

VERMONT STORMWATER MASTER PLANNING GUIDELINES

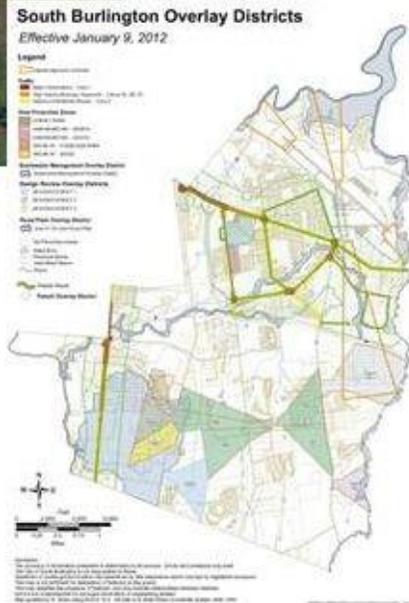
Danville



Springfield



Barre City



South Burlington

AGENCY OF NATURAL RESOURCES
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Clean Water Initiative Program
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Revised

<http://dec.vermont.gov/watershed/cwi/solutions/municipal-stormwater>

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I. What is stormwater and why is it an issue?

Stormwater runoff is any form of precipitation (rain or melting snow and ice) that runs off the land. Under natural conditions, this runoff is but a small percentage of the total precipitation with the vast majority of water either infiltrating into subsurface soils and deep groundwater reserves or evapotranspiring into the air. This process is generally known as the hydrologic cycle.

Experience has shown that human developments have a significant impact on the hydrologic cycle. These impacts are usually a result of increasing impervious area. As impervious cover increases, infiltration and evapotranspiration rates decrease which leads to a subsequent increase in stormwater runoff.

The concept of a municipal stormwater management plan was a result of a national stakeholder process. The stakeholders concluded that a comprehensive municipal stormwater management plan was the most cost effective approach for addressing stormwater runoff. The goal of stormwater planning is to protect or maintain the health of streams, lakes and aquatic life as well as to provide opportunities for human uses of water by mitigating the effects of urban development.

II. Why do we need to plan for stormwater?

- (1) Pollutants are mobilized in runoff from impervious and roadway surfaces including: sediment, nutrients, pathogens (animal waste, overflows from combined sewer systems), metals, hydrocarbons, wash-off of air pollution particulate matter, trash and debris;
- (2) Runoff leads to flow alterations: changes in land use perviousness lead to changes in hydrologic patterns often leading to channel erosion and channel instability;
- (3) Runoff leads to habitat alterations, and to siltation/sedimentation changes in rivers and lakes which impact macroinvertebrates (insect life) and fish;
- (4) To maintain healthy and viable communities and to prevent sprawl we need to minimize impacts to water quality from our downtowns and designated growth centers;
- (5) The current estimated cost to restore water quality for the 19 water bodies in the state principally impaired by stormwater runoff in Vermont is well over \$100 million dollars;
- (6) Runoff impacts human use and enjoyment of surface waters.

Federal and State laws will require the following water pollution mitigation plans or Total Maximum Daily Loads (TMDLs) to be implemented:

- Nutrient-based TMDLs
 - Lake Champlain Phosphorus TMDL
 - Lake Memphremagog Phosphorus TMDL
 - Connecticut River Long Island Sound Nitrogen TMDL
- Flow-based TMDLs
 - 19 urban or developed land stormwater impaired watersheds
- Bacteria-based TMDLs
 - 22 bacteria impaired stream or river segments

Other state and local planning efforts such as the ones listed below, acknowledge how regional and localized flooding and water quality problems can stem from ineffective or lack of effective management of stormwater runoff, giving further justification for sound stormwater planning and management:

- (1) State All-Hazards Mitigation Plans;
- (2) State local road and bridge funding tied to water quality practice implementation;
- (3) Surface drinking water source protection plans;
- (4) Road and culvert inventories and asset management of those inventories; and,
- (5) Voluntary or mandated adoption of the six minimum measures of the federal municipal separate storm sewer system (MS4) permit.

III. How is stormwater runoff typically managed?

Stormwater runoff has historically been addressed by way of engineered systems. A standard technique is to use piped conveyance. Piped conveyance is a strategy that moves water to a specific discharge point using piping, catch basins or inlets and links impervious surfaces together.

Piped conveyance systems unfortunately are singular in function and do not provide any additional ecological benefits. They do little to prevent stormwater runoff from occurring in the first place. Their use does not get us closer to the natural hydrologic cycle. Since 1978 the state has regulated stormwater runoff from new development. In 2002 the state adopted a unified sizing criteria that addressed 4 different storm sizes and groundwater recharge. In 2002 a modest stormwater requirement for redevelopment also became law. Many urbanized areas predate the state stormwater regulations and are piped conveyance systems with no stormwater treatment. State stormwater regulations cover about 5% of all the impervious cover in Vermont.

IV. Stormwater master planning: making better use of limited dollars by targeting high priority stormwater projects.

The cost to complete and implement the plans above as well as maintain our existing wastewater, stormwater and drinking water infrastructure are enormous and well beyond any one year's allocation of financial resources (VTDEC, 2013). It will take many years of concerted effort to achieve the goals that we have set to conserve and improve Vermont's waters. We can be more effective with federal, state and municipal dollars, if we plan carefully and implement practices cost effectively. Taking a more cost-effective approach in addressing stormwater involves targeting areas based on our knowledge of: (1) where pollution is generated; and, (2) where it can be captured and removed efficiently and at the least expense. For urbanized areas and rural road networks, developing stormwater master plans is a first step in that effort. In the appendix of these guidelines is a table listing all Vermont towns, the current status of stormwater master planning in the town and a suggested template, or templates, the town could use to better manage its runoff.

V. Why will stormwater master plans be more effective than what we are doing today?

First, stormwater master plans can prevent problems from happening either by mitigating impacts before they create problems or by avoiding the creation of problems; prevention is cheaper than restoration. If we are to avoid the high cost of restoring degraded surface waters we must better

manage stormwater runoff before the waters become impaired. Second, plans are developed with public involvement and comment and so should be as comprehensive as possible in listing all known problems. Third, because plans are based on a prioritized list of projects or a strategic approach they are more likely to succeed than a reactionary approach that addresses problems as they arise. Historically almost all municipalities have responded to stormwater runoff or drainage problems the latter way, and frequently during an emergency or after a structural failure has occurred. Finally, stormwater management plans contain important information about preserving natural features and functions of a watershed, and provide a list of evaluated alternatives such as using traditional pipe (gray) infrastructure versus more efficient and economic green infrastructure.

VI. What can we expect if stormwater master plans are developed and implemented?

- A better targeting of limited funds to high priority projects;
- Community road-maps to achieve and protect water quality into the future;
- “Demonstration Projects” for under-tested but promising technology;
- Fewer downstream stormwater impacts from upstream (local or regional) incremental and subjurisdictional (nonregulated) growth;
- Increased awareness and involvement by a more educated public of stormwater runoff and its long term impacts; and,
- Greater awareness and ownership by the public in finding and implementing stormwater solutions.

VII. How does a stormwater master planning effort start?

There are many ways for a master plan to be developed. For example, plans have been created by a developer or large landowner in order to provide an orderly and more easily permitted means to develop a subdivided parcel. Plans have been developed by a municipality to address a localized stormwater flooding or instream erosion problem. These guidelines will provide a number of different master plan examples that either exist in Vermont today or have the potential to work in Vermont. In order to be successful any plan must be understood by, and have the support of, the majority of landowners it will impact.

VIII. Does stormwater management make sense in rural towns of the state without urbanization or large areas of impervious surfaces?

Stormwater runoff that degrades surface and groundwater comes from impervious surfaces and all land clearing and land use conversion activities (Booth, 2000, 2002; DeGasperi et. al., 2009). State and Federal laws are largely crafted around the impact that runoff from impervious surfaces has on surface and ground water. Impervious surfaces create the largest volume of runoff per unit area, but all land clearing activities have an impact. Golf courses, ski trails, timber stand improvements, hobby farms, corn fields, suburban lawns, all increase runoff volume and can cause negative impacts on receiving waters. These land uses can deliver pollutants and water volume more directly as a result of decreased soil and vegetation absorption and enhanced pathways or drainage routing. Rural towns can better manage the runoff from these areas when a documented problem arises or has the potential to occur. We increase the flood resiliency of our watersheds and reduce the risk of downstream property damage or personal loss during certain storm events by improving runoff management via detention and infiltration. We will

also increase our flood resiliency by increasing conveyance capacity of the system through basic maintenance of our drainage structures such as the removal of sediment from piping and inlets.

IX. How can stormwater master planning interface with growth center planning?

Growth center planning in Vermont emphasizes the protection and enhancement of historic growth patterns by providing a formal designation with benefits for downtowns, village centers, new town centers and areas around these centers (VTDHCA, 2007) including designated neighborhood development areas. As part of the growth center planning process, municipalities must undertake several steps that parallel steps often needed to create a stormwater master plan.

Growth center planning requires:

1. A 20-year development build-out analysis;
2. A 5-year capital improvement plan for wastewater and stormwater infrastructure, with a 20-year projection estimate;
3. An inventory of existing and planned public parks and open spaces; and,
4. The identification of all existing natural resources, a discussion of the anticipated impacts by the proposed growth center and a plan to mitigate those impacts.

The mitigation of existing stormwater impacts to water resources can best be addressed through a comprehensive approach of stormwater management. Designated new town centers typically accomplish this requirement by receiving a state stormwater discharge permit for the entire town center similar to the example shown in Template 1a. Several of the master stormwater plan templates described below have been used in the other designated growth areas as well.

X. What is the basic outline of a stormwater master plan?

The following describes a framework or road map that can apply to a range of stormwater problem needs. Not all water quality problems, either based on local or regional problems, need the same level of effort for plan development. It is important to note that master plans can emphasize structural improvements such as stormwater treatment practices, nonstructural practices such as enhanced tree canopy, impervious cover disconnection, a zoning overlay district/ordinance impacting new development or a combination of both structural and nonstructural. Ultimately stormwater master plans should be inserted into implementation tables of VTDEC Tactical River Basin plans which are developed every 5 years. The inclusion of the master plan, as well as a schedule for implementation of the master plan tasks in the basin plan, will be a prerequisite for VTDEC Clean Water Initiative Program grant funding in the future.

The templates described in this document exemplify roughly three size scales: (1) site or local, (2) community, subwatershed or watershed and (3) regional or multi town. The basic ingredients of a stormwater master plan can be summarized in outline form on the following page.

