Lake Memphremagog, Tomifobia and Coaticook Basin overview

The Vermont portions of the St. Francis River watershed encompass a total of 589 square miles including the Vermont portions of the Lake Memphremagog watershed and the Tomifobia and Coaticook river watersheds. There are 90 inventoried lakes and ponds in the watershed covering 17,660 acres or over five percent of the basin. The Lake Memphremagog drainage basin encompasses a total of 687 square miles of which 489 square miles (71%) are in Vermont and 198 square miles (29%) are in the Province of Quebec in Canada (see Figure 5). Although much more of the watershed is in the United States, about three-quarters of the lake's area is in Canada. There are three main rivers in the U.S. portion of the Lake Memphremagog basin - the Black, Barton and Clyde rivers, which flow northerly into the southern end of Lake Memphremagog.

Almost all of the Tomifobia River is in Canada although two significant tributaries, Holland Brook and Stearns Brook and their watersheds, are largely in the United States. The Coaticook River originates at the outlet of Norton Pond and flows northeasterly for over six miles passing just west of Norton and into Canada.

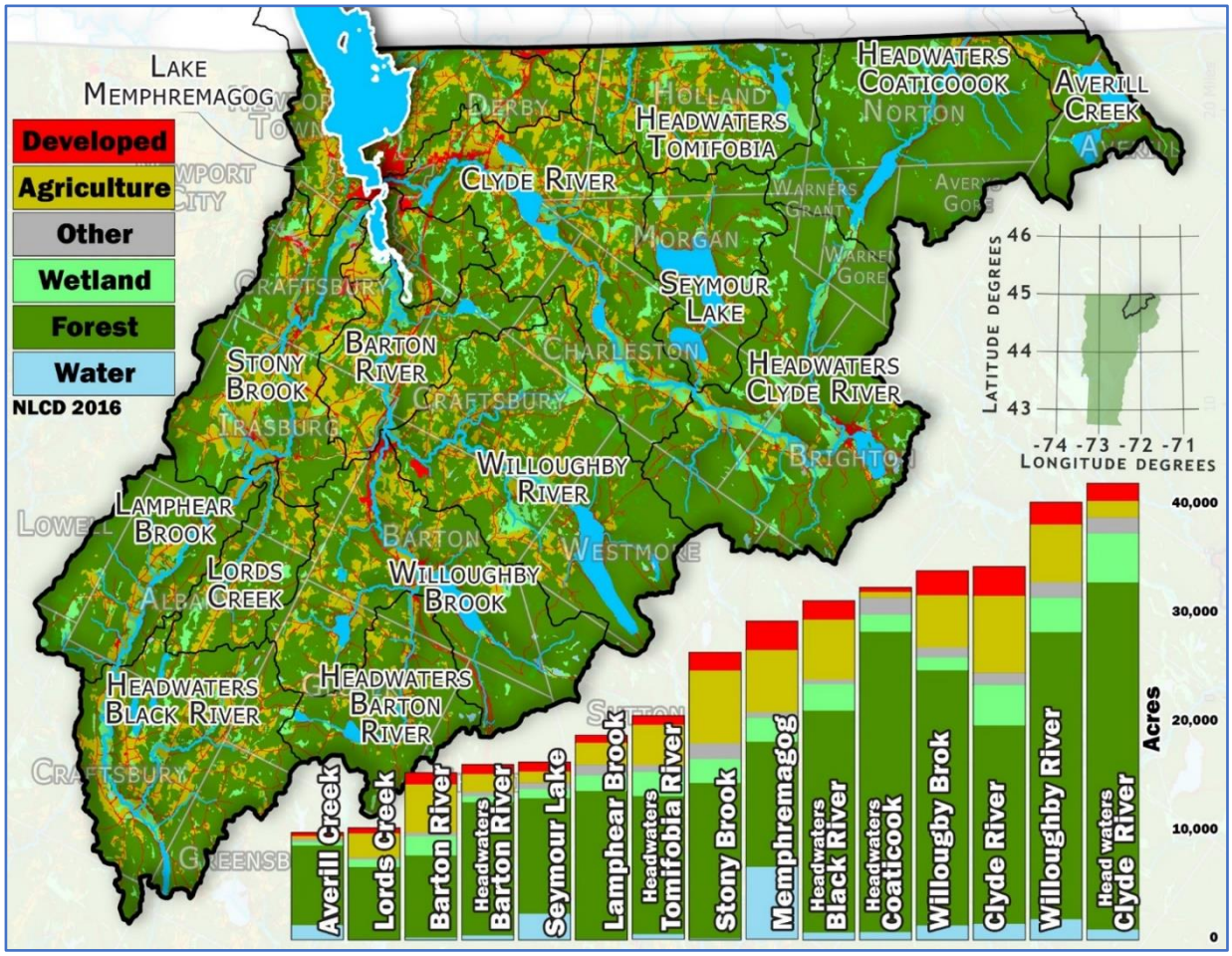

Figure 1. Land Cover by Acreage of Sub-watersheds

Executive Summary

Basin 17, the Lake Memphremagog Tomifobia and Coaticook Watershed, covers approximately 589 square miles, where waters flow north into the Saint Francis River. The majority of the watershed flows into Lake Memphremagog, a shared waterbody with Quebec, or into the Tomifobia River which flows into Lake Massawippi, two waterbodies impacted by elevated phosphorus levels. This Tactical Basin Plan (TBP) provides a detailed description of current watershed conditions and identifies water quality focused strategies to protect and restore the Basin's surface waters.

