.vermont.gov/watershed/wastewater/discharge-notifications).

Jeff Van Noort provided the following comments:

Comment: There was a note on page 124 that Malletts Bay has a high priority program to "Continue sampling of shoreline and enhance program to gage degree of contribution of pathogens from shoreline wastewater systems". I think it is important to extend this item everywhere, especially in areas where there are a lot of blooms and where development and campers are below the recent high-water mark. I suspect that there are a lot of septic fields that leak directly into the lake, especially during high water events. The worst offenders may never fail because the sewage is going directly into the lake, so they may never trigger an upgrade. We need to find a way to see who is in compliance. Your plan doesn't mention septic systems much and has even less to say about how to pay for upgrades.

Response: Please see the previous response to a comment from Scott E Mapes, P.E., regarding failing septic systems. With respect to Mallett's Bay, tributaries to the Bay are subject to an approved TMDL addressing the bacterial impairment. Ongoing shoreline monitoring is conducted as a component of meeting the pollution reduction targets identified in that TMDL.

Comment: would love to find a way to make people abandon their lawns

Response: The ANR supports the Lake Wise program and participates in the Lawn To Lake partner organization to encourage alternative landscaping practices to reduce lawn or at least to reduce impacts from lawns through growing longer grass and limiting fertilizer application per the Vermont turf fertilizer law (10 V.S.A §1266b).

Comment: Years ago, there was a study to remove part of the railroad bridge across Carry Bay. The study for the bridge answered the wrong question, whether it would increase shore erosion. The bridge is unnatural, so I am not concerned about the erosion. I am more concerned about the fact that the bridge obstructs the waves, and the lack of waves allows the blooms to grow unhindered. We need the wave action, the churning and the flow. Similarly, the culvert under route 2 at the Carry (or Bird Land), is terribly inadequate. At present, it is clogged in one end, and the water is too low for it to flush any water through

Response: The Agency acknowledges your concerns. The cyanobacteria blooms in the Bay are supported by a number of conditions. Calm waters will support blooms; however, high nutrient levels and high temperatures are the primary cause of blooms and reducing nutrient loading is the Agency's priority at this time.

Comment: Regarding shore erosion, I would like to learn more about the Lake Wise program, but I fear that it is too focused on too few properties. I only know of one near me that says it is certified. I suspect we need a broader outreach. (I also am not liking the rip-rap solution that seems to be getting very common. I hope that is not what people think is a good solution.)

Response: Thanks for your note and for your interest in learning more about the Lake Wise Program. Please see the Lake Wise website for more information about this program, including a list of best management practices to protect Vermont's shorelands. The BMP Fact Sheets are "homeowner" friendly with techniques to manage stormwater runoff, protect water quality, wildlife habitat, and property, and provide a good starting point for learning more about what makes a "Lake Wise" property.

Any lakeshore owner can participate in the Lake Wise Program, including state parks, town beaches, private homes and businesses. The Program is currently growing on inland lakes (Vermont has about 810 lakes, other than Lake Champlain) and although Lake Champlain shoreland owners are welcome to participate, there has been slower interest in the Program along the shore of Lake Champlain.

As you will see from our list of best management practices, utilizing riprap to control shoreline erosion is only one of many solutions and we feel it should be used as a last resort. Often, shoreline erosion problems can be addressed by limiting foot traffic,

diverting upland runoff, and stabilizing banks with native vegetation. These are more affordable and lower-impact solutions that still protect water quality and property values. Where there is severe bank instability, whenever possible we promote using Bioengineering Methods to solve an eroding bank. A new Manual on Bioengineering Methods, which use native plants and biodegradable products to stabilize slopes, is due out in early 2021 and will offer alternatives techniques to rip rap for stabilizing shorelands.

Every November, the Lake Wise Program offers the Natural Shoreland Erosion Control Certification training for all those who live and work along shorelands, such as contractors, engineers, landscapers, environmental consultants, and shoreland owners. Shoreland BMPs and Bioengineering solutions are taught during this training which helps spread the word and introduce these softscape engineering methods to more professionals, with the goal that they will be more widely practiced and become the "norm" for improving shoreland erosive issues and protecting Lake Champlain. Attending the NSECC training is also a great place to start to guide efforts towards creating a "lake friendly" and Lake Wise property and more information about these trainings is available on the Lake Wise or NSECC web sites.