Model Outline for Stormwater Master Plans

- I. *Problem Definition*
 - a. *Water quality or water quantity problems*
 - I. *Biological or chemical monitoring data of receiving waters;*
 - II. *Receiving stream or river geomorphic data.*

- II. *Existing Data Collection*
 - a. *Geographic Information Systems (GIS) data – Stormwater infrastructure, impervious surfaces, soils, wetlands, watershed-subwatershed boundaries, culvert and bridge inventories, roads, stormwater best management practices, tree canopy cover, elevation data, slope, build out analyses and land use;*
 - b. *Existing reports/studies of water quality problems (i.e. water quantity or water quality modeling analyses, class 3 or 4 road assessments/inventories, sanitary surveys, surface water drinking water protection plans, stormwater illicit discharge assessments, municipal capital development plans);*
 - c. *Existing Data Analysis - Define priorities for receiving water restoration based on current data, define water quality and/or quantity goals, define data gaps and plan to fill data gaps.*

- III. *New Data Collection*
 - a. *Conduct field surveys (windshield, public polls, public meetings, DPW –Street Dept. meetings, watershed walks, etc.) and compile list of sites contributing to the water quality problem;*
 - b. *Define any field data gaps and plan to fill gaps;*
 - c. *Field data analysis;*
 - d. *Compile list of sources associated with defined water problem;*
 - e. *Prioritize list based using decision matrix that can lead to feasible project selection, funding and implementation.*

- IV. *Existing and proposed program, procedure or practice evaluation*
 - a. *Define existing programs, procedures or practices that address problem;*
 - b. *Define new programs, procedures or practices that could address problem.*

- V. *Summary and Recommendations*
 - a. *Summarize current conditions;*
 - b. *Propose additional system knowledge acquisition based on II c and III b;*
 - c. *Proposed actions for existing development;*
 - d. *Proposed actions for new development;*
 - e. *Coordinate V c and V d actions with municipal capital development plans;*
 - f. *Coordinate public comments/input.*

XI. State or regional contacts for outline problem definition and existing information assistance

Municipalities can find assistance in acquiring the necessary information for a plan from the following sources:

- Vermont Department of Environmental Conservation River Basin Planners:
<http://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/TBP%20Contacts%20Map.pdf>
- Vermont Department of Environmental Conservation River Management Technical Assistance:
http://dec.vermont.gov/sites/dec/files/wsm/rivers/docs/rv_River_Scientist_Regions.pdf
- Vermont Center for Geographic Information: <http://vcgi.vermont.gov/>
- Vermont Department of Environmental Conservation Clean Water Initiative Illicit Discharge and Detection Elimination Program:
<http://dec.vermont.gov/watershed/cwi/manage/idde>
- Vermont Association of Planning and Development Agencies: <http://www.vapda.org/>
- Center for Watershed Protection: Methods to Develop Restoration Plans for Small Urban Watersheds:
http://www.bebuffered.com/downloads/center_watershed_protection_methods_develop_rest.pdf
- Vermont League of Cities and Towns Water Resources Assistance:
<http://www.vlct.org/municipal-assistance-center/water-resources-assistance/>
- Vermont Natural Resources Council Overlay Districts Information:
<http://vnrc.org/resources/community-planning-toolbox/tools/overlay-districts/>

XII. Case studies in Vermont: examples of existing stormwater master plans

Vermont has a number of examples of approaches to stormwater problems that involve stormwater master planning for small villages up to large cities. These examples typically rely on a combination of zoning and public works projects to achieve their goals. These guidelines review 9 templates and briefly discuss the approach each used. The templates are arranged in an order starting with small sites or subwatersheds, increasing to larger watersheds, and then finally to regional or town wide applications. All of the approaches can be considered for use by a municipality. All of these approaches have some limitations and each approach should be revised over time as new information becomes available. The templates cover areas that range in size from one hundred acres to entire townships. In the appendix of these guidelines a table is provided listing all Vermont towns, the current status of stormwater master planning in the town and a suggested template or templates the town could use to better manage its runoff.

Template 1a: Site, local or small watershed approach with planned build out analysis and traditional (end of pipe or centralized) stormwater management

A stormwater master plan can use a local or site industrial park approach for managing stormwater similar to how a developer may propose to manage it. A good example of this is the Middlebury Industrial Park. The key concept is to develop a master drainage plan for each catchment area in the park that takes into account all future build-out conditions and provides either an end-of-pipe stormwater management structure(s), at the catchment area outlet, or decentralized treatment within the park drainage areas at designated areas.



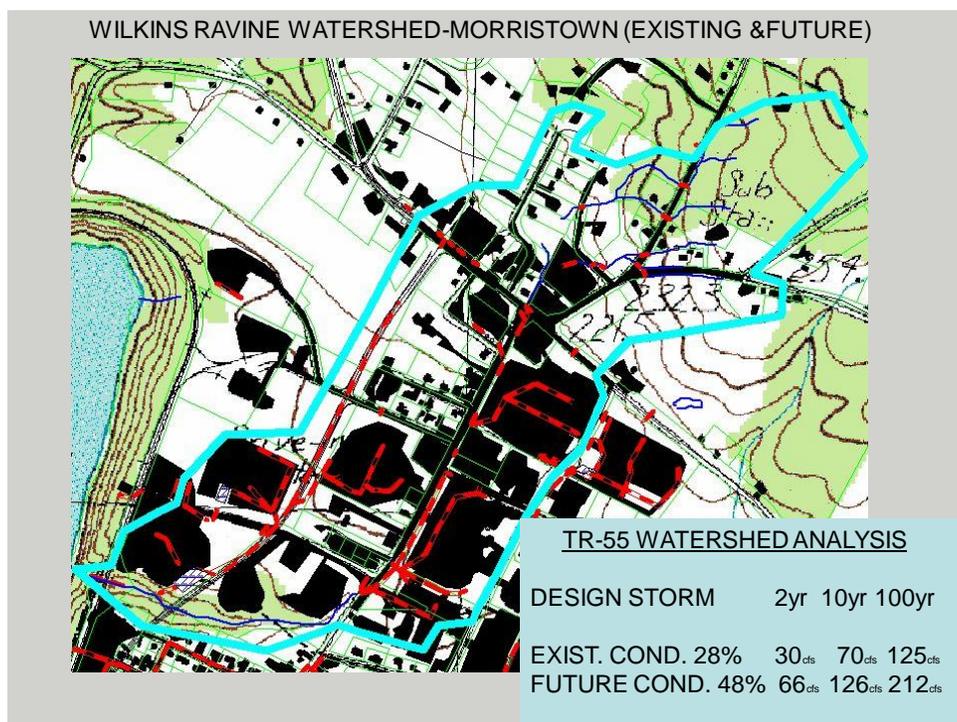
Middlebury Industrial Park – Middlebury

Key: Stormwater Ponds (blue), Parcels in park (aqua blue), swales (green), drainage system (red), streams (grey).

This approach allows the entire park to meet a defined stormwater treatment requirement. Typically large new development projects must meet the Vermont 2002 Stormwater Management Manual design criteria for groundwater recharge (Rev), water quality volume (WQv), channel protection volume (CPv), 10 year peak discharge flood control (Qp10) and the 100 year peak discharge flood control (Qp100). This approach works best when the entity developing the plan initially owns or controls most of the land and has the financial resources or natural resources available to meet these requirements. The advantage to this approach is that the majority of permitting is done up front and therefore minimizes permitting expense and time as each lot is developed. In the Middlebury Industrial Park case 45 acres of impervious cover (roads, buildings, and parking) in the 120 acre park have their permit in place. The stormwater treatment system in the park is a very large wet pond; this also serves as an auxiliary fire protection pond. It can typically take 5-10 years to see complete build out of a park such as this. The owner and/or municipality must manage the stormwater system without a full park association membership sharing in the cost during this period. Ultimately however, the entire system can be handled through a cooperative municipal-park association arrangement where each member pays only their share of the cost prorated to the amount of impervious cover they own. There are numerous examples of industrial or commercial parks statewide that have been developed in this manner. This approach is well suited for municipalities with small urbanized areas or designated growth centers and most land under single ownership such as a municipal industrial park. This template does not fully meet the Model Outline for Stormwater Master Plans (specifically numerals I, II, III and IV).

Template 1b: Site, local or small watershed retrofit approach with traditional (end of pipe or centralized) stormwater management

For more urbanized areas of the state experiencing growth or for growth centers, stormwater master plans may often need to include stormwater treatment retrofits as well as or in addition to future controls based on a build out analysis in order to mitigate the unintended negative consequences of rapid urbanization. One example of this can be seen in the **Town of Morristown**. Since 1965 the commercial north end district of Morristown has been growing, the district is also the regional growth



center for Lamoille County. The district largely drains to an unnamed tributary of the Lamoille River called the Wilkins Ravine. In the late 1990's wastewater expansion feasibility studies conducted by the Town concluded that stormwater infrastructure in the growth center was inadequate. In 2000, an Act 250 permit application for a new development was denied due to the potential for increased erosion and siltation of the Wilkins Ravine and the threat to the trout fishery and habitat of the Lamoille River. In 2001, a culvert upgrade to reduce surcharging stormwater led in 2002 to a failure of a railroad embankment and a massive sediment discharge to the river. In response to this problem, Morristown, with assistance from VTDEC, developed a stormwater master plan consisting of a three phase approach and requiring the implementation of 12 specific tasks. The three phases were:

- Stabilize and clean up the Wilkins Ravine receiving runoff from the north end commercial growth district.
- Install stormwater quality treatment controls and, where possible, quantity treatment controls in the developed area drainage network upstream of the Ravine.
- Reduce the overall volume of stormwater discharging to the Ravine by retaining water on-site and infiltrating to groundwater as much clean runoff as possible.

As part of this plan a TR-55 hydrologic analysis was conducted to estimate the current and future peak runoff from the district. The analysis assumed a 20% increase in the amount of impervious cover (from 28% to 48%) for the future build out condition. Over a period of about 10 years local landowners, the Town, the State, and the US EPA have invested almost one million dollars in stormwater infrastructure upgrades, treatment practices and erosion stabilization. The upgrades and practices are by in large designed and constructed to handle the future build out scenario. In addition, by encouraging, or directing when required, stormwater infiltration in the district, the Town can insure that the drainage system will not require future size upgrades or overwhelm maintenance schedules of the treatment structures. This approach works with municipalities with moderate urbanized areas or growth centers, greater than average growth potential, and multiple land ownership. This template covers all of the elements in the Model Outline for Stormwater Master Plans.

Template 1c: Site, local or small watershed retrofit approach with green stormwater infrastructure (GSI) stormwater management

A more sophisticated master plan example using a green stormwater infrastructure (GSI) approach can be found with the **City of South Burlington's** Bartlett Brook watershed. For a rural state such as Vermont the opportunities to use green stormwater infrastructure are immense. The goal of this form of stormwater management is to distribute or spread out the runoff versus concentrating it. GSI utilizes multiple small pervious areas to distribute the runoff. It minimizes the generation of large volumes and concentrated flows preventing the typical downstream erosion and water quality problems more characteristic of curb and gutter piped drainage systems. If a community has not developed traditional drainage infrastructure or is faced with the need to expand or repair stormwater infrastructure, this approach, when matched with the correct soils, is by far the least energy and capital intensive. Several highly urbanized areas in the state where stormwater and sewage are combined together (combined sewer systems) can also benefit from this approach because of the cost savings.

As part of suburban South Burlington the Bartlett Brook watershed has experienced significant growth in the last 50 years. The watershed soils are predominantly well drained (NRCS hydrologic group A). While highly suitable for infiltration these soils are also highly prone to erosion when runoff is diverted on to the soil's steep slopes. For 30 years, the City has recognized that stormwater runoff can cause significant erosion and water quality problems for the stream; Bartlett Brook is also listed by VTDEC as stormwater impaired. In 1980 the City adopted a zoning overlay district to try and mitigate the impacts of new

stormwater discharges. In 2010 recognizing the changing science of stormwater mitigation the City revised the requirements of the overlay district to mandate the use of GSI. The purpose of the district in part is to:

- To promote stormwater management practices that maintain predevelopment hydrology through site design, site development, building design and landscape design techniques that infiltrate, filter, store, evaporate and detain stormwater close to its source;
- To promote public safety from flooding and streambank erosion, reduce public expenditures in removing sediment from stormwater drainage systems and natural resource areas, and to prevent damage to municipal infrastructure from inadequate stormwater controls.