Although many surface waters monitored meet or exceed water quality standards, there are waters in need of restoration and continued monitoring. Thirty-three lakes, ponds, or river segments are identified for restoration. Two river segments and six lakes are considered impaired, five lakes and four rivers are considered altered by flow regime, three lakes are altered by aquatic invasive species (or AIS) and 13 lakes are impacted by increasing nutrient trends. Chapter 3 also includes progress reporting and target setting for the Lake Memphremagog Phosphorus Total Maximum Daily Load (TMDL).

Sector-based strategies are proposed to meet protection and restoration goals, including targets of the Lake Memphremagog Phosphorus TMDL, with a focus on voluntary participation and project implementation by watershed partners and the Basin's Clean Water Service Provider. Sixty-eight detailed strategies and 57 monitoring priorities are recommended for the next five years for implementation by ANR and many watershed partners, a number of which have been building capacity for this work. Monitoring priorities have been identified to fill data gaps, track changes in water quality condition, and identify waters for reclassification and Class I wetland designation.

Table 1. Focus areas and priority strategies for restoration and protection.

	Focus Areas	Priority Strategies
Agriculture	Lower Black, Lower Clyde, Willoughby, Direct to lake Memphremagog, Mud, Walker Ponds, Stearns Trib, Roaring Branch watersheds. Lake Parker, Shadow Lake, Lake Willoughby, Echo Lake, Lake Salem, Seymour Lake watersheds. Figure 8 target subwatersheds	• Target field Best Management practice (BMP) practice implementation in high priority watersheds. • Develop a pilot program to develop and implement trapping and control practices identified using Agricultural Conservation Planning Framework. • Improve nutrient management practices (NMP) through technical support, NMP workshops, and financial support for improved nutrient utilization. • Implement NMPs and associated agricultural water quality practices in high priority catchments. • Support monitoring efforts to track results of practices applied in priority watersheds and tell farmer success stories. • Support farm teams, conservation equipment programs, soil health assessments, and farmer participation in the pay for phosphorus program.

