White River Watershed Basin 9 Tactical Basin Plan

December 2024 | Final Plan

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

Approved:

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Cover Photo: Lower White River, Hartford, Keith J. Fritschie

White River Basin Towns

Barnard	Granville	Ripton*	Tunbridge
Bethel	Hancock	Randolph	Vershire*
Braintree	Hartford	Rochester	Warren*
Bridgewater*	Killington*	Roxbury	Washington
Brookfield	Mendon*	Royalton	Williamstown
Chelsea	Norwich*	Sharon	
Chittenden	Pittsfield	Stockbridge	
Goshen*	Pomfret	Strafford*	

**Only a small area of the town is in the watershed and is covered in more detail in corresponding basin plans.*

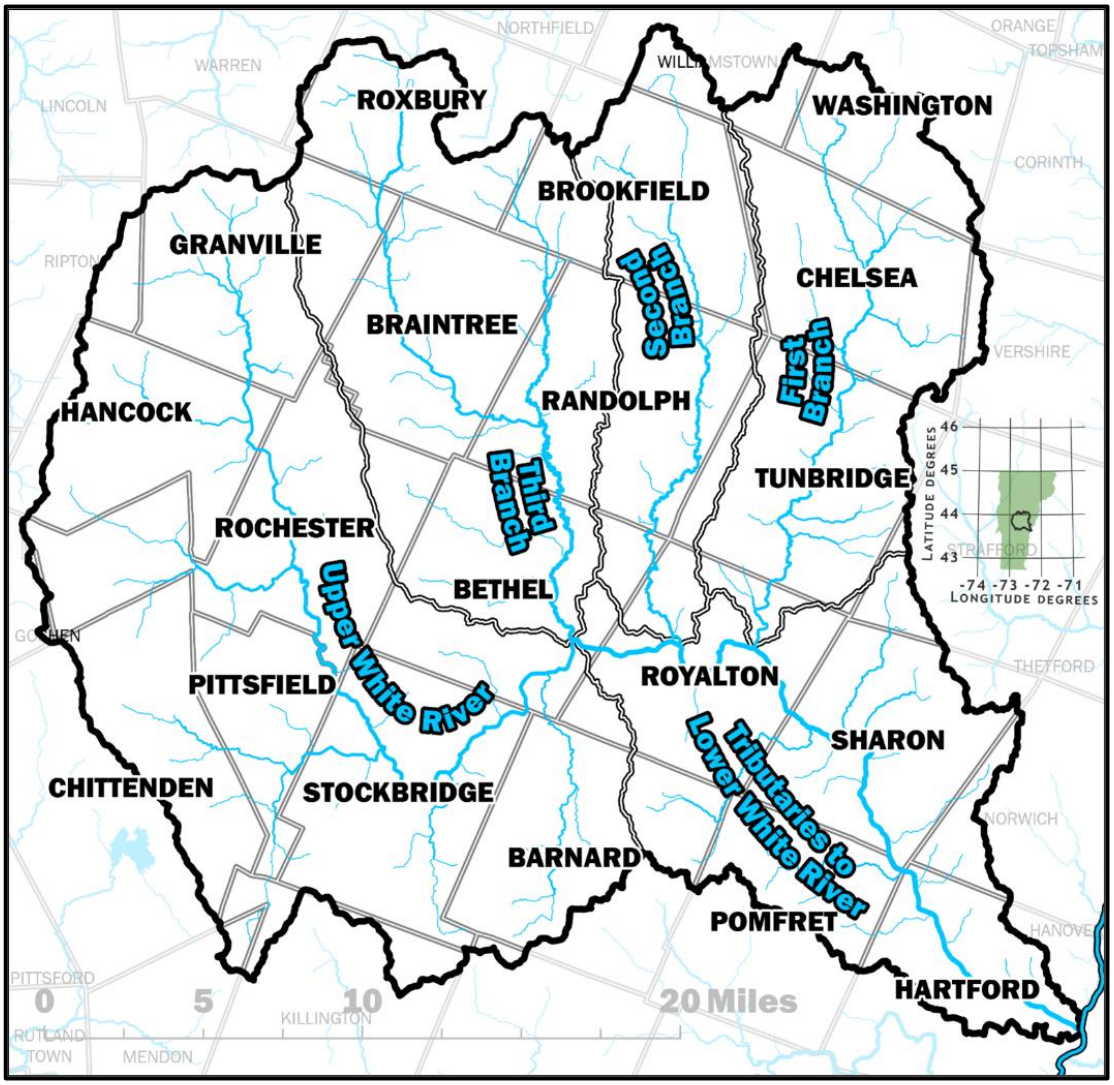


Table of Contents

List of Figures

List of Tables

Executive Summary

The White River basin (Basin 9) covers approximately 710 square miles and accounts for 7.4 percent of Vermont's land area. The main stem of the White River flows 56 miles from the Ripton to White River Junction and enters the Connecticut River at an elevation about 3,200 feet lower than where it originates on the slopes of Battell Mountain. The White River is the longest un-dammed tributary to the Connecticut River and is one of the last free-flowing rivers in Vermont. The Basin occupies significant parts of Windsor and Orange Counties and lesser parts of Addison, Rutland, and Washington Counties. The entire watershed includes 29 towns and is roughly 83.5% forest, 8% agriculture, 2% surface waters and wetland, 1% field and shrubland, and 5.5% developed area including roads. 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.

Most surface waters monitored meet or exceed water quality standards. All streams above 2,500ft elevation are classified as A(1), as are five other sub-watersheds below 2,500ft. Additionally, one waterbody qualifies for Class I wetland designation 45 stream sub-watersheds qualify for B(1) reclassification. 13 stream segments and one wetland are also recommended for continued monitoring to determine their reclassification potential. The mainstem White River is also recommended as an Outstanding Resource Water for recreation, as exemplified by significant use at many public access sites along the White River Water Trail.

While most surface waters are in good condition, there are also waters in need of restoration and continued monitoring. Five lake or river segments are identified for restoration, including three segments of the First, Second, and Third Branches impaired by E. coli, one segment of Smith Brook impaired by iron, and Skylight Pond, which is impaired by acidification. An additional 10 stream segments are recommended for continued monitoring to determine their attainment of aquatic life criteria.

Sector-based strategies are proposed to meet overall protection and restoration goals. 41 detailed strategies and 74 monitoring priorities are recommended for the next five years and summarized in Table 1. 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 a summary of strategies for restoration and protection.

	Focus Areas	Example Strategies
Agriculture	First, Second, and Third Branches of the White River	• Support farmers in developing, updating, and implementing nutrient management plans. • Support farmers in developing and implementing grazing plans, pasture and agronomic BMPs. • Identify opportunities and prioritize outreach for riparian and wetland restoration and protection. • Develop additional capacity for Farm Teams, facilitated by the White River Natural Resources Conservation District, to streamline service provider outreach to farmers. • Promote and expand the existing list of locally available equipment necessary for BMP implementation. • Coordinate with existing regional agricultural meetings to discuss issues, needs, funding opportunities, and concerns regarding water quality issues.
Developed Lands - Stormwater	All towns, including Royalton, Bethel, Hartford, Rochester, Chelsea, Sharon, Braintree, Washington, and Roxbury	• Develop Stormwater Master Plans. • Support the design and implementation of high priority projects identified in stormwater master plans and stormwater mapping reports. • Assist municipalities in updating Road Erosion Inventory and prioritizing and implementing roads projects to meet the Municipal Roads General Permit.
Wastewater	Bethel, Chelsea, Royalton, Randolph, and villages adjacent to waterways	• Support municipalities pursuing wastewater treatment facility optimization, refurbishment projects, and upgrades to address water quality concerns. • Support pollution prevention and industrial pretreatment programs. • Provide technical assistance and funding to towns interested in exploring and implementing village wastewater systems and septic replacement through ANR Village Wastewater Solutions. • Promote septic system maintenance in communities adjacent to nutrient- or bacteria-degraded waters via Wastewater Workshops.

	Focus Areas	Example Strategies
Rivers	Basin-wide	• Develop and implement stream restoration projects identified in River Corridor Plans, Hazard Mitigation Plans, or the US Forest Service's Robinson Integrated Natural Resource Assessment. • Develop and implement an assessment method for identifying and prioritizing corridor easements or floodplain buyouts. • Identify, develop, design, and implement priority culvert upgrade and dam removal projects. • Identify, develop, design, and implement low-tech, process-based restoration projects to improve stream equilibrium. • Continue buffer implementation. • Educate towns about and assist them in adopting new FEMA flood maps using model flood hazard bylaw or similarly protective language. • Support partner coordination to identify the basin's outstanding values and provide community outreach on opportunities to designate the White River as a state Outstanding Resource Water and/or to develop a National Wild and Scenic River study.
Lakes	Silver and Sunset Lakes	• Evaluate community support for and conduct Lake Wise assessments and Lake Watershed Action Plans. • Develop, design, and implement priority projects identified through Lake Wise assessment or other planning efforts. • Establish greeter programs.
Wetlands	Potential Class I wetlands, RCPP-identified or other wetland restoration priorities	• Identify potential wetland restoration sites and support partner outreach to landowners. • Develop, design, and implement priority projects. • Provide support to the Wetlands Program for publicizing updated wetland mapping and local efforts for reclassification.
Forests	State and federal lands, town forests, and large private lands with significant tributary networks	• Pilot forest road inventories and implement priority projects on state, municipal, and potentially private lands. • Support the use of skidder bridges through direct funding programs. • Implement priority US Forest Service actions identified in the Robinson Integrated Natural Resource Assessment.