To accomplish this purpose the City has undertaken an extensive computer modeling and flow monitoring study of the stream to accurately assess the most damaging and erosive stormwater runoff events (1.5 yr frequency: 2.2"/24 hour). The City requires that all new development disturbing more than ½ acre to use GSI practices and that the peak discharge rate from the proposed development site for this rain event not exceed the predevelopment rate. South Burlington's plan also includes additional requirements as part of state and federal permits including: (1) compliance with the six minimum measures of the MS4 permit (Template 3c); (2) stream flow monitoring; and, (3) the development of a stormwater flow restoration plan for the Brook (Template 2c). This approach works best with municipalities with larger urbanized areas, well drained soils, and multiple land ownership. This template covers all of the elements in the Model Outline for Stormwater Master Plans.

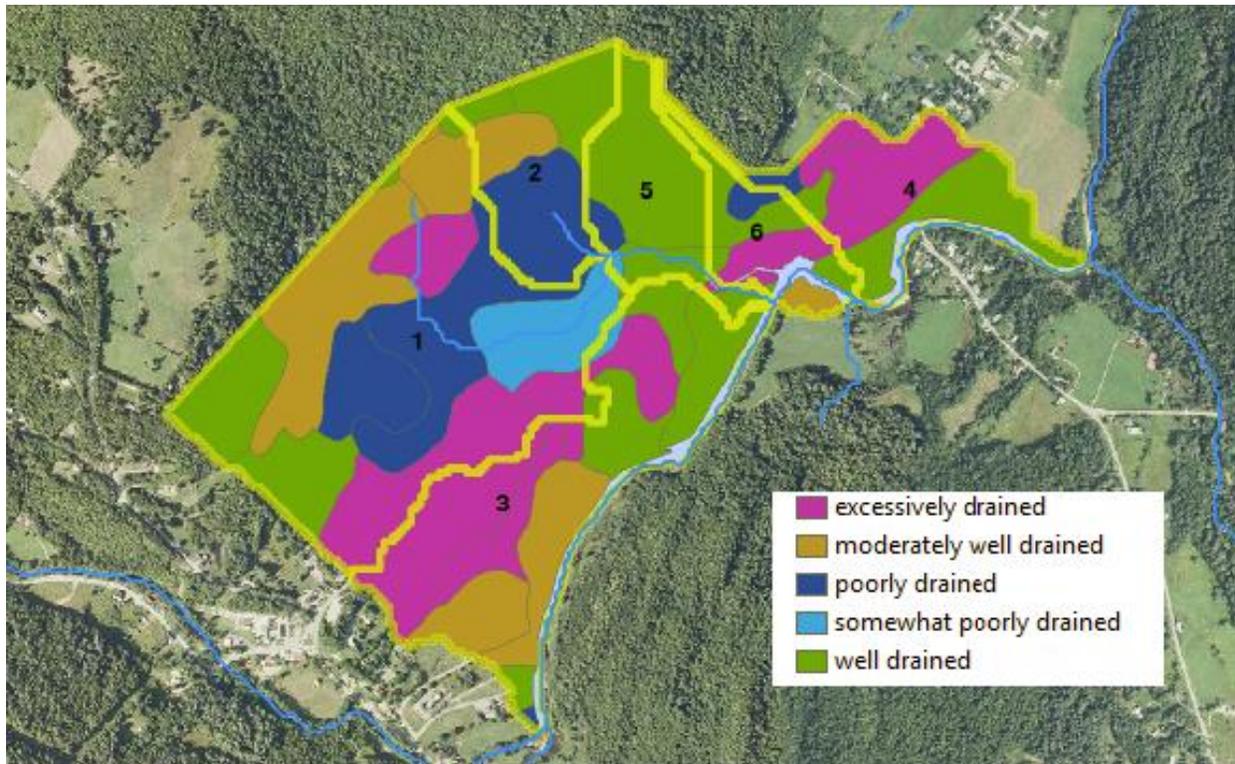


Example of severe erosion in the Bartlett Brook watershed

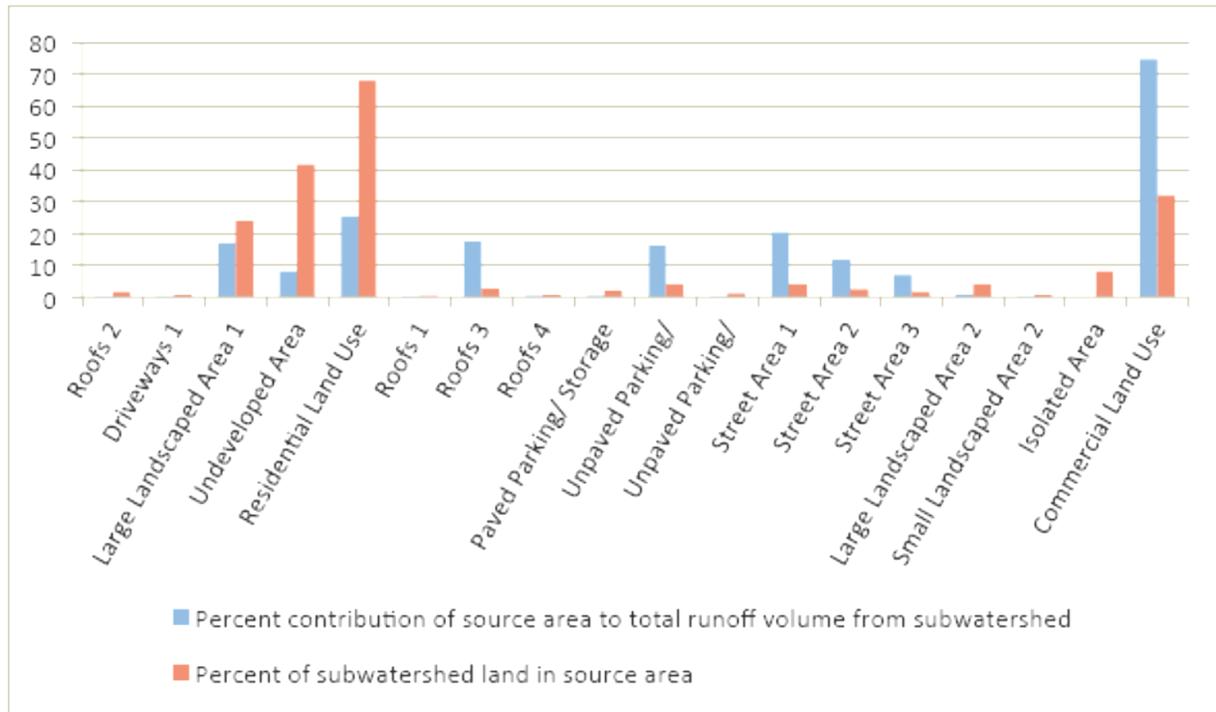
Template 2a: Hybrid site & community retrofit approach with green stormwater infrastructure (GSI) stormwater management

A hybrid community and site scale example of a green stormwater infrastructure option for managing stormwater through a master plan can be seen in the **Town of Waitsfield**. Green stormwater infrastructure can be used for both large and small urbanized areas of the state that are developed on moderate to deep and well to excessively well drained sands or gravels (NRCS hydrologic group A and B soils). In Waitsfield a plan was developed at two different scales: the “community planning scale” and the “site scale”. The plan develops a list of priority areas in the community subwatersheds to be further refined at the site scale. At the site scale GSI retrofit concepts are prepared such as rain gardens, infiltration swales, etc., that are appropriate and “fit” the site. At the site scale there is outreach to property owners or property managers to educate them about the benefits of GSI and gauge their interest. This is followed by both volume and pollutant modeling to determine the benefits that could be achieved from the retrofits. The modeling evaluates different sources within a site area separating out the runoff from roofs, driveways, parking areas, commercial areas, pervious areas, etc. A summary table of GSI concepts is created and a prioritized implementation plan developed based on land owner cooperation and project benefit. This template works best with municipalities with small urbanized areas, well drained (NRCS A-B) soils and multiple land ownership. This template does not fully meet the Model Outline for Stormwater Master Plans (specifically, numerals I, II, and IV).

Waitsfield subwatersheds and soil drainage categories included in GSI stormwater master plan

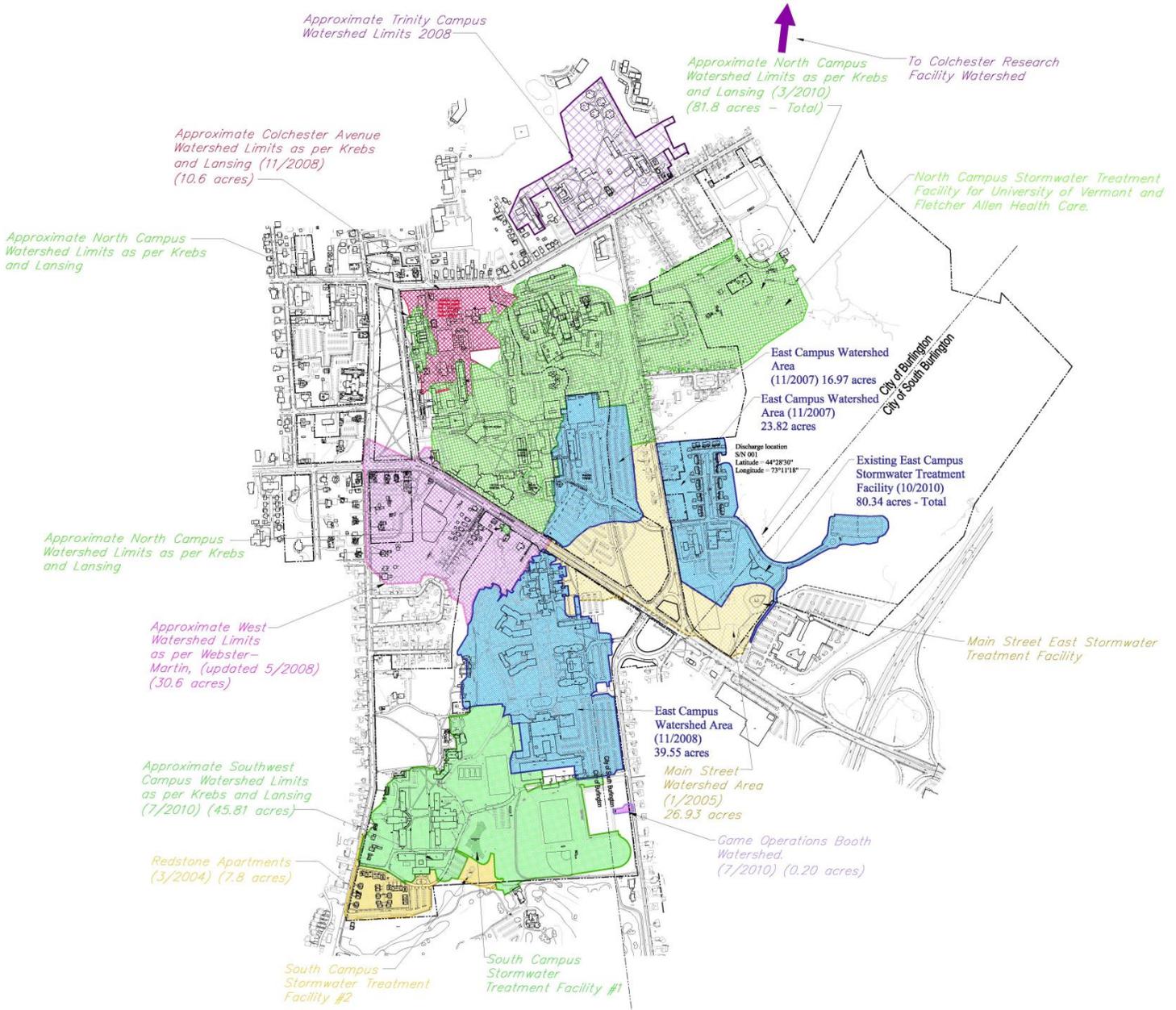


Runoff contributions from source areas in a Waitsfield subwatershed



Template 2b: Community or watershed approach with planned build out analysis and traditional (end of pipe or centralized) stormwater management

A more complex and community or watershed scale version of the traditional industrial park master plan approach (Template 1a) can be seen on the **University of Vermont** campus. In this case the entire campus has been broken up into approximately eight individual subwatersheds. Each subwatershed is assessed for its potential for growth as envisioned through a long term campus master plan for development at the University. For the overall campus approximately seventy-five percent of the land or 306 acres drains to a stormwater treatment structure at the subwatershed outlets. These treatment structures are built to the most recent design standards. This approach allows the University to use less valuable land for stormwater treatment on campus and minimizes the permitting and time necessary whenever a new addition or improvement is made to the campus grounds. The University's stormwater management plan also includes additional tasks that are required by state and federal permits including compliance with the six minimum measures of the MS4 permit (Template 3c), creation of stormwater pollution prevention or stormwater no exposure plans for any industrial facilities on site, stream flow monitoring and the development of stormwater flow restoration plans (Template 2c) for the four stormwater impaired watersheds it overlays. This approach works best with municipalities with moderate urbanized areas or designated growth centers and when most if not all of the land is under single ownership such as a new town center, an academic campus or a recreational resort. This template covers all of the elements in the Model Outline for Stormwater Master Plans.