	Focus Areas	Priority Strategies
Developed Lands - Stormwater	Basin-wide with focus on Lake Willoughby, Little and Great Averill, Bean Pond, Crystal Lake, Echo Lake, Holland Pond, Parker Pond, Lake Salem watersheds and Newport City, Derby, Barton, and Glover	• Develop designs and implement stormwater treatment projects in the Memphremagog Stormwater master plan and subsequent assessments. • Support the design and implementation of small-scale stormwater practices through formula grant funding. • Provide outreach and technical support to landowners with 3 acre parcels to support early design and implementation of stormwater practices. • Develop a list of erosive stormwater outfalls and work with landowners and municipalities to stabilize and restore sites. • Develop a residential landowner stormwater BMP campaign/brochure to raise awareness of simple stormwater management solutions.
Developed Lands - Roads	Little and Great Averill, Bean Pond, Crystal Lake, Echo Lake, Holland Pond, Parker Pond, Lake Salem, Lake Willoughby, Albany, Charleston, Craftsbury, Derby, Glover, Holland	• Coordinate the work of partners through the NEK Rivers and Roads Workgroup to provide and support training for road crews. Develop prioritization and design guidelines to address gully erosion from road cross culvert outlets and failed class IV roads.. • Provide technical support to towns to implement priority MRGP projects. • Develop private road phosphorus reduction estimates and complete private road segmentation and assessments. • Develop a phosphorus control plan for state transportation infrastructure in the Lake Memphremagog watershed as required by the state transportation permit TS4 permit.
Wastewater	Barton, Brighton, Glover, Orleans, Newport City, Lake communities	• Support towns in completing Wastewater Treatment Facility (WWTF) optimization efforts. • Provide technical and financial support for the town of Brighton to increase the level of phosphorus treatment for the Brighton WWTF. • Promote septic system maintenance and ANR Village Wastewater Solutions.
Rivers	Lower Clyde River, Middle Barton River, Black River, Lower Johns River, Mad Brook, Shalney Branch	• Develop a basin specific tool to estimate phosphorus reduction potential of stream projects and train local partners on this tool. • Complete phase 2 lite geomorphic assessments on priority reaches and implement priority stream protection and restoration projects. • Pilot low tech “process based” restoration and hydroseeding techniques. • Provide support for Municipalities to update flood hazard bylaws and to consider adoption of river corridor protections with new Federal Emergency management Agency (FEMA) maps. • Implement Aquatic Organism Passage (AOP), strategic wood addition, and dam removal projects.
Lakes	Willoughby, Shadow Parker, Salem, Echo, Seymour, Crystal, Great and Little Averill, Norton, Island, Holland, Bean, Memphremagog	• Develop lake watershed action plans and implement priority projects. • Increase local capacity for designing and implementing lakeshore projects. • Initiate, maintain, and build the capacity for aquatic invasive species spread prevention programs including Public Access Greeter and Vermont Invasive Patroller Programs. • Where applicable, increase protections for high-quality lakes through reclassification and/or Outstanding Resource Water Designation

	Focus Areas	Priority Strategies
Wetlands	Bucks Flats (Clyde River)	• Develop wetland restoration phosphorus reduction credits for the Lake Memphremagog watershed. • Develop and implement priority wetland restoration projects. • Develop an approach for funding and stewardship of small-scale wetland restoration projects including process-based wetlands restoration projects. • Provide support to the Wetlands Program for publicizing updated wetland mapping and local efforts for reclassification.
Forests	Headwaters of: Mad Brook, Nutting Brook, Brownington Branch, Sucker Brook, Minister's Brook, Webster's Brook, Pherrins River	• Complete forest road inventories and implement priority projects on state and private lands. • Develop Memphremagog specific forest road and trail reduction estimates. • Identify and implement feasible forest gully projects. • Support the use of skidder bridges through rental and incentive program. • Work with trail clubs to implement trail erosion control projects.

The 2017 Basin 17 plan identified 66 strategies to address protection and restoration of surface waters. Of the 66 strategies identified, 19 are complete, 38 are in progress, eight are awaiting action, and one is discontinued (Figure 2). The Basin 17 report card, available online on the Basin 17 webpage includes a list of detailed updates for each strategy identified in the 2017 Plan. Several strategies were carried over to this plan.