The 2018 White River basin plan identified 60 strategies to address protection and restoration of surface waters. Of the 60 strategies identified, 19 are complete, 28 are in progress, 5 are discontinued, and 8 are awaiting action (Figure 1). The White River basin report card, included in Appendix A of this Plan, includes a list of detailed updates for each strategy identified in the 2018 Plan. Several strategies will be carried over to this plan.

Figure 1. Status of strategies from the 2018 TBP.

The 41 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 also a strong sentiment that waters in the White River basin should be upwardly reclassified if the available data indicate they are candidates. Stakeholders expressed the importance of ensuring access to waters for all members of the community, including ensuring clean surface water for consumptive and recreational uses. They also expressed interest in the possible recognition of the outstanding values of the White River basin through either state Outstanding Resource Water or National Wild and Scenic River designation. There appears to be a growing recognition of the overlap of clean water, habitat, and flood resilience goals and an understanding that well-sited natural resource protection and restoration actions can complement more traditional infrastructure-based strategies for improving local and basin-wide flood resilience.

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. The agency develops these watershed plans for each of the 15 major basins in the State of Vermont. TBPs target strategies and prioritize resources to those actions that will have the greatest influence on surface water protection or restoration.

Figure 2. Policy requirements of Tactical Basin Planning.

Figure 3. Five-year basin planning cycle.

TBPs are integral to meeting a broad array of both state and federal requirements including the U.S Environmental Protection Agency's 9-element framework for watershed plans (Environmental Protection Agency, 2008), US Clean Water Act Section 303(e) for state-level water quality planning, and state statutory obligations including those of the Vermont Clean Water Act, and 10 VSA § 925 and 10 VSA § 1253 (Figure 2).

Tactical basin planning is carried out by the Water Investment Division in collaboration with the Watershed Management Division 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, federal, regional, and local government agencies, and other stakeholders, including community and non-profit 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 the ecological health and public use and enjoyment of Vermont waters as set forward in the Vermont Surface Water Management Strategy and the

Vermont Water Quality Standards. The TBP process shown in Figure 3, allows for the issuance of plans for Vermont's 15 basins every five years.

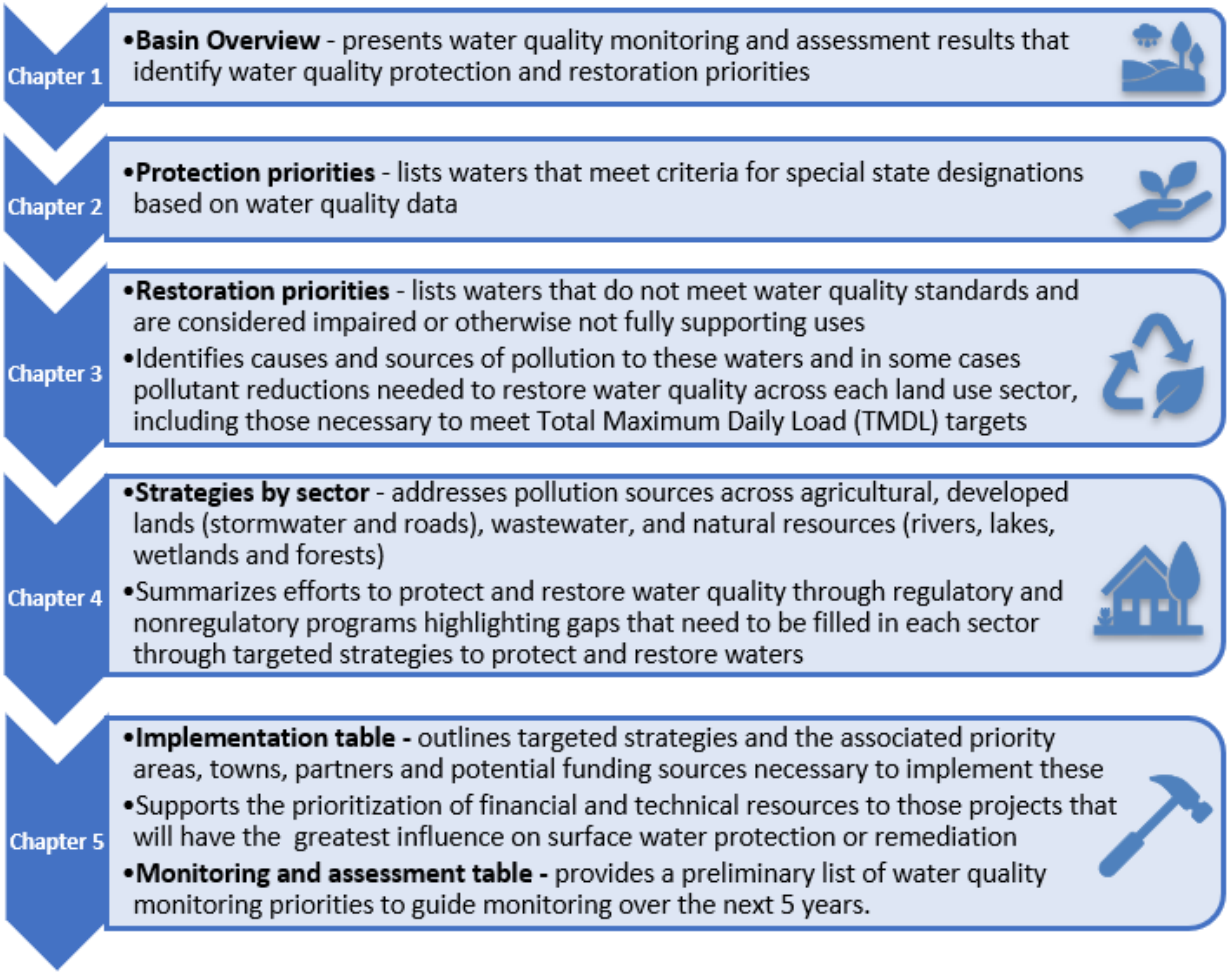


Figure 4. Chapters of Tactical Basin Plans.

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 4).

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 and the Watershed Projects Explorer. The Project Database and Explorer are found on ANR's Clean Water Portal and are regularly updated to capture project information throughout the TBP process.

Chapter 1 – Basin Description and Conditions

A. Basin Overview

The White River basin (Basin 9) encompasses 710 square miles in Vermont. The entire watershed spans 29 towns covering five counties: Windsor, Orange, Rutland, Addison, and Washington counties. The White River begins its 56-mile journey in Ripton along Battell Mountain at nearly 3,600ft and terminates at its confluence with the Connecticut River in White River Junction at Hartford. The river basin comprises 5 sub-basins (Figure 5) which include the First, Second, Third, Hancock, and West Branches, the Tweed River, Ayers Brook, and many other smaller tributaries. Detailed information about each of these rivers and other smaller watersheds within the Basin can be found in previous individual basin assessment reports and the 2018 White River Tactical Basin Plan. Three major features— the Green Mountains to the west, the Richardson Memorial Contact that splits the basin latitudinally, and glacial Lake Hitchcock whose rich sediments extend through

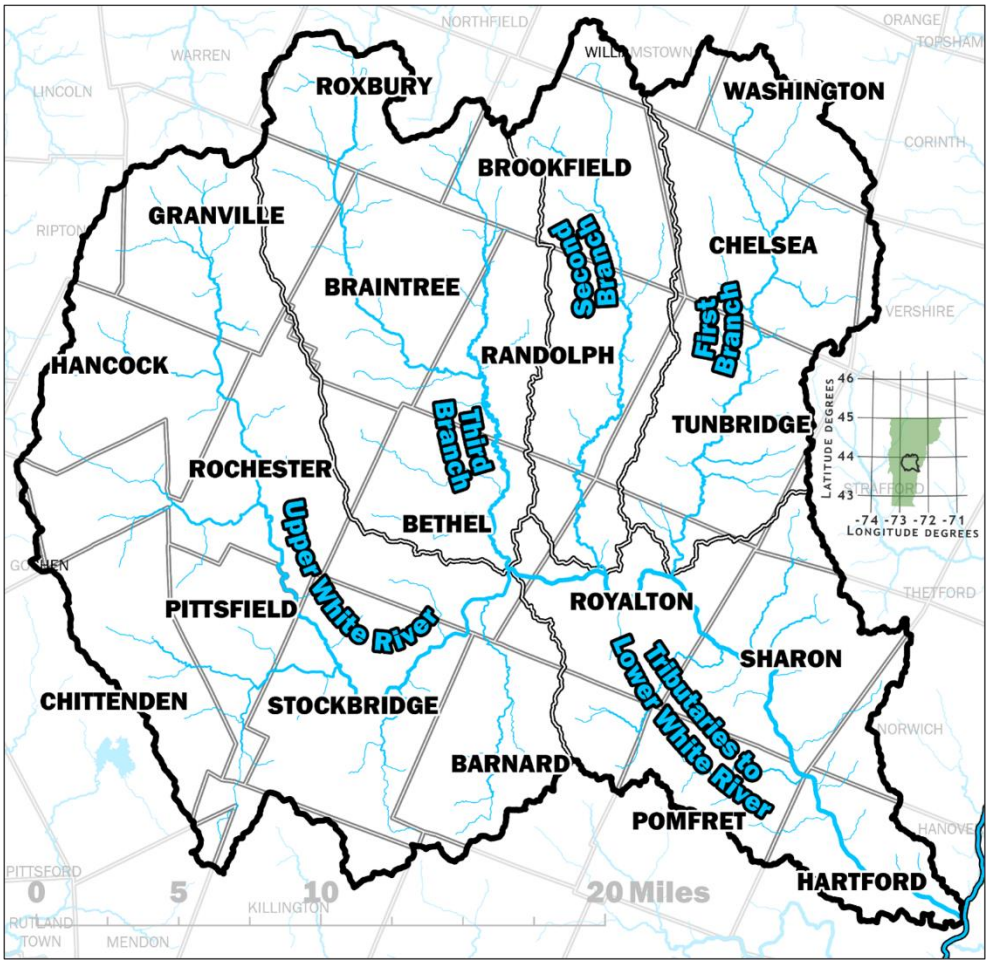


Figure 5. The White River basin is composed of five major sub-watersheds that drain to the Connecticut River.

the lower mainstem and First, Second, and Third Branches— form the geologic template influencing surface water structure and condition in this watershed.