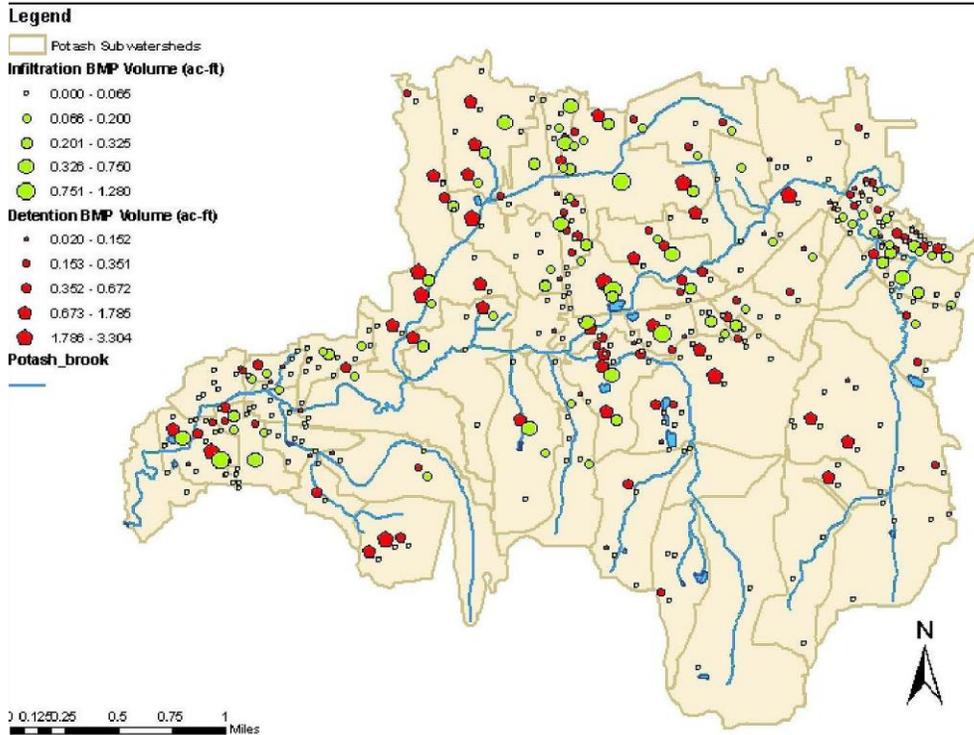
University of Vermont overall campus watershed and stormwater management map

Template 2c: Watershed flow restoration plan (FRP) approach

A more sophisticated form of the retrofit template (Template 1b) at the watershed level, and one which involves more expensive data acquisition, is a stormwater flow restoration plan (FRP). While this template does not necessarily fit most stormwater problems found in the state, it is important to provide this example and the “lessons learned” from its development. Municipalities can avoid making streams hydrologically unstable by learning from past mistakes of unplanned urbanization. There are **12 communities in the state** (Burlington, Colchester, Essex, Essex Junction, Rutland City, Rutland Town, St. Albans City, St. Albans Town, Shelburne, S. Burlington, Williston and Winooski) that have or share

thirteen small streams that do not meet the state Class B water quality standards as a result of the volume and sediment load from stormwater runoff. There are a number of high elevation streams at **6 ski resorts** (Stratton, Mt Snow, Sugarbush, Bromley, Killington and Jay Peak) that also do not meet state water quality standards due to stormwater runoff. There are **7 additional municipalities** that have streams that are close to not meeting the Class B standards for the same reasons. These streams experience frequent erosive bank full channel flooding events and often diminished channel low flows all of which degrade the aquatic life community leading to water quality violations. In order to reestablish a hydrologic regime capable of supporting the Class B standards a stream flow restoration plan for both the high flows (Q0.3) and the low flows (Q95) must be developed.

Stormwater infiltration and detention structures needed for flow restoration plan in the Potash Brook watershed, South Burlington



The basic elements of the flow restoration plan (FRP) are:

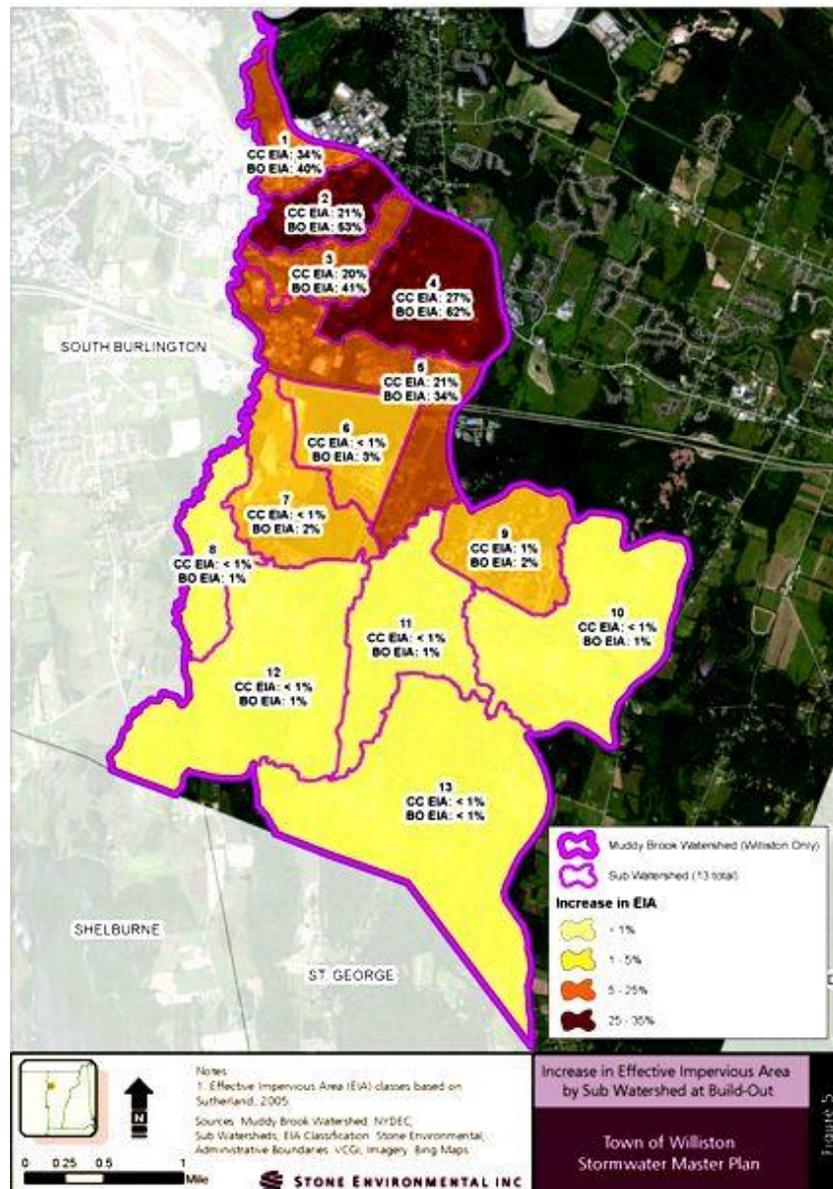
- (1) The documentation through geomorphic study of the sediment/water imbalance;
- (2) Baseline environmental data gathering;
- (3) The use of attainment (meets Class B standard and is similar in watershed characteristics such as soils, slope, land use) watersheds to compare the impaired watershed to as a measure of success;
- (4) The use of high and low flow hydrologic targets derived from the attainment stream for the impaired stream to achieve;
- (5) Stream flow hydrologic monitoring and modeling of the impaired and attainment streams; and,
- (6) Adaptive stormwater management practices to mitigate the high flows and increase the low flows.

This approach to water resource management is firmly grounded in the sciences of stream geomorphology and aquatic biology. VTDEC has acquired the necessary data and tools to develop the FRPs with the thirteen communities. However each community is responsible for final plan development, a compliance schedule for implementing the plan and the financial resources to implement the plan. Five ski resorts have developed plans similar to this template and to date have successfully remediated water quality impairments at two. In both the urban and ski resort examples extensive water quality and stream geomorphic monitoring studies have been conducted in collaboration with VTDEC. The watersheds have been broken out into subwatersheds and GIS infrastructure inventories have been completed. A suite of stormwater best management practices to address the water quality impairments have been, or will be, constructed as part of a long term water quality or water volume remediation plan. Finally, a capital improvement plan with an adequate funding source has been defined as an integral companion to the stormwater management plan. This template is useful for extreme and wide spread water quality or water volume remediation problems. This template covers all of the elements in the master plan.

Template 3a: Large watershed or regional approach with planned build out analysis and traditional (end of pipe or centralized) stormwater management

An example of a watershed scale plan with a build out analysis approach can be seen in the **Town of Williston**. Since 1990, Williston's population has more than doubled. As a result of this rapid growth, the subsequent urbanization of the town, and the subsequent increase in state and federal water quality permit requirements Williston has embarked on the development of a town-wide stormwater master plan including all of the Allen Brook, and the town-wide extent of the Muddy Brook watershed (termed a *Town-wide Watershed Improvement Plan*). The plan development involved a review of existing data and data gap identification, collection of all existing watershed related data, identification of problem areas from existing reports, local knowledge, and a field survey. A classification of problem areas from high to low based on a decision matrix was constructed and followed by field confirmation of all significant problem areas. Unique to this form of master planning is the modeling of scenarios to determine anticipated future peak stormwater flow rates and flow volumes for the 2-year, 10-year, 25-year, & 100-year 24 hour design storms. Williston's plan incorporates the expected impact of existing State of Vermont stormwater permit requirements on projected future flow rates and volumes and identifies sub-watersheds where existing stormwater management regulations appear to be inadequate to control future stream flows. The plan also predicts future design flow rates and volumes (2-year, 10-year, 25-year, & 100-year) for all Level 3 (high priority) in-stream problem areas.