Comment: looks like most of the plan is based on training and support and very little on requirements or mandates. I think it is time to put some substantial penalties on the worst behaviors.

Response: Pursuant to Act 64 (2015), the Vermont Clean Water Act, new regulations were enacted to ensure that all sectors contribute to a reduction of pollutant loading to surface waters in Vermont. Any violation of these regulations will be address through enforcement actions, either through the ANR or Vermont Agency of Agriculture, Food and Markets (AAFM).

Comment: I am skeptical that injection will help in the long-term. My view is that this landscape cannot handle the large number of animals in these large farms unless their manure is treated/digested. It looks to me like BMP is inadequate this landscape cannot handle the large number of animals in these large farms unless their manure is treated/digested. It looks to me like BMP is inadequate

Response: The Vermont AAFM requires that farms meet the Required Agricultural Practices regulations that, among other things, require that nutrients, including manure be managed in a manner that does not lead to over fertilization of soils or runoff to water. Manure injection is one of many tools for achieving this requirement. With the passing of Act 64 in 2015, the vast majority of fields in cultivation will need to be part of a nutrient management plan that meets detailed state and federal standards. Nutrient

management plans require that soils receive no additional nutrients over what a crop is expected to take up during the growing seasons. Limiting the amount of manure that can be spread on or injected into fields in this way may require a farmer to adjust animal numbers appropriately or alternatively manage manure to meet the nutrient management plan and regulatory requirements.

Comment: Are sailboats not included because too small an issue?

Response: Sail boats have not been identified as a significant source of pollutant loading to Lake Champlain. The Agency does support partners' work to educate boaters about protecting surface waters. The Department of Fish and Wildlife also works with marinas to use federal Clean Vessel Act Grant to construct, renovate, operate, or maintain pump out stations for recreational boaters.

Comment: The Colchester Selectboard requests that there is inclusion in the implementation table of reference to completion of a Malletts Bay Sewer Project which was included in the 2015 Plan. following key points in support of this request.

1. Following the completion of a 4 year, $2 million water quality study funded by the United States Environmental Protection Agency, (Integrated Water Resources Management Plan, IWRM) a team of professional engineers and scientists recommended that the best way to ensure the public health in the bay was to install municipal sewers in Malletts Bay.

2. The current Town Plan identifies the Malletts Bay Sewer Project as a high priority to address high-risk septic areas and water quality in Lake Champlain, (Malletts Bay).

3. In a 11/19/15 memo from Neil Kamman of the Vermont DEC, Mr. Kamman concluded that the Malletts Bay Sewer Project was necessary to maintain Water Quality Standards during dry weather flow, and, to maintain the intent of the Water Quality Classification for the receiving water in question, (Malletts Bay).

4. The 2015 Basin 5 Tactical Basin Plan specifically identified the Malletts Bay Sewer Project in the implementation table. The project was assigned a high priority and listed the Vt. DEC as a project partner. The project description read as follows.

“Consider a sewer line along the inner bay, supported by the state revolving loan funds if project meets criteria used by the DEC Facilities Engineering Division. Provide technical assistance to support application.” We have always interpreted this language to mean that the DEC considered the completion of the Malletts Bay Sewer project as a high priority, as opposed to simply assisting in the advancement of a project. To place high priority on only assisting in the advancement of a project versus actually

completing the project would seem to be somewhat counterproductive to achieving important water quality goals.

As you are aware, the Malletts Bay Sewer project was defeated in March of 2019 by a narrow margin. Following this vote, we requested that our citizen-based Planning Commission re-evaluate options to address ageing and failing septic systems in Malletts Bay. Similar to the IWRM, options re-evaluated included the use of both individual and community based decentralized wastewater disposal systems. After 6 months of additional study, including extensive public outreach, the Planning Commission concluded that the best option was to install municipal sewers.