Land Use and Land Cover

The White River Basin is a predominantly forested landscape. Forested land covers about 83% of the Basin while <2% is wetlands and open water. Developed and agricultural land cover about 5.5% and 8.3% of the Basin, respectively (Figure 6). A basin-wide analysis of land use change from 2001 to 2019 showed some changes in land cover over this time including increases in developed lands (2913 acres) and scrub shrub (1089 acres) and decreases in forest (-1037 acres), pasture and hay (-2041 acres), and herbaceous grassland (-1019 acres). Increases in developed lands were generally evenly distributed among the White River's sub-basins. Forestland losses were greatest in the Mill Brook, Broad Brook, Stony Brook, Breakneck Brook, and lower White River sub-watersheds. The headwaters of the Third Branch actually gained significant forest cover, offsetting a significant loss in herbaceous grassland cover. Pasture and hay land change was greatest in the First and Second Branches, Ayers Brook, and Broad Brook.

Land cover and land use are primary determinants of surface water quality. Large areas of properly managed forests, riparian buffers, and wetlands are principally responsible for good water quality in Vermont. Significant conversion from natural lands to developed or agricultural lands will likely contribute to increased nutrient levels in surface waters. However, where good management practices and quality local stewardship exist on agricultural and developed lands, good water quality can too.

Climate Change Implications for Water Resource Management

Adapting how we manage and use our surface waters in the face of climate change is one of the chief overarching challenges for basin planning. Climate is defined by long-term weather patterns, which in turn influence human and natural systems. In Vermont, climate change is causing increases in storm intensity and total precipitation (Betts, 2011) (National Oceanic and Atmospheric Administration, 2013). These increases will likely lead to a rise in flooding, water quality and ecosystem impairments, and reduced water-based recreational availability (Pealer & Dunnington, 2011).

The 2021 Vermont Climate Assessment established state-level climate change information with implications for local surface waters. Vermont's average annual temperature has increased by almost 2°F (1.11°C) since 1900 with warming occurring twice as fast in winter (Galford, 2021). The latter results in earlier thaw dates for rivers, lakes and ponds, and mountain snowpack. Common fish species such as trout and salmon, and warm-water fish like smallmouth bass rely on groundwater discharges for cooler refuges during summer seasons. These refugia will decrease in availability as groundwater temperature is expected to increase over time (Neidhardt & Shao, 2023). Fish are heavily reliant on their physical landscape and connectivity to migrate, move through different environments at different life stages, and take advantage of multiple habitat types. Infrastructure

such as roads and dams have severely hampered the mobility of aquatic species and form barriers to fish migrating or seeking cold refuge during hot spells.

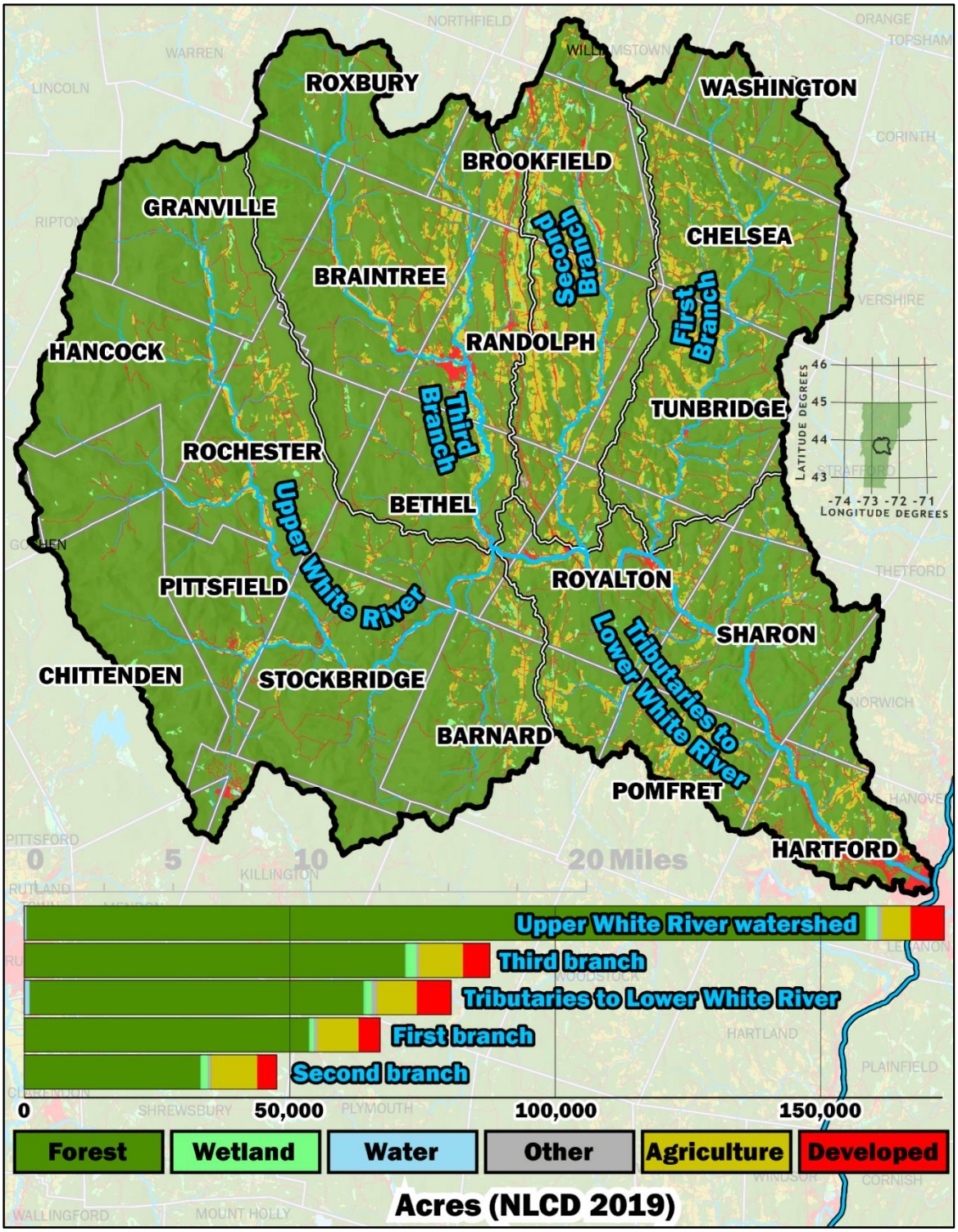


Figure 6. Land cover by acreage across five major White River sub-basins.

The 2021 Vermont Climate Assessment suggests extreme weather events such as droughts and floods are expected to continue to increase with climate change. Of the many natural hazards that impact Vermont, flooding poses the greatest risk to Vermont infrastructure and communities (VT Climate Action Plan). Fluvial erosion and inundation flooding continue to be the first and second most significant natural hazards in Vermont, respectively (VT State Hazard Mitigation Plan). Vermont experiences 2.4 more days of heavy precipitation than in the 1960s, typically in summer. Average annual stream flows are increasing, which is expected to continue in the future. High flows now happen more frequently, leading to increased inundation flooding and fluvial erosion (stream-related erosion) all of which can be exacerbated or alleviated by land-use management decisions. Within the Basin, the 2018 White River Tactical Basin Plan (Page 37) and its Appendix B demonstrate that the mean annual daily flow— the average daily streamflow at a site over the course of one year— has significantly increased by 20-30% since 1940 at two USGS stream gaging stations on Ayers Brook and the lower White River mainstem. Aquatic habitats affected by increased runoff and streamflow could experience increases in sediment mobilization, nutrients and scouring in addition to increased water temperature. In response, local freshwater plant and animal species may shift their geographic ranges and alter their abundance and seasonal activities (Stamp et al., 2020).

The Vermont Climate Assessment highlights five key messages for water resources in Vermont:

- Due to extreme variation in precipitation with our changing climate, periods of prolonged dry-spells and drought, coupled with higher water usage in snowmaking and agriculture could exacerbate low water availability.

- Increases in overall precipitation, and extreme precipitation, have caused average annual streamflows to rise since 1960. Climate change will further this pattern, although the overall increase in streamflow comes with disruptions in seasonal flows cycles.

- Increases in heavy precipitation jeopardize water quality in Vermont. Storms produce large runoff events that contribute to erosion and nutrient loading. Combined with warm temperatures, this creates favorable conditions for cyanobacteria blooms.

- Increased occurrence of high streamflows increases the risk of flooding that causes damage to many roads and crossing structures. Risk reduction requires addressing outdated and unfit structures.