The Town of Williston's plan also includes additional tasks that are required by state and federal permits including compliance with the six minimum measures of the MS4 permit (Template 3c), stream flow monitoring and the development of a stormwater flow restoration plan (Template 2c) for a stormwater impaired watershed. This approach works with municipalities with larger urbanized areas or growth centers, greater than average growth, and multiple land ownership. This template covers all of the elements in the master plan outline.



Town of Williston Muddy Brook Watershed future stormwater impact areas

Darker Areas show subwatersheds where current state and local requirements may not be sufficient to protect water quality standards with build out.

Template 3b: Regional or multi town approach with rural road focus

The **Franklin County Towns** of Swanton, Richford, Enosburgh, Georgia, Highgate, Fairfield and Sheldon in collaboration with the Friends of Northern Lake Champlain watershed association have developed a regional and primarily rural road focus to their approach for managing stormwater runoff. This approach involves gathering and summarizing existing water quality plans and studies and other related data; supplementing existing information with field data where necessary in order to evaluate conditions within each town/village, and the development of a comprehensive, municipality-specific water resources summary.

The master plan for each town includes:

- (1) A water quality library report;
- (2) A problem area report;
- (3) Problem area maps; and,
- (4) A prioritized list of projects.

This approach can be easily reconciled with any existing municipal road inventories and priority projects can be added to a municipality’s capital planning process. This template will work well with municipalities with very small urbanized areas and most impervious cover as existing roads (gravel and paved). Almost all Vermont municipalities can be characterized as predominantly rural with smaller urbanized areas. This template therefore can apply to the rural areas of most towns. A different template should be applied to the urbanized area(s) within the town. This template meets all of the master plan elements but could be enhanced by describing the “summary and recommendations” mentioned in the Model Outline for Stormwater Master Plans described above (in numeral V).

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Enosburgh Master Plan Problem Area Example

Problem Area Data Sheet

Problem Area ID: TB-7	Latitude: 44°52'16.39"N	Longitude: 72°47'53.04"W
Watershed: Tyler Branch		
Location: Town Garage on Route 108		
Problem Type: Local Drainage		
Identification Source: Town Feedback		
Ownership: Local		
Classification Level: 4		
Problem Description:		
Stormwater management at the Town Garage needed is problematic, including areas around both current salt and sand storage.		

Date of Field Data Collection: 7/13/2012

Field Photos	
	
Photo 1. Parking lot run-off	Photo 2. Salt shed

Description of Observed Conditions:

Erosion from Town Garage parking lot and salt shed flows directly into Tyler Branch (Photo 1). Town has tried to address the issue by placing jersey barriers along the sand pile and access road. While this has helped reduce the amount of sand being washed directly into Tyler Branch, it has caused the stormwater to concentrate and is causing erosion along foundation of salt shed downhill to stream. Entire town lot is sloped downhill toward stream. Sand pile is outside and above salt shed. No nearby land farther away from the stream is owned by the Town.

Template 3c: Regional or multi town approach with municipal separate storm sewer system (MS4) minimum measure focus

Another regional example of a stormwater master plan that can be adopted by municipalities or groups of municipalities is a plan based on the federal municipal separate storm sewer system (MS4) permit requirements. In 1990 the US EPA began requiring certain large urbanized areas (Phase I) of the United States to be subject to the requirements of the MS4 permit. In 2000 the Vermont Legislature recognized the cost effective nature of these measures and encouraged by statute, the adoption of these practices by all municipalities. In 2003, EPA expanded the permit jurisdiction to small MS4s (Phase II) which impacted some municipalities in Vermont. A small MS4 is any publicly owned MS4 not already covered by the Phase I program as a medium or large MS4 and which was located in “urbanized areas” (UAs) as defined by the Bureau of the Census, and on a case-by-case basis those small MS4s located outside of UAs that the permitting authority designates. As of 2016 there are **15 designated MS4s** (Burlington, Burlington International Airport, Colchester, Essex, Essex Junction, Milton, Rutland Town, St. Albans City, St. Albans Town, Shelburne, S. Burlington, University of Vermont, Vermont Agency of Transportation, Williston and Winooski) subject to the Phase II rule in Vermont. Rutland City abides by the permit requirements voluntarily. In 2004 a Lake Champlain Basin Program study recommended increasing the number of towns subject to the permit requirements. The study recommended including all towns in New York and Vermont with populations of at least 3000 people and with at least 50% of the township area located in the lake watershed (Winsten, 2004).

The requirements of the permit are essentially six minimum measures. These measures were developed through a national stakeholder process. The permit requires that over a 5 year period the designated MS4 adopt, implement or contract with others the required minimum measures, in a comprehensive manner such as through a master plan or municipal program. The six minimum measures are:

- (1) Develop a public education and outreach effort on the impacts of stormwater runoff;
- (2) Involve the public in the stormwater plan development;
- (3) Develop and implement an illicit discharge, detection and elimination plan for nonstormwater discharges to the stormwater system;
- (4) Adopt a construction erosion control ordinance or reference a qualifying program;
- (5) Adopt a post-construction stormwater management ordinance or reference a qualifying program; and,
- (6) Develop and implement a good housekeeping/pollution prevention plan for all municipal facilities including public street sweeping and catch basin cleaning.

Taken alone or in conjunction with other plans described above these six measures are simply good common sense. If adopted statewide they would greatly contribute to reducing the impact of stormwater runoff in Vermont. Examples of regional collaboration by municipalities to effectively meet these requirements and examples of nine MS4 stormwater management plans can be found at: <http://www.smartwaterways.org/resources/local-resources/>. This template does not fully cover Model Outline for Stormwater Master Plan (numerals I-V) and is better viewed as part of a more comprehensive stormwater management framework that could work in conjunction with any of the Templates.

XIII. Funding sources for stormwater master planning

The following table matches state funding opportunities with each master planning template. Note that all grant eligibility conditions must be met for a project to be eligible for funding:

Funding Sources for Stormwater Master Planning			
Template	Meets VTDEC Clean Water Initiative Project Eligibility Requirements?¹ (Awards up to \$75,000)	Meets VT DHCA Municipal Planning Project Eligibility Requirements? (Awards up to \$15,000)	Meets VTrans Better Back Roads Project Eligibility Requirements (Awards up to \$10,000)
1a	Yes	Yes	No
1b	Yes	Yes	No
1c	No	Yes	No
2a	Yes	Yes	No
2b	Yes	Yes	No
2c	Yes (if not required by a permit)	Yes	No
3a	Yes	Yes	No
3b	No	Maybe	Yes
3c	No	Yes	No

XIV. Case studies in the United States: examples of stormwater master plans that could work in Vermont¹

XV. References

Booth, D., D. Hartley, and R. Jackson, 2002. Forest cover, Impervious Surface Area and the Mitigation of Stormwater Impacts. *Journal of the American Water Resources Association* 38(3).

Booth, D., 2000. Forest cover, Impervious Surface Area and the Mitigation of Urbanization Impacts in King County, Washington. University of Washington, Seattle, WA.

DeGasperi, Curtis L., Hans B. Berge, Kelly R. Whiting, Jeff J. Burkey, Jan L. Cassin, and Robert R. Fuerstenberg, 2009. Linking Hydrologic Alteration to Biological Impairment in Urbanizing Streams of the Puget Lowland, Washington, USA. *Journal of the American Water Resources Association* 45(2).

Vermont Department of Housing and Community Affairs. 2007. Growth Center Planning Manual for Vermont Communities. Montpelier, VT.

Vermont Department of Environmental Conservation. 2013. Water Quality Remediation, Implementation and Funding Report, Montpelier, VT.

Winsten, J. 2004. Policy Options for Reducing Phosphorus Loading in Lake Champlain. Lake Champlain Basin Program, Grand Isle, VT.

¹This addendum to these guidelines will be available in the future.

XVI. Template References

Example Stormwater Master Plans are posted on the VTDEC web site at:

<http://dec.vermont.gov/watershed/cwi/solutions/municipal-stormwater>

- 1a. VTDEC Watershed Management Division Stormwater Section stormwater permit file # 3010-9010.A.
- 1b. Pease, J., "Creating Partnerships at the Local Level: Morristown Vermont Case Study." Presentation at the 2008 New England Nonpoint Source Conference, Groton CT.
<http://www.neiwpc.org/npsconference/08-presentations/Pease.pdf>
- 1c. City of South Burlington Land Development Regulations (May 2012, page 175) 12.03 Stormwater Management Overlay District: http://www.sburl.com/vertical/Sites/%7BD1A8A14E-F9A2-40BE-A701-417111F9426B%7D/uploads/LDRs_Complete_No_Maps_5-7-2012.pdf
City of South Burlington Zoning Overlay District map:
<http://accd.vermont.gov/sites/accd/files/Documents/strongcommunities/cd/tif/sburlington/Map-Overlay-Districts.pdf>
- 2a. Hurley, S. 2012. Green stormwater infrastructure Opportunities in Waitsfield, Vermont. Final Report, VTDEC Ecosystem Restoration Grant 2011-CCC-2-01.
- 2b. VTDEC Watershed Management Division Stormwater Section MS4 stormwater permit file for the University of Vermont, Notice of Intent for permit #3-9014, March 2008.
- 2c. VTDEC Watershed Management Division Stormwater Section web site:
<http://dec.vermont.gov/watershed/stormwater/impaired-waters/stormwater-tmdl>
Dubois & King Inc., 2012. Town of Williston Allen Brook Flow Restoration Plan Draft Report.
http://dec.vermont.gov/sites/dec/files/wsm/erp/docs/erp_AllenBrook.pdf
- 3a. Stone Environmental Inc. 2013. Town of Williston Town-Wide Watershed Improvement Plan, Phase 1 Final Report. Project ID 12-055. Montpelier, VT.
- 3b. Stone Environmental Inc. 2013. Stormwater Management Plan for the Town of Enosburgh and the Village of Enosburgh Falls Final Report. Project ID 112475-W. Montpelier, VT.
- 3c. US EPA Stormwater Phase II Final Rule Fact Sheet Series, Minimum Control Measures
<http://cfpub.epa.gov/npdes/stormwater/swfinal.cfm>

XVII. Glossary

Act 250: Vermont's land use and development law

Green stormwater infrastructure (GSI): an approach to managing stormwater runoff that utilizes the natural infiltration capacity of the soil to filter and absorb water that otherwise becomes runoff. The utilization of existing soils and the natural vegetation of those soils can be a very cost effective method for reducing stormwater pollution loads and stormwater runoff volume.

NRCS: United States Natural Resources Conservation Service

Stormwater retrofit: A structural or nonstructural practice installed after development has occurred in a watershed to reduce pollutants from stormwater runoff.

TMDL: A TMDL or Total Maximum Daily Load is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. Water quality standards identify the uses for each waterbody, for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use. The Clean Water Act, section 303, establishes the water quality standards and TMDL programs.

TR-55: NRCS Hydrologic modeling program used for calculating predevelopment and post development stormwater peak discharges for varying storm sizes.