At this time, the Town of Colchester continues to consider this as a high priority project and intends to continue working with the community to advance this project in a manner that is publicly supported. We are hopeful that the Vt. DEC will continue to serve as a valued partner in this project and will continue to specifically identify this as a high priority project in the proposed 2020 Basin 5 Tactical Basin Plan.

Response: The TBP lists strategies associated with distribution of technical or financial assistance that the Agency or partners will provide over the next five years to restore or protect surface waters, including infrastructure development and maintenance. The surface water benefits that would accompany completion of The Malletts Bay Sewer Project are reflected by the identification of the project in the Intended Use Plan and Priority System for access to Clean Water State Revolving Fund (CWSRF) loans and related pollution control grant funds, subject to availability, in addition to the TBP. The project is highlighted in page 28 of the 2020 Intended Use Plan.

ANR staff with partners will continue to assist Colchester with tasks that will lead to reduction of bacterial loads to the bay. This can be now found under strategy #22 in the TBP's implementation table, "Assist communities in addressing inadequate individual onsite wastewater treatment on small, challenging sites through the planning and development of solutions, including community wastewater systems or innovative/alternative onsite systems, in addition to use of WWTF". A priority area field in the strategy includes "interested communities." We have added "Colchester" to this field and made specific reference to Colchester's ongoing need in Strategy 22(a).

Comment from Mary Houle follows:

Comment: a fair amount of effluent, residual muck rests in the lakes, is there a way to harvest that which is considered a nutrient to re-place back on the land?

Response: Dredging lake sediment is generally prohibitively expensive and has not been identified as a cost-effective means of addressing nutrient enrichment.

The following comments regarding editorial changes have been accepted or addressed as follows and incorporated in the final plan, where applicable:

(Following comments from the Lewis Creek Association)

Comment: Page 14: suggest adding web links to Lewis Creek Association, Chittenden County Stream Team (now called Rethink Runoff Stream Team) and the Town of Colchester's Integrated Water Resources Management Study.

Comment: Page 23, Table 3: add missing ID#s for Long Lake and Colchester Pond

Comment: Page 32, ERAF discussion: correct to read "Ten of the 19 municipalities have been granted "early adopter" status by the DEC adopted River Corridor Protection, qualifying for…."

Comment: Page 65, Table 14: add Munroe Brook to South Burlington row in table

Comment: Page 66, three-acre permit discussion: add a comment describing current delay to issuance of permit due to COVID-19.

Comment: Page 70: correct 2nd bullet to read "including support of the Chittenden County Rethink Runoff Stream Team and Franklin County Stormwater Collaborative; add to 7th bullet as follows: "collaborative partnership and the stormwater Best Management Practices promoted by Rethink Runoff and the Franklin County Stormwater Collaborative.

Comment: Page 71, 4th paragraph: add to read, "as well as a variation that suits gravel or dirt roads and one that suits curbed roads with catch-basins and outfalls."

Comment: Page 102, Developed Land, Strategy #14: correct to read "for development of Phosphorus Control

(Comments from the CCRPC)

Comment: Page 115, Table 21: change column for South Hero Land Trust to read "Local Land Trusts" then add footnote under table referencing: "e.g., South Hero Land Trust, Charlotte Land Trust, Hinesburg Land Trust, etc."

Comment: Page 116, RSEP discussion: update bold text to read "Chittenden County Rethink Runoff campaign / Rethink Runoff Stream Team" ……"across a nine-town area (Burlington, Colchester, Essex, ……"……"The project utilizes targeted media advertisements and social networking tools…" "The project is managed by the Chittenden County Regional Planning Commission with Stream Team efforts delegated to the Winooski Natural Resources Conservation District while website design and

media purchases are managed by a subcontracted marketing firm. Special focus is placed on impaired streams in eight of the nine municipalities….

Comment: Page 123, Englesby Brook: correct status to read "Completed"

(Comment from the Friends of Northern Lake Champlain)

Comment: Please include current mission statement: Friends of Northern Lake Champlain is a non-profit, citizens' group dedicated to the rehabilitation and protection of Missisquoi Bay and northern Lake Champlain. Through educational programs and community involvement we strive to foster public and governmental awareness of the environmental issues affecting water quality.