- Nature-based solutions are an effective, low-cost approach to climate change adaptation. River corridor, floodplain, and wetland protection dampen flood impacts and improve water quality along with green infrastructure.

Protective measures, such as strategic land acquisition and limitations on development in riparian areas, may be the most economical solution to address the challenges presented by climate change and to achieve healthy surface waters (Watson, Ricketts, Galford, Polasky, & O'Neil-Dunne, 2016)

(Weiskel, 2007). However, the plan also identifies restoration strategies— such as floodplain, stream, and wetland restoration and agricultural, forestry, and stormwater best management practice implementation— to complement protective measures where appropriate. Ongoing efforts to strengthen ecological resilience and the role of natural infrastructure in protecting built communities can be found on the Climate Change in Vermont website. This website also details the 2020 Global Warming Solutions Act (Act 153), which sets Vermont greenhouse gas emissions reduction goals, establishes a Climate Council tasked with developing and updating a Climate Action Plan (2021 Initial Vermont Climate Action Plan), and requires the Agency of Natural Resources to adopt rules consistent with the plan.

Summer Flooding

In July 2023, and again in December 2023 and July 2024, catastrophic flooding occurred across Vermont. While not surpassing water levels experienced during 2011's Tropical Storm Irene, many White River towns sustained severe damage, and statewide impacts warranted a federal disaster declaration in eight Vermont counties. In response to this and numerous previous flooding events, the Vermont legislature passed Act 143 in 2024 relating to natural disaster government response, recovery, and resiliency. The Act creates the Community Resilience and Disaster Mitigation Grant Program for the purpose of awarding grants for municipal disaster mitigation projects. These grants will provide funding for:

> (A) technical assistance for natural disaster mitigation, adaptation, or repair to municipalities;
>
> (B) technical assistance for the improvement of municipal stormwater systems and other municipal infrastructure;
>
> (C) projects that implement disaster mitigation measures, adaptation, or repair, including watershed restoration and similar activities that directly reduce risks to communities, lives, public collections of historic value, and property; and
>
> (D) projects to adopt and meet the State's model flood hazard bylaws.

Additionally, the legislature also passed Act 121 relating to the regulation of wetlands, river corridor development, and dam safety. This act requires the development of a State River Corridor Base Map to identify areas suitable for development located in existing settlements in river corridors that will not contribute to fluvial erosion hazards, establish minimum flood hazard area standards, protect, regulate, and restore wetlands so that the State achieves a net gain of wetlands acreage, and enables the Dam Safety Revolving Loan Fund to provide financial assistance for emergency and nonemergency dam projects.

Further recommendations to increase flood resiliency across Vermont include:

- Seek to make permanent the Flood Resilient Communities Fund (FRCF) that was created through an ARPA funding allocation in 2021 and has been a successful flood mitigation program. Additionally, evaluate expanding eligibilities for the FRCF program to maximize the impact of federal hazard mitigation funding and coordinate flood resilience work at the statewide level across state agencies.
- Consider additional conservation practices and incentives for agricultural lands that are located in river corridors and low-lying floodplains that often provide ecosystem services in major flood events.
- Increase funding for private property buyouts and slope stability mitigation to protect public health and safety and build longer term flood resilience.

B. Water Quality Conditions

The Vermont Water Quality Standards (VWQS) provide the basis used by the Vermont Department of Environmental Conservation (DEC) in determining the condition of surface waters including whether the water meets or does not meet certain criteria. The assessment of a water's condition within the context of the VWQS requires consideration of the water's classification, designated and existing uses, and the corresponding narrative and numeric water quality criteria (see Chapter 2 for definitions). This assessment categorizes Vermont's surface waters as either "full support, altered, or impaired".

DEC uses a five-year rotational monitoring approach, where basin sites are typically monitored once every five years. This state-collected data is augmented by community-science monitoring programs throughout the state, including the LaRosa Partnership Program and the Lay Monitoring Program. Water quality monitoring and assessment work is described in detail in the Water Quality Monitoring Program Strategy.

Most surface water monitoring is led by programs in DEC's Watershed Management Division (WSMD), including the Rivers Program, the Lakes and Ponds Management and Protection Program, and the Wetlands Program. The result of this work offers site specific assessments of the Basin's waters.

Within the Rivers Program, the Biomonitoring and Aquatic Studies Section focuses on biological monitoring of aquatic macroinvertebrate and fish communities, plus targeted water chemistry and temperature monitoring. Biomonitoring staff also support the LaRosa Partnership Program, a community-based nutrient and chloride monitoring program. See the LaRosa Partnership Program's Power BI interface and database reports to interact with data collected through this program. The White River Partnership has collected data at 15 sites through the Program since the 2018 TBP. The Connecticut River Conservancy has also collected data at the White River's mouth as a part of a regional Connecticut River water quality monitoring effort.

The Lakes and Ponds Management and Protection Program supports the Inland Lake Assessment and Lay Monitoring Programs, which evaluate nutrient conditions and trends on lakes, as well as shoreland condition and more in-depth lake assessments through the Spring Phosphorus Program and Next Generation Lake Assessments. The Lakes and Ponds Program also performs surveys to monitor the spread of aquatic invasive species in Vermont's public waters through the Vermont Aquatic Invasive Species Program.

In addition to the WSMD's surface water monitoring programs in this basin, the following programs also contribute monitoring data to determine the health of Vermont's surface waters:

- The Rivers Program supports biological and chemical monitoring as well as stream geomorphic assessments that evaluate geomorphic and physical habitat conditions of rivers.
- The Wetlands Program conducts assessments on wetlands to determine the biological condition and ecological integrity of wetlands.
- The Vermont Fish and Wildlife Department conducts fisheries assessments and targeted temperature monitoring to assess the health of recreational fish populations and opportunities for habitat restoration.
- Jointly, the Rivers Program and Lakes and Ponds Management and Protection Program maintain a network of twelve stream and thirteen lake sentinel sites statewide respectively, which are monitored every year for biology, temperature, water chemistry and hydrology (at a subset of sites). These sentinel sites (three in the White River basin: Bingo and Smith Brooks and the upper White River) have negligible prospects for development or land use change and are closely monitored to isolate long term impacts related to climate change.
- The Rivers Program's Streamflow Protection section administers a cooperative agreement with the U.S. Geological Survey to maintain and operate a number of stream gages in Vermont.
- The Vermont Agency of Agriculture, Food, and Markets conducts monitoring at sampling sites throughout Vermont on rivers and tributaries that pass through agricultural use areas. The Agency also runs the Ambient Surface Water Study to establish baseline levels of pollutants and to monitor for the presence of neonicotinoids, glyphosate, corn herbicides, and nitrate across the state.
- The Drinking and Groundwater Protection Division and the Watershed Management Division monitor Per- and Polyfluoroalkyl Substances.

Tactical Basin Plans include monitoring information reported by Vermont State agencies as results relate to the designated uses defined by the VWQS. Most of the DEC monitoring data can be accessed through the Vermont Integrated Watershed Information System online data portal.

The following is an overview of water resource health in the White River basin. More detail is provided in Chapters 2 and 3. Chapter 2 includes waters where values and uses exceed current classifications, while Chapter 3 includes waters on the Vermont Priority Waters List, the list of rivers and lakes that do not meet VWQS or other Agency criteria.