XVIII. Credits

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Appendix: Vermont municipalities with existing stormwater plans and suggested templates for towns without plans (6/23/2016)

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	DEC GIS SW Map	Existing Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
<i>Addison</i>	1,413	LC	Lake Champlain			NA	3b		
<i>Albany</i>	808	Mag	Lake Memphremagog			NA	3b		
Alburgh	2,045	LC	Lake Champlain		2016	NA	3b	Completed	<i>Alburgh Village Center</i>
<i>Andover</i>	548	Will	Connecticut River			NA	3b		
Arlington & Arlington Village	2,425	Bat	Hudson		2016	Yes	2a		
<i>Athens</i>	323	Sax	Connecticut River			NA	3b		
<i>Averill</i>	8	Aver	St Lawrence			NA	3b		
<i>Avery's gore</i>	1	Nul	Connecticut River			NA	3b		
Bakersfield & Bakersfield Village	1,402	Miss	Lake Champlain		2014	NA	3b		<i>Bakersfield Village Center</i>
<i>Baltimore</i>	260	Black	Connecticut River			NA	3b		
<i>Barnard</i>	953	White	Connecticut River		2015	NA	3b		
<i>Barnet</i>	1,773	Conn	Connecticut River			NA	3b		
Barre Town	8,005	Win	Lake Champlain	Gunner Brook on 303d-Part A, Jail Branch & Stevens Branch on Stressed Waters List	2013	Yes	3c	To be completed in 2017.	
Barre City	8,837	Win	Lake Champlain	Gunner Brook on 303d-Part A, Jail Branch & Stevens Branch on Stressed Waters List	2013	No	3c	Park Street neighborhood to be completed in 2016. Quarry Hill to be completed in 2017. Overall plan to be completed in 2017.	Barre City Downtown
Barton & Barton Village & Orleans Village	2,788	Mag	Lake Memphremagog		2013	No	1b & 2a		Barton Village Center
<i>Belvidere</i>	286	Lam	Lake Champlain			No	3b		
Bennington	15,093	Hud	Hudson		2015	Yes	3c		North Bennington Village Center/Bennington Downtown/Bennington Growth Center

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Existing Stormwater Ordinance	Suggested SW Master Planning Template	Existing Status of SW Master Planning	Growth Center Category
<i>Benson</i>	1,018	Hub	Lake Champlain	Hubbardton River on 303d-Part A for E.coli, nutrients and temperature impairment below Village	2013	Yes	1a		<i>Benson Village Center</i>
<i>Berkshire</i>	1,598	Pike	Lake Champlain			NA	3b		
Berlin	2,822	Win	Lake Champlain	Stevens Branch on Stressed Waters List	2013	Yes	3a	To be completed in 2017.	
Bethel & Bethel Village	1,933	White	Connecticut River	Third Branch White River and Ayers Brook on Stressed Waters List	2014	No	2a		Bethel Village Center
<i>Bloomfield</i>	256	Nul	Connecticut River			NA	3b		
<i>Bolton & Bolton Valley Ski Area</i>	1,000	Win	Lake Champlain			No	3b		
Bradford & Bradford Village	2,655	Conn	Connecticut River		2013	No	2a		Bradford Downtown
<i>Braintree</i>	1,228	White	Connecticut River			NA	3b	Ayers Brook watershed plan completed.	
Brandon & Brandon Village	3,866	Otter	Lake Champlain		2010	Yes	3c	To be completed in 2017.	Brandon Downtown
Brattleboro & W.Brattleboro	11,491	Conn	Connecticut River	Crosby Brook on 303d-Part A, Whetstone Brook on Priority List Part D for E.coli	2010	Yes	1c & 2c & 3c	Crosby Brook watershed completed.	West Brattleboro Village Center/Brattleboro Downtown
Bridgewater	916	Otta	Connecticut River		2015	No	2a		
<i>Bridport</i>	1,232	Otter	Lake Champlain			NA	3b		
Bristol & Bristol Village	3,741	Otter	Lake Champlain	Little Otter Creek on Priority List Part D for E.coli	2014	No	1c & 2a		Bristol Downtown
<i>Brookfield</i>	1,239	White	Connecticut River			NA	3b	Ayers Brook watershed plan completed.	
<i>Brookline</i>	442	West	Connecticut River			NA	3b		
<i>Brownington</i>	854	Mag	Lake Memphremagog			NA	3b		<i>Brownington Village Center</i>
<i>Brunswick</i>	104	Conn	Connecticut River			NA	3b		

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Existing Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
<i>Buels gore</i>	12	Win	Lake Champlain			NA	3b		
Burke & E.Burke Village & Burke Mt Ski Area	1,706	Pas	Connecticut River	Dishmill Brook Tributary 2 on Stressed Waters List	2013	Yes	3b & 3a	To be completed in 2016 for Dishmill Brook	West Burke Village Center/East Burke Village Center
Burlington	38,897	LC/Win	Lake Champlain	Englesby and Centennial Brooks on Priority Waters List Part D, Lower Winooski River on Stressed Waters List	2013	Yes	2c & 3c	In development, MS4	Burlington Downtown
Cabot & Cabot Village	1,334	Win	Lake Champlain		2013	No	1a	Completed	
<i>Calais</i>	1,546	Win	Lake Champlain			No	3b		
Cambridge & Cambridge Village & Jeffersonville Village & Smugglers Notch Ski Area	3,090	Lam	Lake Champlain	Brewster River on Stressed Waters List	2011	Yes	2a		Jeffersonville Village Center/Cambridge Village Center
Cannan & Canaan Village & Beecher Falls Village	1,084	Conn	Connecticut River		2013	No	2a		
Castleton & Castleton Village	4,618	Cast	Lake Champlain		2013	No	1a & 2a	Castleton River Headwaters to be completed in 2017	Castleton Village Center/Castleton Corners Village Center
Cavendish & Cavendish Village	1,377	Black	Connecticut River		2015	No	2a		Cavendish Village Center/Proctorsville Village Center
<i>Charleston</i>	862	Mag	Lake Memphremagog			NA	3b		
<i>Charlotte</i>	3,761	LC	Lake Champlain	LaPlatte River, Lewis Creek on Priority Waters List D		NA	3b	Completed as part of LaPlatte River Watershed plan	
Chelsea & Chelsea Village	1,229	White	Connecticut River		2014	No	2a		Chelsea Village Center
Chester & Chester Village	3,000	Will	Connecticut River		2016	No	2a		
<i>Chittenden</i>	1,270	Otter	Lake Champlain			NZ	3b		
<i>Clarendon</i>	2,894	Otter	Lake Champlain			NA	3b		

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Existing Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
Colchester	17,237	LC/Win	Lake Champlain	Sunderland Brook on Priority Waters List Part D, Direct Smaller Tributaries to Malletts Bay on Priority Waters List Part D, Lower Indian Brook & Sunnyside Brook on Stressed Waters List	2010	Yes	1c & 2c & 3c	In development, MS4.	Severance Corners Town Center/Colchester Growth Center
<i>Concord</i>	1,210	Pas	Connecticut River		2014	NA	3b		
<i>Corinth</i>	1,452	Waits	Connecticut River			NA	3b		
<i>Cornwall</i>	1,210	Otter	Lake Champlain			No	3b		
<i>Coventry</i>	981	Mag	Lake Memphremagog			NA	3b		
<i>Craftsbury</i>	1,096	Mag	Lake Memphremagog		2015	NA	3b		<i>Craftsbury Common Village Center/ Craftsbury Village Center</i>
<i>Danby</i>	1,270	Otter	Lake Champlain	Flower Brook on Priority List Part D for E.coli		NZ	3b		<i>Danby Village Center</i>
Danville & Danville Village	2,334	Pas	Connecticut River		2013	No	1a	Implemented for Danville Village Center	Danville Village Center
Derby & Derby Line Village	4,791	Mag	Lake Memphremagog		2013	No	2a		Derby Line Village Center
<i>Dorset</i>	2,106	Bat	Hudson			NA	3b		
Dover & Mt Snow Ski Area	1,432	Deer	Connecticut River	N. Branch Deerfield River and Iron Stream on 303d-Part A, N.Branch Deerfield River on Priority List Part D for E.coli, Baselodge Tributary on stressed waters list	2016	No	2a & 2c	Under consideration for N.Branch Deerfield and Iron Brook or will be issued a permit requirement	East Dover Village Center/West Dover Village Center
<i>Dummerston</i>	1,937	Conn	Connecticut River	Crosby Brook on 303d-Part A		NA	3b	Crosby Brook watershed completed.	
<i>Duxbury</i>	1,305	Win	Lake Champlain			No	3b		
<i>East Haven</i>	298	Moose	Connecticut River			NA	3b		
<i>East Montpelier</i>	2,715	Win	Lake Champlain		2014	Yes	3b		<i>East Montpelier Village Center</i>

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Existing Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
<i>Eden</i>	1,120	<i>Lam</i>	<i>Lake Champlain</i>			NZ	3b		
<i>Elmore</i>	970	<i>Win</i>	<i>Lake Champlain</i>			Yes	3b		
Enosburg & Enosburg Falls Village	2,698	<i>Miss</i>	<i>Lake Champlain</i>		2009	NA	3b	Completed	Enosburg Falls Village Center
Essex Town & Essex Jct	19,649	<i>LC/Win</i>	<i>Lake Champlain</i>	Indian and Sunderland Brooks on Priority Waters List Part D, Alder Brook listed by VTDEC as altered, Lower Winooski River on Stressed Waters List	2008/2002	Yes	2c & 3c	In development, MS4	Essex Junction Village Center / Neighborhood Planning Area
Fair Haven & Fair Haven Village	2,924	<i>Poult</i>	<i>Lake Champlain</i>	Castleton River on 303d Part A for E.coli impairment below Village	2013	No	2a		
Fairfax & Fairfax Village	4,195	<i>Lam</i>	<i>Lake Champlain</i>		2011	NA	1b & 3b		Fairfax Village Center
<i>Fairfield</i>	1,916	<i>Miss</i>	<i>Lake Champlain</i>		2014	NA	3b	Completed	<i>Fairfield Village Center/East Fairfield Village Center</i>
<i>Fairlee</i>	1,005	<i>Conn</i>	<i>Connecticut River</i>	Ompompanoosuc River on Priority Waters List Part D	2014	NA	3b		
Fayston & Mad River Glen Ski Area	1,245	<i>Win</i>	<i>Lake Champlain</i>			Yes	3b		
<i>Ferdinand</i>	32	<i>Paul</i>	<i>Connecticut River</i>			NA	3b		
<i>Ferrisburgh</i>	2,670	<i>LC</i>	<i>Lake Champlain</i>	<i>Little Otter Creek, Lewis Creek on Priority List Part D for E.coli</i>		No	3b		
<i>Fletcher</i>	1,301	<i>Lam</i>	<i>Lake Champlain</i>			NA	3b		
<i>Franklin</i>	1,300	<i>Pike</i>	<i>Lake Champlain</i>			NA	3b	Completed	<i>Franklin Village Center</i>
Georgia & Georgia South Village	4,507	<i>Lam</i>	<i>Lake Champlain</i>	Deer Brook on 303d-Part A, Mill River on Stressed Waters List	2011	NA	3b	Completed	
<i>Glastenbury</i>	15	<i>Wal</i>	<i>Hudson</i>			NA	3b		
<i>Glover</i>	929	<i>Mag</i>	<i>Lake Memphremagog</i>		2014	NA	3b		<i>West Glover Village Center/Glover Village Center</i>