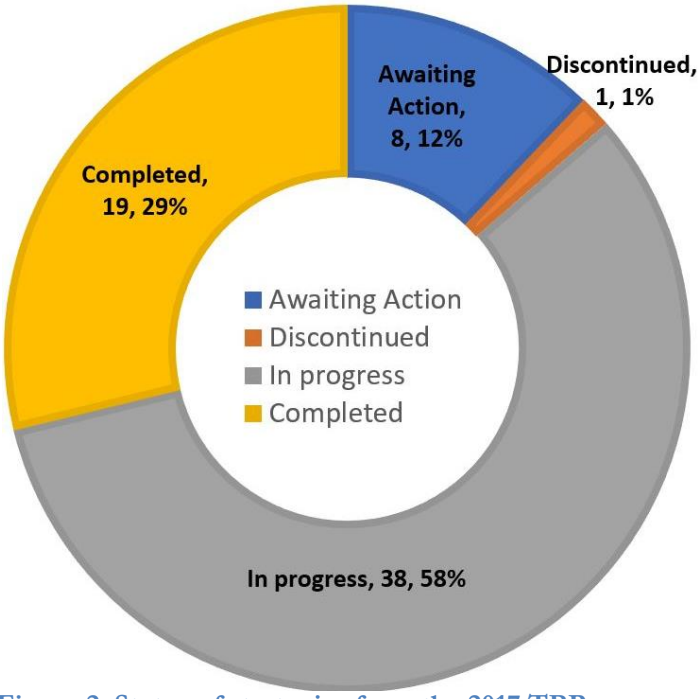

Figure 2. Status of strategies from the 2017 TBP

The 66 priority strategies identified in this plan reflect input from the public, state and federal water quality staff, sector-based workgroups, watershed groups, and regional planning commissions. During the basin planning process, stakeholders expressed that unified clean water messaging, technical support and training on how to protect and maintain surface waters, and continued financial and technical support, are all critical to meet water quality goals. There was a strong sentiment that all waters in the Memphremagog River Basin should be protected regardless of their current status. The importance of ensuring access to waters for all members of the community was identified including ensuring clean surface water for consumptive and recreational uses and the safe consumption of fish, access to waters for recreation for all abilities and economic levels, open space availability and access in more densely populated and equitable implementation of clean water projects.

What is a Tactical Basin Plan?

A Tactical Basin Plan (TBP) is a strategic guidebook produced by the Vermont Agency of Natural Resources (ANR) to protect and restore Vermont's surface waters. TBPs target strategies and prioritize resources to those actions that will have the greatest influence on surface water protection or restoration. TBPs are integral to meeting a broad array of both state and federal requirements including the U.S

Figure 3. Policy Requirements of Tactical Basin Planning

Environmental Protection Agency's (EPA) 9-element framework for watershed plans (Environmental Protection Agency, 2008) and state statutory obligations including those of the Vermont Clean Water Act, and 10 VSA § 925 and 10 V.S.A. § 1253 (Figure 3).

Figure 4. 5-year Basin Planning Cycle

Tactical basin planning is carried out by the Water Investment Division (WID) in collaboration with the Watershed Management Division (WSMD) and in coordination with other state agencies and watershed partners. A successful basin planning process depends on a broad base of partnerships with other state agencies, federal, regional, and local governments, organizations, and stakeholders, including citizens and non-profits groups and academic institutions. The partnerships support and strengthen the Agency's programs by proposing new ideas and input, increasing understanding of water quality issues, and building commitment to implementing solutions.

Basin-specific water quality goals, objectives, strategies, and projects described in this Plan aim to protect public health and safety and ensure public use and enjoyment of Vermont waters and their ecological health as set forward in the Vermont Surface Water Management Strategy (VSWMS) and the Vermont Water Quality Standards (VWQS). The TBP process shown in Figure 3, allows for the issuance of plans for Vermont's fifteen basins every five years.