Rivers and Streams

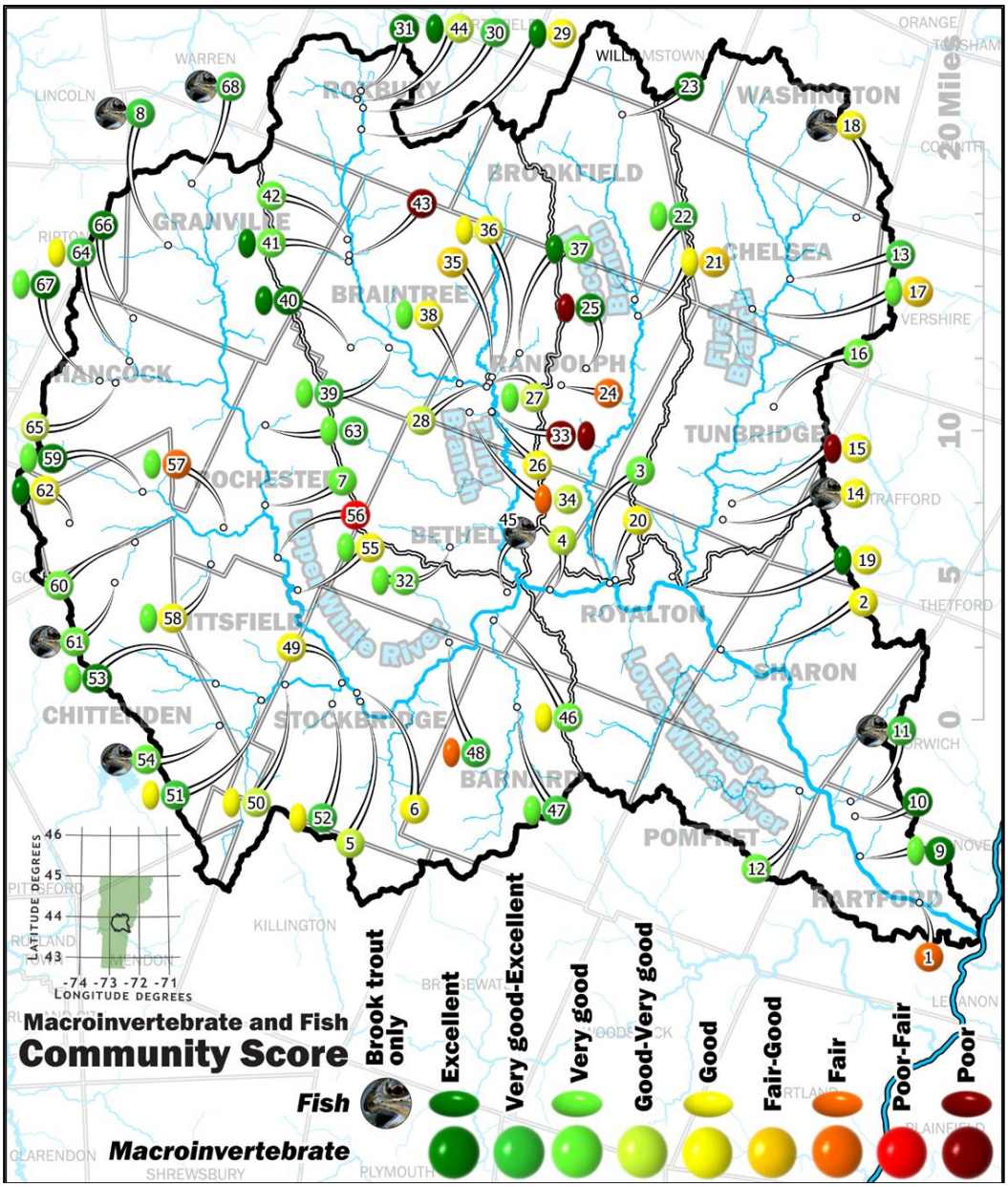


Figure 7. Biological condition of fish and macroinvertebrate communities of the White River basin sampled since 2012 (most recent shown if a site has been sampled multiple times since 2012). Map IDs correspond with data in Table 2.

Biological Assessment

Biological communities reflect overall ecological integrity (i.e., chemical, physical, and biological condition). Therefore, biomonitoring results can directly assess the status of a waterbody relative to the primary goal of the federal Clean Water Act. These communities integrate the effects of different stressors and thus provide a broad measure of the stressors' aggregate impact. Because they integrate stressors over time, they can provide an ecological measure of fluctuating environmental conditions. The WSMD uses biological monitoring (i.e., biomonitoring) to detect aquatic biota impairments in wadeable streams, as well as the type and severity of potential stressors causing the impairment. Biomonitoring is also important for identifying streams at or near a reference level condition. Each community of macroinvertebrates and fish is rated from *Poor* (severely degraded and not meeting VWQS) to *Excellent* (similar to the natural condition and exceeding the VWQS). If a stream repeatedly fails to meet minimum aquatic biota expectations, it is a candidate for the Vermont

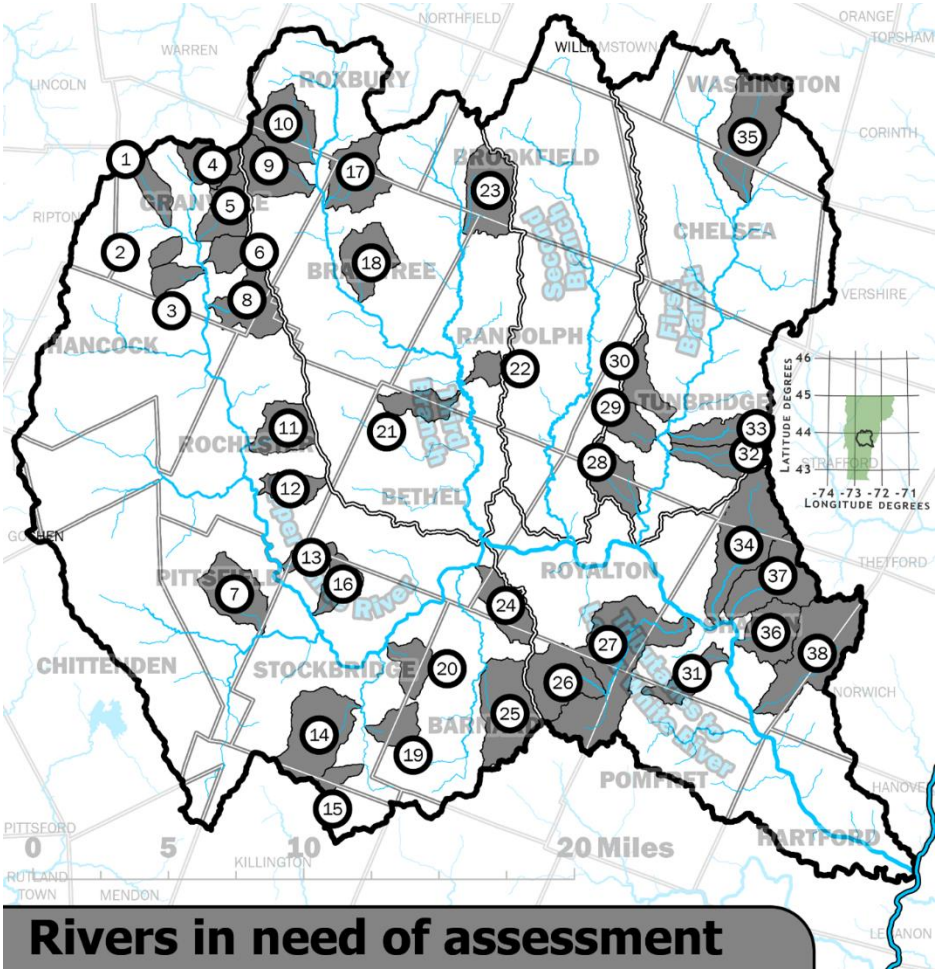


Figure 8. Stream catchments without current biosurvey data in the White River basin. Sites are listed in the Chapter 5 Monitoring Table (Table 14).

Priority Waters List. If a stream has macroinvertebrate and fish communities consistently at or near a reference level condition, it is a candidate for increased protection through upward reclassification.

Macroinvertebrate and fish monitoring is conducted following procedures outlined in the WSMD Field Methods Manual (DEC 2022). Applying biocriteria and determining assessments for both communities is outlined in the VWQS (2022).

Macroinvertebrate Monitoring Results

Macroinvertebrate assessments were completed at 67 sites in the White River basin between 2012 and 2022 (Figure 7, Table 2). The results of the assessments are described below. In addition, to ensure a comprehensive understanding of water quality basin wide, a gap analysis was conducted by DEC to identify sites without current monitoring data (Figure 8). Some of these will be prioritized based on land use or other factors for the 2025 monitoring season and can be found in the Chapter 5 Monitoring and Assessment Table.

Of the 67 completed macroinvertebrate sites assessed, 38 monitoring sites (57%) exhibited *Very Good* or better condition in their most recent assessment. Of these, 12 were found to be *Excellent*, meaning their macroinvertebrate community is comparable to reference or natural condition. Most of these waters are either headwater streams or located higher up in the watershed. Another 26 were found to be in *Very Good* to *Very Good - Excellent* condition. Streams in *Very Good* or better condition exceed the VWQS criteria for B(2) classification and are priorities for additional assessment and protection. 19 (28%) macroinvertebrate assessments scored *Good* or *Good - Very Good*. These streams meet the VWQS B(2) criteria and are priorities for maintenance and protection. Four sites (6%) had macroinvertebrate assessments that scored *Fair - Good*. Condition is indeterminate at these sites, and they require more monitoring to determine full aquatic biota support status. Six sites (9%) scored *Fair* or lower, failing to meet VWQS B(2) criteria.

Fish Monitoring Results

Fish community surveys were completed at 41 sites between 2012 and 2022 in the White River basin (Figure 7, Table 2). Seven of the sample sites had only Brook Trout, which means that a community assessment could not be made; however, a density criterion can be applied for upward reclassification of Brook Trout only streams. Of the 34 sites where fish communities could be assessed, 21 (62%) had fish communities in *Excellent* or *Very Good* condition, indicating the fish communities at these sites exceed the VWQS for class B(2) streams. Eight (23.5%) sites with fish assessments exhibited communities in *Good* condition which meet the VWQS for class B(2) streams and are priorities for maintenance and protection.

Five sites (15%) with fish assessments exhibited communities in *Fair* or *Poor* condition. Fish-based conditions at one of these sites scored similarly to the macroinvertebrate-based conditions (i.e., lower Smith Brook, an impaired water). However, at the remaining four sites the *Fair* or *Poor* fish-

based conditions were in contrast with *Good* to *Excellent* macroinvertebrate-based conditions. Often, a fish community can suggest different stressors from a macroinvertebrate community; therefore, assessing both the macroinvertebrate and fish community at a site is useful when resources allow it. Sites that fail to pass VWQS for a single community but score well for the other may be prioritized for further sampling to determine if anthropogenic impacts are responsible for the degradation. These sites are included in the Chapter 5 Monitoring Table (Table 20).

Table 2. Bioassessment results in the White River basin assessed between 2012 and 2023. Map ID corresponds to assessed sites in biological condition maps above. For each site, only the most recent assessment result is given. 'BKT' indicates a brook trout only fish community.