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Existing Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
<i>Goshen</i>	215	Otter	Lake Champlain			NA	3b		
Grafton & Grafton Village	612	Sax	Connecticut River		2015	NA	3b		
<i>Granby</i>	83	Paul	Connecticut River			NA	3b		
<i>Grand Isle</i>	2,377	LC	Lake Champlain			NA	3b		
<i>Granville</i>	284	White	Connecticut River		2014	NA	3b		<i>Granville Lower Village Center/Granville Upper Village Center</i>
<i>Greensboro</i>	773	Lam	Lake Champlain			Yes	3b		
Groton & Groton Village	955	Wells	Connecticut River		2014	No	2a		
<i>Guildhall</i>	268	Conn	Connecticut River			NA	3b		<i>Algiers Village Center</i>
<i>Guilford</i>	1,939	Conn	Connecticut River			NA	3b		
<i>Halifax</i>	818	Deer	Connecticut River			No	3b		
<i>Hancock</i>	359	White	Connecticut River		2014	NA	3b		
Hardwick & Hardwick Village	3,207	Lam	Lake Champlain		2011	No	1b	To be completed in 2017.	Hardwick Village Center
Hartford & White River Jct & Quechee Village	10,696	White, Otta	Connecticut River	Ottaquechee River on Stressed Waters List	2014	No	1c, 2b or 3a		White River Jct Downtown/Hartford Growth Center/Quechee Village Center
<i>Hartland</i>	3,026	Conn	Connecticut River			NA	3b		<i>Hartland Three Corners Village Center/Hartland Four Corners Village Center/North Hartland Village Center</i>
Highgate Center	3,691	Miss	Lake Champlain		2009	NA	3b	Completed	
Hinesburg & Hinesburg Village	4,629	LC	Lake Champlain	LaPlatte River, Lewis Creek, Pond Brook on Priority Waters List Part D, Patrick Brook on Stressed Waters List	2010	Yes	3a	Completed as part of LaPlatte River Watershed plan	Hinesburg Village Center
<i>Holland</i>	566	Tom	St Lawrence			NA	3b		
<i>Hubbardton</i>	774	Cast	Lake Champlain			NA	3b		
<i>Huntington Village</i>	1,951	Win	Lake Champlain	Huntington River on Priority Waters List Part D		No	3b		<i>Huntington Village Center/Huntington Center Village Center</i>
Hyde Park & Hyde Park Village	3,299	Lam	Lake Champlain		2011	No	1a	Implementation Phase for Hyde Park Village	Hyde Park Village Center
<i>Ira</i>	449	Otter	Lake Champlain			NZ	3b	Castleton River Headwaters to be completed in 2017	

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Existing Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
<i>Irasburg</i>	1,037	Mag	Lake Memphremagog			NA	3b		
Brighton & Island Pond Village	1,311	Mag	Lake Memphremagog		2013	No	2a	Implementation Phase for Island Pond Village	Island Pond Village Center
<i>Isle La Motte</i>	510	LC	Lake Champlain			NZ	3b		
<i>Jamaica</i>	897	West	Connecticut River			NA	3b		<i>Jamaica Village Center</i>
Jay & Jay Peak Ski Area	555	Mag	Lake Memphremagog	Jay Branch on Stressed Waters List	2009	No	3b & 3c	3c completed for Jay Branch Tributary #9	
Jericho & Jericho Village	5,190	Lam	Lake Champlain		2011	Yes	2a	To be completed in 2017.	Jericho Corners Village Center/Jericho Village Center
Johnson & Johnson Village	3,194	Lam	Lake Champlain		2011	No	2a		Johnson Village Center
Killington & Killington & Pico Ski Areas	1,133	Otta	Connecticut River	E. Branch of Roaring and Roaring Brook on 303d-Part A, Falls Brook, W. Branch of Roaring and Upper Roaring Brook on Stressed Waters List	2015	No	2c & 3a	Under consideration for E. Branch Roaring Brook and Roaring Brook or will be issued a permit requirement	
<i>Kirby</i>	518	Pas	Connecticut River			NA	3b		
<i>Landgrove</i>	137	West	Connecticut River	West River on Priority Waters List Part D		NA	3b		
<i>Leicester</i>	1,003	Otter	Lake Champlain			NA	3b		
<i>Lemington</i>	117	Conn	Connecticut River			NA	3b		
<i>Lewis</i>	1	Nul	Connecticut River			NA	3b		
<i>Lincoln</i>	1,267	Otter	Lake Champlain			NA	3b		
Londonderry & Londonderry Village	1,793	West	Connecticut River	West River on Priority Waters List Part D	2015	No	2a		
<i>Lowell</i>	711	Miss	Lake Champlain			NA	3b		
Ludlow & Ludlow Village & Okemo Mt Ski Area	2,639	Black	Connecticut River	Coleman Brook, Okemo Brook and Trailside Brook on stressed waters list	2015	No	2a		Ludlow Village Center
Lunenburg & Lunenburg Village & Gilman Village	1,285	Conn	Connecticut River	Scales Brook on Stressed Waters List	2013	NA	3b		

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Existing Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
Lyndon & Lyndonville	5,679	Pas	Connecticut River		2013	No	2a	To be completed in 2017.	Lyndon Village Center
<i>Maidstone</i>	106	Paul	Connecticut River			NA	3b		
Manchester & Manchester Village	4,271	Bat	Hudson		2016	No	1c		
<i>Marlboro</i>	969	Deer	Connecticut River			NA	3b		
Marshfield & Marshfield Village	1,593	Win	Lake Champlain		2013	No	3b	Completed	
<i>Mendon</i>	1,096	Otter	Lake Champlain			NA	3b		
Middlebury & Middlebury Village	8,271	Otter	Lake Champlain	Middlebury River and Otter Creek on Priority List Part D for E.coli	2010	No	3c	To be completed in 2016 for Middlebury Village	East Middlebury Village Center/Middlebury Downtown
<i>Middlesex</i>	1,872	Win	Lake Champlain	Winooski River below Middlesex on Stressed Waters List	2014	Yes	3b		
Middletown Springs & Middletown Springs Village	802	Poult	Lake Champlain	Winooski below dam on Stressed Waters List	2013	No	2a		
Milton	10,714	Lam	Lake Champlain	Streeter Brook on Stressed Waters List	2004	NA	3c	Completed for MS4 designated area	
<i>Monkton</i>	1,977	Lewis	Lake Champlain	Little Otter Creek, Lewis Creek on Priority List Part D for E.coli		NA	3b		
Montgomery & Montgomery Village	1,053	Miss	Lake Champlain		2009	No	1a or 2a		Montgomery Village Center/Montgomery Center Village Center
Montpelier	7,760	Win	Lake Champlain	Winooski River & Lower N.Branch Winooski River on 303d-Part A for E.coli, Winooski above city on Stressed Waters List	2014	No	3c	To be completed in 2016	Montpelier Downtown/Montpelier Growth Center
<i>Moretown</i>	1,730	Win	Lake Champlain	Mad River on Priority List Part D for E.coli	2014	NA	3b		
<i>Morgan</i>	744	Mag	Lake Memphremagog			NA	3b		
Morristown & Morrisville	5,561	Lam	Lake Champlain		2011	Yes	1b	Completed for Wilkins Ravine watershed	Morrisville Downtown

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Existing Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
<i>Mount Holly</i>	1,216	Otter	Lake Champlain			NA	3b		<i>Belmont Village Center</i>
<i>Mount Tabor</i>	198	Otter	Lake Champlain			NZ	3b		
<i>New Haven</i>	1,829	Lit Otter	Lake Champlain	Little Otter Creek on Priority List Part D for E.coli		NA	3b		<i>New Haven Village Center</i>
<i>Newark</i>	457	Pas	Connecticut River			NA	3b		
Newbury & Newbury Village & Wells River Village	2,167	Conn	Connecticut River		2014	NA	3b		
<i>Newfane</i>	1,702	West	Connecticut River		2016	NA	3b		
Newport City	5,148	Mag	Lake Memphremagog		2013	No	3c	To be completed in 2016	Newport Downtown
<i>Newport Town</i>	2,032	Mag	Lake Memphremagog		2014	NA	3b		
<i>North Hero</i>	915	LC	Lake Champlain			NA	3b		<i>North Hero Village Center</i>
Northfield & Northfield Village	5,740	Win	Lake Champlain		2013	Yes	2a	Implementation Phase	Northfield Village Center/Riverside Village Center
<i>Norton</i>	231	Conti	St Lawrence			NA	3b		
Norwich & Norwich Village	3,523	Conn	Connecticut River		2013	Yes	2a		Norwich Village Center
<i>Orange</i>	961	Win	Lake Champlain			NZ	3b		
<i>Orwell</i>	1,219	East	Lake Champlain		2014	NA	3b		<i>Orwell Village Center</i>
<i>Panton</i>	683	LC	Lake Champlain			NA	3b		
Pawlet	1,418	Met	Hudson	Flower Brook on Priority List Part D for E.coli	2014	NA	3b	To be completed in 2016 for the Flower Brook watershed	Pawlet Village Center/West Pawlet Village Center
<i>Peacham</i>	670	Conn	Connecticut River			NA	3b		<i>Peacham Village Center</i>
Peru & Bromley Mt Ski Area	425	West	Connecticut River	West River on Priority Waters List Part D, Mill Brook Tributary #6 on 303d Part A for stormwater		NA	3b		<i>Peru Village Center</i>
<i>Pittsfield</i>	417	White	Connecticut River		2014	NA	3b		<i>Pittsfield Village Center</i>
Pittsford & Pittsford Village	3,195	Otter	Lake Champlain		2010	NA	2a	Castleton River Headwaters to be completed in 2017	Pittsford Village Center

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Existing Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
Plainfield & Plainfield Village	1,339	Win	Lake Champlain		2013	Yes	2a or 3b	Integrated plan completed. Larger plan to be completed in 2017.	
<i>Plymouth</i>	566	Black	Connecticut River		2015	NA	3b		
<i>Pomfret</i>	955	Conn	Connecticut River			NA	3b		
Poultney & Poultney Village	3,532	Poult	Lake Champlain		2013	No	2a	Implementation Phase for Poultney Village	East Poultney Village Center/Poultney Downtown
<i>Pownal</i>	3,442	Hud	Hudson		2016	NA	3b		
Proctor & Proctor Village	1,810	Otter	Lake Champlain		2012	Yes	1b or 3b		
<i>Putney</i>	2,600	Conn	Connecticut River		2016	NA	3b		<i>Putney Village Center</i>
Randolph & Randolph Village & Vermont Tech College	5,037	White	Connecticut River	Third Branch White River and Ayers Brook on Stressed Waters List	2014	Yes	2a	Ayers Brook watershed plan completed.	East Randolph Village Center/Randolph Downtown
<i>Reading</i>	709	Black	Connecticut River			NA	3b		
<i>Readsboro</i>	764	Deer	Connecticut River			NA	3b		<i>Readsboro Village Center</i>
Richford & Richford Village	2,293	Miss	Lake Champlain		2009	No	2a or 3b		Richford Village Center
Richmond & Richmond Village	4,160	Win	Lake Champlain		2009	Yes	2a		Richmond Village Center
<i>Ripton</i>	586	Otter	Lake Champlain			NA	3b		
Rochester & Rochester Village	1,123	White	Connecticut River		2014	No	2a or 3b		Rochester Village Center
Rockingham & Saxtons River Village & Bellows Falls Village	4,949	Conn	Connecticut River	Lower Williams River on Stressed Waters List	2015	Yes	2a		Saxtons River Village Center/Bellows Falls Downtown
<i>Roxbury</i>	551	White	Connecticut River			NA	3b		
<i>Rupert</i>	705	Met & Bat	Lake Champlain & Hudson			NA	3b	To be completed in 2015 for White Creek and Mill Brook watersheds	