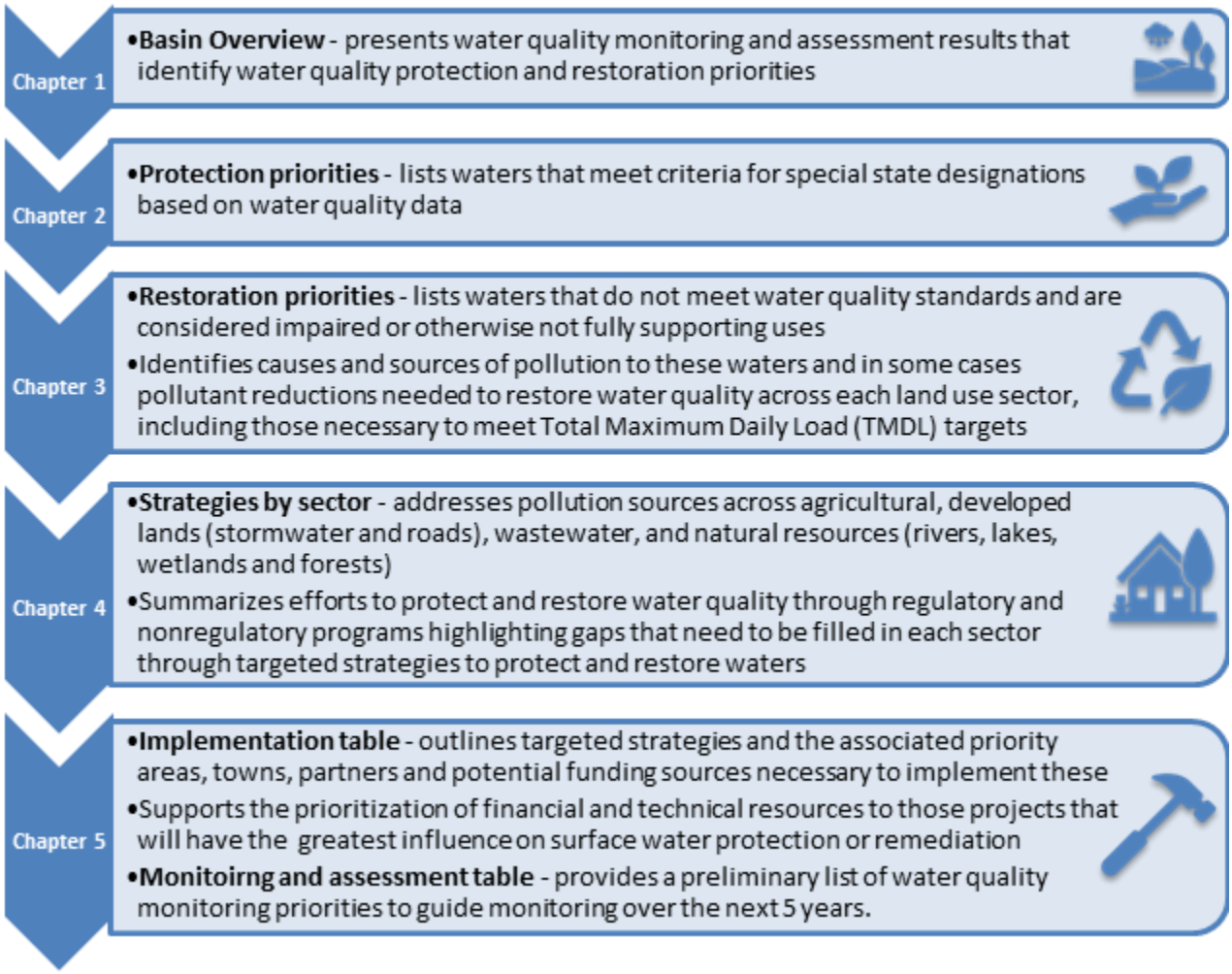

Figure 5. Chapters of Tactical Basin Plans

Chapters 1 through 4 in the TBP describe water quality in the Basin, protection and restoration priorities, and efforts to protect and restore water quality for each sector. This information supports the targeted strategies listed in the implementation table in Chapter 5 (Figure 5).

Tactical Basin Plans identify strategies that help ANR, and its partners, prioritize activities for the next five-years. These strategies inform individual projects that are identified and tracked in the Watershed Projects Database (WPD) and the Watershed Projects Explorer. The Project Database and Explorer are found on ANR's Clean Water Portal and are continuously updated to capture project information throughout the TBP process.