Map ID	Site Name, River Mile	Year	Macroinvertebrate Assessment	Year	Fish Assessment
1	White River, 2.5	2023	Fair		
2	White River, 15.4	2023	Good		
3	White River, 21.8	2014	Very Good		
4	White River, 24.1	2018	Good - Very Good		
5	White River, 31.9	2023	Good		
6	White River, 32.4	2020	Fair - Good		
7	White River, 43.7	2014	Very Good		
8	White River, 55.2	2020	Very Good - Excellent	2020	BKT
9	Jericho Brook, 0.1	2020	Excellent	2020	Very Good
10	White River Trib 12, 0.6	2018	Excellent		
11	Podunk Brook, 0.9	2014	Very Good - Excellent	2014	BKT
12	Mill Brook, 0.9	2020	Very Good		
13	First Branch White River, 17.1	2020	Very Good - Excellent		
14	Button Brook, 0.3	2014	Good	2014	BKT
15	Belknap Brook, 0.7	2021	Good	2021	Poor
16	Foundry Brook, 0.8	2014	Very Good		
17	Cram Brook, 0.7	2020	Fair - Good	2020	Very Good
18	First Branch White River Trib 20, 3.8	2018	Good	2018	BKT
19	Happy Hollow Brook, 0.4	2014	Good	2014	Excellent
20	Second Branch White River, 0.2	2023	Good		
21	Second Branch White River, 17.4	2020	Fair - Good	2020	Good
22	Second Branch White River, 18.5	2014	Very Good - Excellent	2014	Very Good
23	Second Branch White River, 25.6	2021	Excellent		
24	Peak Brook, 3.1	2019	Fair		
25	Penny Brook, 2.4	2020	Excellent	2020	Poor
26	Third Branch White River, 8.5	2014	Good		
27	Third Branch White River, 9.5	2019	Good - Very Good	2019	Very Good
28	Third Branch White River, 9.7	2019	Good - Very Good		
29	Third Branch White River, 21.5	2020	Good	2020	Excellent

Map ID	Site Name, River Mile	Year	Macroinvertebrate Assessment	Year	Fish Assessment
30	Third Branch White River, 22.2	2020	Very Good - Excellent		
31	Third Branch White River, 22.9	2020	Excellent		
32	Camp Brook, 2.5	2020	Very Good	2020	Very Good
33	Smith Brook, 0.1	2020	Poor	2020	Poor
34	Smith Brook, 0.9	2020	Good - Very Good	2020	Fair
35	Ayers Brook, 0.4	2020	Fair - Good		
36	Adams Brook, 0.2	2020	Good	2020	Good
37	Adams Brook, 1.5			2020	Excellent
38	Thayer Brook, 0.1	2020	Good	2020	Very Good
39	Riford Brook, 0.9	2020	Very Good - Excellent	2020	Very Good
40	Riford Brook, 2.6	2021	Excellent	2021	Excellent
41	Batchelder Brook, 0.5	2012	Very Good		
42	Brackett Brook, 0.1	2020	Very Good	2020	Excellent
43	Flint Brook, 0.2	2020	Good - Very Good	2020	Excellent
44	Stoddard Brook, 0.5			2014	BKT
45	Locust Creek, 0.4	2020	Very Good	2020	Good
46	Locust Creek, 4.7	2012	Very Good - Excellent	2012	Very Good
47	Lilliesville Brook, 0.4	2020	Very Good - Excellent	2020	Fair
48	Tweed River, 0.2	2020	Good		
49	Tweed River, 3.2	2012	Good - Very Good	2012	Good
50	Tweed River, 4.5	2019	Very Good - Excellent	2019	Good
51	Bartlett Brook, 0.5	2016	Very Good - Excellent	2016	Good
52	West Branch Tweed River, 1.9	2020	Excellent	2020	Very Good
53	Townsend Brook Trib #2, 0.2			2023	BKT
54	Breakneck Brook, 0.2	2016	Good	2016	Very Good
55	Liberty Hill Brook, 0.1	2016	Poor - Fair		
56	Wing Brook, 0.2	2023	Fair	2023	Very Good
57	Corporation Brook, 1.1	2016	Good	2016	Very Good
58	Bingo Brook, 1.8	2023	Excellent	2023	Very Good
59	Chittenden Brook, 0.5	2021	Very Good		
60	Chittenden Brook, 2.4	2016	Very Good	2016	BKT
61	Smith Brook, 1.3	2023	Good	2023	Excellent
62	Marsh Brook, 1.0	2016	Very Good - Excellent	2016	Very Good
63	Hancock Branch, 3.9	2020	Very Good - Excellent	2019	Good
64	Grindstone Brook, 0.1	2016	Good - Very Good		
65	George Brook, 0.1	2016	Excellent		
66	Robbins Branch, 1.4	2020	Excellent	2020	Very Good
67	Deer Hollow Brook, 0.9	2020	Very Good - Excellent	2015	BKT

Stream Geomorphic Assessment

Fluvial geomorphology is a subdiscipline of geomorphology that investigates how flowing water shapes and modifies Earth's surface through erosional and depositional processes. The Rivers Program conducts a three-phase approach to assess the physical condition of rivers in the State of

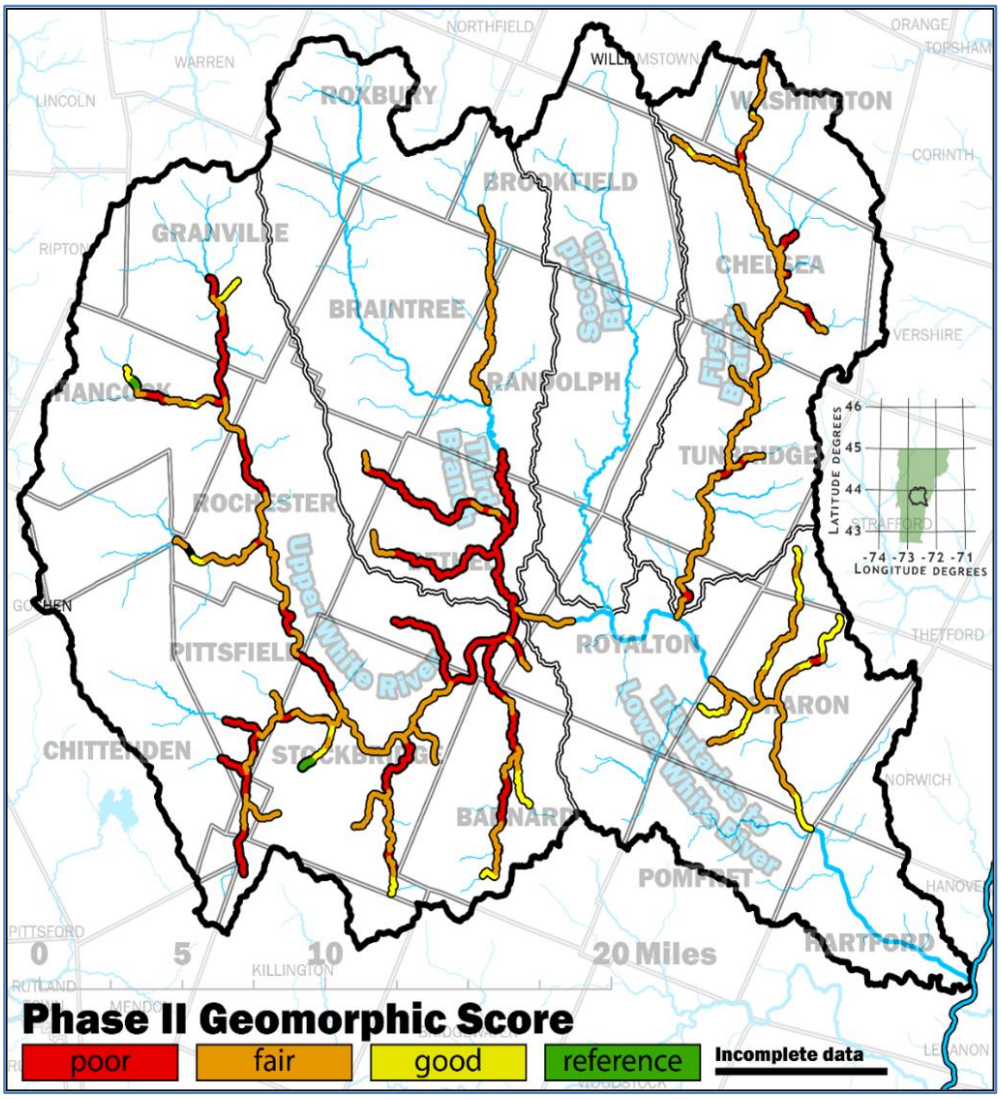


Figure 9. Geomorphic condition of Phase 2-assessed White River basin rivers and streams. Note that Second Branch has received a Phase 2 assessment since the 2018 TBP, but the data have not been QAQCed for mapping.

Vermont. Phase 1 is a watershed assessment. Phase 2 is a rapid field stream assessment, and Phase 3 is a survey assessment.

Phase 1 Stream Geomorphic Assessments have been completed on about 747 miles of streams in the watershed (56% of perennial stream miles), and 206 miles have had Phase 2 Stream Geomorphic

Assessments completed (about 16% of perennial stream miles). Most of the stream reaches with Phase 2 Assessments have been rated as fair to poor condition as a function of their departure from their reference stream type (Phase 2 SGA Protocol Page 76; Figure 9). Aside from Ayers Brook, most larger tributaries in the White have been subject to Phase 2 Assessments; therefore, the fair to poor geomorphic conditions noted by Phase 2-assessed reaches are likely representative of basin conditions. A Phase II assessment of the Second Branch has been completed since the 2018 TBP. All completed SGAs in the White River basin are accessible via Table 12.