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
Rutland City	16,742	Otter	Lake Champlain	Moon Brook on Priority Waters List Part D, Tenney Brook on Stressed Waters List, Lower East Creek and Otter Creek below WWTP on Part A for E.coli	2012	Yes	2c & 3c	Completed for Tenney Brook-E Creek area of City.	Rutland Downtown
Rutland Town	4,076	Otter	Lake Champlain	Moon Brook on Priority Waters List Part D, Tenney Brook listed by VTDEC as stressed	2012	No	2c & 3c	In development, MS4	
<i>Ryegate & E.Ryegate Village and South Ryegate Village</i>	1,201	Wells	Connecticut River		2014	NA	3b		
Royalton & S.Royalton Village	2,439	White	Connecticut River		2014	No	2a		Royalton Village Center/South Royalton Village Center
<i>Salisbury</i>	1,091	Otter	Lake Champlain			NA	3b		
<i>Sandgate</i>	349	Bat	Hudson			NA	3b	To be completed in 2017.	
<i>Searsburg</i>	89	Green	Connecticut River			NA	3b		
<i>Sharon</i>	1,328	White	Connecticut River		2014	NA	3b		<i>Sharon Village Center</i>
<i>Sheffield</i>	706	Pas	Connecticut River			NA	3b		
Shelburne	7,146	LC	Lake Champlain	Munroe Brook, LaPlatte River on Priority Waters List Part D	2009	Yes	2c & 3c	In development, MS4. Also part of LaPlatte River Watershed plan	Shelburne Village Center / Neighborhood Planning Area
Sheldon	2,303	Miss	Lake Champlain		2009	Yes	3b	Completed	
<i>Shoreham</i>	1,294	Otter	Lake Champlain		2014	Yes	3b		
<i>Shrewsbury</i>	1,133	Otter	Lake Champlain			NA	3b		
<i>Somerset</i>	5	Green	Connecticut River			NA	3b		
South Burlington	17,574	LC/Win	Lake Champlain	Potash, Bartlett and Centennial Brooks on Priority Waters List Part D, Lower Winooski River on Stressed Waters List	2013	Yes	1c & 2c & 3c	In development, MS4	City Center Town Center
<i>South Hero</i>	1,882	LC	Lake Champlain			NA	3b		

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
Shaftsbury & South Shaftsbury Village	3,698	Wal	Hudson		2016	Yes	2a		South Shaftsbury Village Center/Shaftsbury Village Center
Springfield & N.Springfield	8,602	Black	Connecticut River	Black River on Priority List Part A for E.coli impairment due to CSOs and Stressed Waters List	2010/2015	Yes	1b or 2a		Springfield Downtown
St. Albans City	7,250	LC	Lake Champlain	Stevens Brook & Rugg Brook on Priority Waters List Part D	2010	Yes	2c & 3c	In development, MS4	St. Albans Downtown/St. Albans Growth Center
St. Albans Town	6,014	LC	Lake Champlain	Stevens Brook & Rugg Brook on Priority Waters List Part D	2011	Yes	2c & 3c	In development, MS4	
<i>St. George</i>	692	Lewis	Lake Champlain			NA	3b	Completed as part of LaPlatte River Watershed plan	
St. Johnsbury	7,421	Sleep, Pas	Connecticut River	Passumpsic and Lower Sleepers Rivers on 303d Part A for E.coli impairment due to CSOs	2010	No	1b	To be completed in 2016 for St Johnsbury Village	St. Johnsbury Downtown
<i>Stamford</i>	788	Hoosic	Hudson			NA	3b		
<i>Stannard</i>	194	Lam	Lake Champlain			NA	3b		
<i>Starksboro</i>	1,909	Lewis	Lake Champlain	Huntington River on Priority List Part D for E.coli		NA	3b		
<i>Stockbridge</i>	678	White	Connecticut River			NA	3b		
Stowe & Stowe Village & Stowe Mt Ski Area	4,919	Win	Lake Champlain	Big Spruce Brook on Priority Waters List Part B, E. Branch of Little River and Little Spruce Brook on Stressed Waters List	2009	Yes	1b & 2c	Big Spruce Brook completed	Stowe Village Center

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
<i>Strafford</i>	1,079	<i>Omp</i>	<i>Connecticut River</i>	Ompompanoosuc River on Priority List Part D for E.coli		NA	3b		<i>South Strafford Village Center</i>
Stratton & Stratton Ski Area	167	West	Connecticut River	Styles Brook & Tributary of N. Branch Ball Mountain Brook on Priority Waters List Part D	2015	NA	3b	Completed for North Branch of Ball Mt Brook watershed	
<i>Sudbury</i>	609	<i>Hub</i>	<i>Lake Champlain</i>			Yes	3b		
<i>Sunderland</i>	902	<i>Bat</i>	<i>Hudson</i>		2016	NA	3b		
<i>Sutton</i>	1,067	<i>Pas</i>	<i>Connecticut River</i>			NA	3b		
Swanton	6,428	Miss	Lake Champlain		2009	Yes	3b	Completed	Swanton Village Center
<i>Thetford</i>	2,780	<i>Conn</i>	<i>Connecticut River</i>	Ompompanoosuc River on Priority Waters List Part D		NA	3b		
<i>Tinmouth</i>	632	<i>Otter</i>	<i>Lake Champlain</i>	<i>Flower Brook on Priority List Part D for E.coli</i>		NA	3b		
<i>Topsham</i>	1,135	<i>Waits</i>	<i>Connecticut River</i>			NA	3b		
Townshend	1,085	West	Connecticut River		2016	NA	2a		
Troy & N.Troy Village	1,686	Miss	Lake Champlain		2009	No	3b		
<i>Tunbridge</i>	1,299	<i>White</i>	<i>Connecticut River</i>		2014	NA	3b		<i>North Tunbridge Village Center/Tunbridge Village Center</i>
Underhill & Underhill Flats Village	3,082	Lam	Lake Champlain		2011	Yes	2a		
Vergennes	2,666	Otter	Lake Champlain	Otter Creek on 303d-Part A for E.coli impairment below City	2010	Yes	1b		Vergennes Downtown
<i>Vernon</i>	2,035	<i>Conn</i>	<i>Connecticut River</i>			NA	3b		
<i>Vershire</i>	625	<i>Omp</i>	<i>Connecticut River</i>	Ompompanoosuc River on Priority List Part D for E.coli		NA	3b		
<i>Victory</i>	95	<i>Moose</i>	<i>Connecticut River</i>			NA	3b		
Waitsfield & Waitsfield Village	1,683	Win	Lake Champlain	Mad River on Priority Waters List Part D	2009	No	2a	Completed for Waitsfield Village	Waitsfield Village Center
<i>Walden</i>	760	<i>Pas</i>	<i>Connecticut River</i>			NA	3b		

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
Wallingford & Wallingford Village	2,324	Otter	Lake Champlain		2012	No	2a or 3b		
<i>Waltham</i>	478	Otter	Lake Champlain	Little Otter Creek on Priority List Part D for E.coli		NA	3b		
Wardsboro	906	West	Connecticut River	Wardsboro Brook on Stressed Waters List	2015	NA	3b		
Warren & Sugarbush Ski Area	1,735	Win	Lake Champlain	Clay Brook on 303d-Part A, Mad River on Priority Waters List Part D	2016	Yes	3b	Under consideration for Clay Brook or will be issued a permit requirement, Rice Brook completed	Warren Village Center
<i>Warren's gore</i>	10	Clyde	Lake Memphremagog			NA	3b		
<i>Washington</i>	1,095	Win	Lake Champlain		2015	No	3b		
Waterbury & Waterbury Village	5,349	Win	Lake Champlain		2009	No	2a		Waterbury Downtown
<i>Waterford</i>	1,220	Conn	Connecticut River			NA	3b		
<i>Waterville</i>	680	Lam	Lake Champlain			NZ	3b		<i>Waterville Village Center</i>
Weathersfield & Ascutney Village	2,832	Conn	Connecticut River		2015	No	2a or 3b		
<i>Wells</i>	1,092	Met	Lake Champlain			NZ	3b		
<i>West Fairlee</i>	722	Omp	Connecticut River	Ompompanoosuc River on Priority List Part D for E.coli	2014	NA	3b		<i>West Fairlee Village Center</i>
<i>West Haven</i>	310	LC	Lake Champlain			NA	3b		
West Rutland	2,513	Cast	Lake Champlain	Clarendon River on Priority Waters List on Stressed Waters List	2012	No	2a or 3b	Castleton River Headwaters to be completed in 2017	West Rutland Village Center
West Windsor	1,096	Conn	Connecticut River		2015	Yes	2a		
<i>Westfield</i>	516	Miss	Lake Champlain			NA	3b		
<i>Westford</i>	2,229	Miss	Lake Champlain			NA	3b		Westford Village Center
Westminster & North Westminster Village	3,192	Conn	Connecticut River		2015	NA	3b		<i>North Westminster Village Center/ Westminster Station Village Center/ Westminster Village Center/ Westminster West Village Center</i>

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
<i>Weston</i>	632	<i>West</i>	<i>Connecticut River</i>	West River on Priority Waters List Part D	2016	NA	3b		<i>Weston Village Center</i>
<i>Weybridge</i>	818	<i>Otter</i>	<i>Lake Champlain</i>			NA	3b		
<i>Wheelock</i>	602	<i>Pas</i>	<i>Connecticut River</i>			NA	3b		
<i>Whiting</i>	402	<i>Otter</i>	<i>Lake Champlain</i>			NA	3b		
<i>Whitingham</i>	1,198	<i>Deer</i>	<i>Connecticut River</i>		2016	NA	3b		<i>Whitingham Village Center</i>
Williamstown & Williamstown Village	3,209	Win	Lake Champlain		2013	No	2a		
Williston	8,430	Win	Lake Champlain	Allen Brook on Priority Waters List Part D, Muddy Brook Trib #4 on 303d-Part A	2012	Yes	2c & 3a & 3c	Completed for all town streams. Also completed as part of LaPlatte River Watershed plan.	Williston Village Center/Williston Growth Center
Wilmington Village	2,340	Deer	Connecticut River	N.Branch Deerfield River on Priority List Part D for E.coli	2016	NA	2a		Wilmington Village Center/Wilmington Downtown
<i>Windham</i>	344	<i>Sax</i>	<i>Connecticut River</i>			No	3b		
Windsor & Windsor Village	3,602	Conn	Connecticut River	Mill Brook on Stressed Waters List	2015	Yes	2a		Windsor Downtown
Winhall	786	West	Connecticut River	Mill Brook on 303d-Part A	2015	NA	3b	Under consideration for Mill Brook or will be issued a permit requirement. Completed for North Branch of Ball Mt Brook watershed	
Winooski	6,429	Win	Lake Champlain	Morehouse Brook on Priority Waters List Part D, Lower Winooski River on Stressed Waters List	2004	Yes	2c & 3c	In development, MS4	Winooski Downtown / Neighborhood Planning Area
<i>Wolcott</i>	1,714	<i>Lam</i>	<i>Lake Champlain</i>		2014	NA	3b		
<i>Woodbury</i>	808	<i>Lam</i>	<i>Lake Champlain</i>			No	3b		

Municipality with Urbanized Area/Rural Municipality	2008 Population	River Basin	Regional Water Basin	Listed for Water Quality Problems Due to Developed Land	GIS SW Map	Stormwater Ordinance	Suggested SW Master Planning Template	Status of SW Master Planning	Growth Center Category
<i>Woodford</i>	387	<i>Wal</i>	<i>Hudson</i>			NA	3b		
Woodstock & Woodstock Village	3,133	Otta	Connecticut River	Ottawaquechee River on Stressed Waters List	2015	Yes (Town)	1b or 2a		Woodstock Village Center
<i>Worcester</i>	860	<i>Win</i>	<i>Lake Champlain</i>		2014	No	3b		<i>Worcester Village Center</i>