Recreational Fisheries

Three trout species contribute to a popular recreational stream fishery in the White River basin (see the 2017 White River Angler Survey). Naturalized (wild) populations of rainbow and brown trout are found in much of the White River's main stem and some tributaries. In the colder, higher elevation streams, wild populations of native brook trout flourish. Increasing temperatures in the main stem and some tributaries limit wild trout distribution while increasing temperatures, road culverts, and dams can all disconnect habitat. Vermont Fish & Wildlife Department's (FWD) state-level population monitoring and habitat management strategies for trout are available in the 2018 VT Management Plan for Brook, Brown, and Rainbow Trout. The lower White River also hosts coolwater fisheries for smallmouth bass and walleye.

FWD assesses fishery populations and important nursery areas to document biological and habitat conditions to manage for high-quality recreational fisheries. FWD completed 28 monitoring events between 2018-2021 in twelve rivers in the White River basin. Salmonid biomass and the number of trout per mile found were variable across sites; criteria for increased stream protection and the streams that qualify for such protections are described in Chapter 2, Table 6. The White River basin was slated for resampling in summer 2023, but persistent high flows and FWD flood response shifted this planned sampling to 2024.

Though not updated with the most recent sampling data, FWD's 2017 White River Wild Trout Evaluations provides an excellent overview of trout population distribution at 42 sites across the basin, population changes over a 40-yr period, and recent habitat conditions. In general, the report found that wild trout populations are relatively stable with evidence of widespread, successful natural reproduction, though specific streams and their possible environmental concerns are further discussed in the report.

Instream fish habitat was severely impacted in some areas following the removal of woody habitat and alteration of stream channels after Tropical Storm Irene. Within the White River basin, it was estimated that major impact to instream habitat occurred along roughly 143,000 feet (27.1 miles) of stream following Tropical Storm Irene (Kirn 2012). While no formal habitat assessments have been completed, the July 2023 flooding may have been less impactful to in-stream conditions in the White River basin because of both a less severe storm as well as improved regulation and outreach guiding

post-flood recovery efforts in and around streams. Where habitat is not severely and permanently degraded, monitoring in Vermont has shown that wild trout populations can recover quickly from a single flood event (Kirn 2011).

In addition to recreationally important species, several Species of Greatest Conservation Need are found in the watershed. American eel and sea lamprey are anadromous fish species that make migrations from the Atlantic Ocean to the Connecticut River drainage to spawn and rear. The Sea Lamprey use the White River for spawning and early life rearing, while American Eel are primarily found in the mainstem Connecticut River. Providing robust riparian corridors, access to floodplain habitats, longitudinal connectivity, and natural flow regimes are management strategies being employed to protect and conserve the species and their habitats. In light of climate change and more frequent flood events, improving post-flood recovery efforts will also help conserve the species.

E. coli Monitoring

The White River Partnership has run a water quality monitoring program (Swim Smart) in the basin for the past 23 years to determine whether waters are safe for swimming and to detect water quality trends through time. Each year 22 swimming holes in the White River mainstem and First, Second, and Third Branches are monitored for *E. coli*, turbidity, conductivity every other week from late May to early September. The White River Partnership communicates their bi-weekly findings to the public via web and social media updates and produce an annual report summarizing their findings (2023 report).

Chloride Monitoring

Chloride is a naturally occurring element in the environment but usually occurs in relatively small amounts in Vermont surface waters. Most sources of chloride result from human activities including deicing agents (road salt), agriculture (animal waste), dust suppression, human waste (septic and treated wastewater) and water softeners. In most areas, road salt is believed to be the most significant contributor of chloride to the environment in Vermont.

For the protection of aquatic biota, the VWQS have chloride specific criteria for both acute and chronic exposures that were recommended to states by the US Environmental Protection Agency in 1988. There is also evidence that negative impacts occur below the VWQS criteria concentrations. Macroinvertebrate community health in Vermont streams appears to be negatively impacted at chloride levels as low as 50 mg/l. The Environmental Protection Agency is currently in the process of reviewing more recent toxicity studies regarding chloride impacts to aquatic biota, but any future recommendations to revise the VWQS are still several years away.

Chloride is routinely sampled in lakes and streams as part of several monitoring programs conducted by the WSMD. Chloride data has been collected at many stream sites in the White River basin; however, to date seven sites show elevated concentrations (>50mg/l), mainly within the town of

Randolph. Where elevated levels exist, there is a greater chance of impairment existing; however, sufficient data needs to be collected to make impairment determinations according to assessment methodologies supportive of the VWQS. More information on the WSMD approach to chloride monitoring and reduction is available in the 2022-2023 Water Quality Monitoring and Assessment Report.

Vermont's Lakes and Ponds Management and Protection Program also notes that, while not approaching the 50mg/l threshold above, several lakes in the basin (Lamson, Silver Lake, and Sunset Lake) have recently exhibited higher than expected chloride concentrations. These lakes will continue to be monitored (Table 14).

PFAS Monitoring

Per- and polyfluoroalkyl substances (PFAS) are a large group of human-made chemicals that have been used in industry and consumer products worldwide since the 1950s. PFAS chemicals from household and commercial products may find their way into water, soil, and biosolids. As a result, PFAS have been found in people, fish, and wildlife all over the world. Some PFAS do not break down easily and therefore stay in the environment for a very long time, especially in water.

The DEC is working with the Vermont Department of Health to identify sources and reduce the use and release of and public exposure to PFAS. The 2023 PFAS Road Map and 2019 PFAS Sampling Plan outlines strategic priorities relating to PFAS and summarizes the actions taken by DEC to address PFAS in Vermont. Major actions include adopting drinking water and groundwater PFAS standards; developing a plan to derive ambient surface water quality standards; adopting Solid Waste Rules that require PFAS testing for biosolids and sites where biosolids are applied; responding to PFAS contamination in multiple sites; and developing a statewide investigation of the potential major sources of PFAS including wastewater treatment facilities, publicly owned treatment works, industrial sources, land application sites, and landfills. To this end, wastewater-specific PFAS sampling and source prioritization information is available in Chapter 4 – Wastewater. No other ambient surface water sampling has been performed in the White River basin to date.

Lakes and Ponds

There are 40 lakes and ponds in the Basin that are greater than one acre and only fourteen that are ten acres or greater. Only one lake is greater than 30 acres (Silver Lake: 81 acres). No lakes in the basin are used for hydroelectric development and only one small pond (below the 1-acre threshold) is a public water supply (Lake John, Royalton). Five lakes are publicly accessible via VT Fish and Wildlife or VT Forest, Parks, and Recreation sites (Silver Lake, McIntosh Pond, Colton Pond, Rood Pond, Ansel Pond), and three ponds are on Green Mountain National Forest lands (Skylight Pond, Beaver Meadows, North Pond [Chittenden]). Most lakes and ponds in the Basin are impounded by dams. More information on dam location, status, purpose, and ownership can be found in Appendix

B.

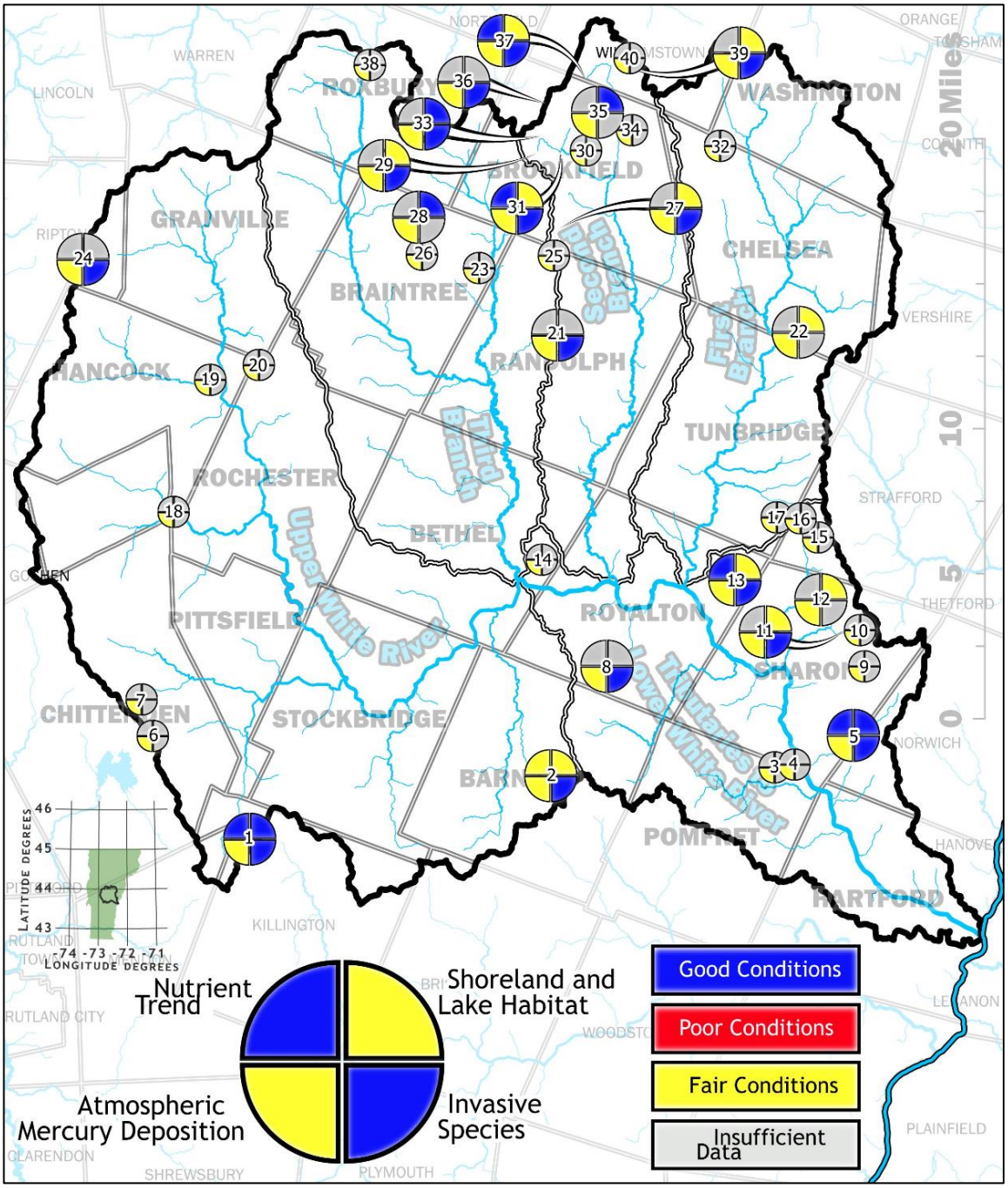


Figure 10. Condition of White River basin lakes and ponds. Map ID corresponds with data in Table 3.

Lake Scorecard Assessment

The Vermont Lakes and Ponds Management and Protection Program shares lake assessments using the Vermont Inland Lakes Scorecard (Figure 10, Table 3). The scorecard provides available data on overall lake health by providing a rating of a waterbody's nutrient trend, shoreland and lake habitat, atmospheric pollution, and aquatic invasive species. The Lake Scorecard's rating system is detailed here. Lake-specific water quality and chemistry data can be accessed online through the Lay Monitoring Program webpage. White River basin Lake Scorecard results are summarized below for lakes larger than 1 acre.

Shoreland Condition and Nutrient Trends

Of the fifteen lakes evaluated for shoreland condition in the basin, five have *Good* ratings and ten have *Fair* ratings (Table 3). Of the six lakes monitored for water quality trends, one lake has a *Fair* rating (Silver Lake in Barnard) and the rest have *Good ratings*. Summer Secchi depth (a measure of water clarity) has been significantly decreasing in Silver Lake, though nutrient data do not yet show concomitant significant trends. Next Generation Lake Assessments have been performed on five lakes in the basin to further assess in-lake, shoreland, and watershed conditions (Mitchell Pond, Sharon; Rood Pond, Williamstown; Crescent Lake, Sharon; an unnamed pond, Chelsea; an unnamed pond, Sharon). While not indicated in the Lake Scorecard, the Lakes and Ponds Management and Protection Program has indicated that Sunset Lake in Brookfield experiences consistently elevated conductivity and chloride concentrations.

Acid Impairment

Beyond nutrient impairment, Vermont has acid-impaired waterbodies, including one in the White River basin (Skylight Pond in Ripton). Three main airborne pollution types affect lakes and ponds in Vermont: sulfur oxides, nitrogen oxides, and mercury. These pollutants are attributable to the prevailing weather pattern that carries mid-west air pollution through the region, the proximity to those pollution sources and to the lack of buffering capacity of the bedrock geology.

Sulfur and nitrogen oxides transported to Vermont from out of state air emissions results in acid forming pollutants raising in-lake acid concentrations. Lakes and ponds are regularly monitored for low pH (high acidity), which impacts biological communities. Thirty-nine lakes and ponds are included in the Vermont Acid Impaired Lake Total Maximum Daily Load. Since the USEPA began enforcing the Clean Air Act and its amendments, nationwide emissions and deposition of acid forming pollutants have declined. As a result, Vermont's in-lake acid concentrations have improved. Skylight Pond in Ripton is the only acid-impaired waterbody in the Basin. More information about long term monitoring of Vermont's acid lakes can be found at:
https://dec.vermont.gov/watershed/map/monitor/acid-rain

Mercury Contamination

Mercury contamination has resulted in fish consumption advisories in nearly every lake in Vermont. Mercury is an atmospherically-deposited contaminant, which arrives in Vermont primarily as a result of coal burning emissions, or solid waste incineration. Much has been accomplished in recent years to control emissions nationally, yet this remains a long-term issue. Atmospherically-deposited mercury is transferred up the food chain from plankton to fish, loons, and larger birds and mammals. All lakes in the Basin received a fair condition score for mercury.

Aquatic Invasive Species

All fifteen of the lakes that have been surveyed for aquatic invasive species have *Good* ratings, indicating that no invasive species have been detected.

Table 3. White River basin Lake Scorecard ratings for lakes greater than one acre. 'ID' = Insufficient data.

Map ID	Lake ID	Area (ac)	Max Depth (ft)	Nutrient Trend	Shoreland Condition	Aquatic Invasive Species	Atmospheric Mercury Deposition
1	COLTON	26.1	10	Good	Good	Good	Fair
2	SILVER (BARNRD)	81	32	Fair	Fair	Good	Fair
3	POMFRET	3.9		ID	ID	ID	Fair
4	BABCOCK	5.2		ID	ID	ID	Fair
5	MITCHELL	27.6	16	Good	Good	Good	Fair
6	NORTH (CHITDN)	4.8	4	ID	ID	ID	Fair
7	BEAVER MEADOWS	4.7		ID	ID	ID	Fair
8	ROYALTON HILL	8.7		ID	ID	Good	Fair
9	SHARON-E	9		ID	ID	ID	Fair
10	DOWNER	2.9		ID	ID	ID	Fair
11	CRESCENT	17.8	10	ID	Fair	Good	Fair
12	STANDING	12.4	42	ID	Fair	ID	Fair
13	MCINTOSH	20.5	15	Good	Fair	Good	Fair
14	ANSEL	2.5		ID	ID	ID	Fair
15	STRAFFORD	2.4		ID	ID	ID	Fair
16	FAY	6.3	12	ID	ID	ID	Fair
17	TUNBRIDGE TROUT	6.7		ID	ID	ID	Fair
18	KINGS	4.8		ID	ID	ID	Fair
19	BLAIR	3.7		ID	ID	ID	Fair
20	HANCOCK MT	7.1	2	ID	ID	ID	Fair
21	CHAMPAGNE	2.7		ID	ID	Good	Fair
22	KEYSER	5.8	17	ID	Fair	ID	Fair
23	HUTCHINSON	2.2		ID	ID	ID	Fair
24	SKYLIGHT	1.8	4	ID	ID	Good	Fair
25	RANDOLPH-N	7.7		ID	ID	ID	Fair
26	MUD (BRAINT)	4.7		ID	ID	ID	Fair

Map ID	Lake ID	Area (ac)	Max Depth (ft)	Nutrient Trend	Shoreland Condition	Aquatic Invasive Species	Atmospheric Mercury Deposition
27	PICKLES	15	2	ID	Fair	Good	Fair
28	UNKNOWN (BRAINT)	4.7	3	ID	Good	ID	Fair
29	SOUTH (BRKFLD)	17.1	10	ID	Fair	Good	Fair
30	HOLDENS	6.8		ID	ID	ID	Fair
31	SUNSET (BRKFLD)	24.6	32	Good	Fair	Good	Fair
32	JONES	1.3		ID	ID	ID	Fair
33	NORTH (BRKFLD)	27.6	17	ID	Good	Good	Fair
34	BM746	7.4		ID	ID	ID	Fair
35	TWIN	15.4	19	ID	Good	ID	Fair
36	LAMSON	26.5	4	ID	ID	Good	Fair
37	ROOD	23.6	52	Good	Fair	Good	Fair
38	ROXBURY FLAT	2.6		ID	ID	ID	Fair
39	STAPLES	11.8	10	ID	Fair	Good	Fair
40	AINSWORTH	3.5		ID	ID	ID	Fair

Wetlands

The Vermont Wetlands Program houses the Wetland Bioassessment Program which assesses the biological condition and ecological integrity of Vermont wetlands. Plant species are used as the primary biological indicator to assess wetland health. Based on a 2017 analysis of bioassessment data, the principal factors that correlate with poor wetland condition are:

- presence of invasive plant species,
- disturbance to the wetland buffer or immediate surrounding area,
- disturbance to wetland soils, and
- disturbance to wetland hydrology (how water moves through a wetland) through ditching (e.g., agricultural), filling (e.g., roads) and draining (e.g., culverts).

Wetlands in remote areas and at high elevations tend to be in good condition, with the most threatened wetlands occurring in areas of heavy agricultural use and high development pressure often exhibiting habitat loss.

Wetland Bioassessment and Vermont Rapid Assessment Method

A total of 51 wetlands in the Basin have been assessed using the Vermont Rapid Assessment Method (VRAM; Figure 11). The VRAM assigns each wetland a score ranging from 15 to 100 with higher numbers representing more intact ecological condition and higher levels of wetland functions and values. The highest scoring wetland, Nyes Swamp in Barnard, scored a 92. Nine other wetlands

scored above 80, indicating excellent condition and/or very high levels of function and value. Eleven wetlands scored below 50, and the average score was 65. The lowest scoring wetland, with a score of 26, is an agricultural floodplain wetland in Bethel. Note that the VRAM assessments in this watershed may not necessarily be representative of the Basin's wetlands, as random sampling was not conducted and a full inventory of all the wetlands in the Basin is not possible at this time.

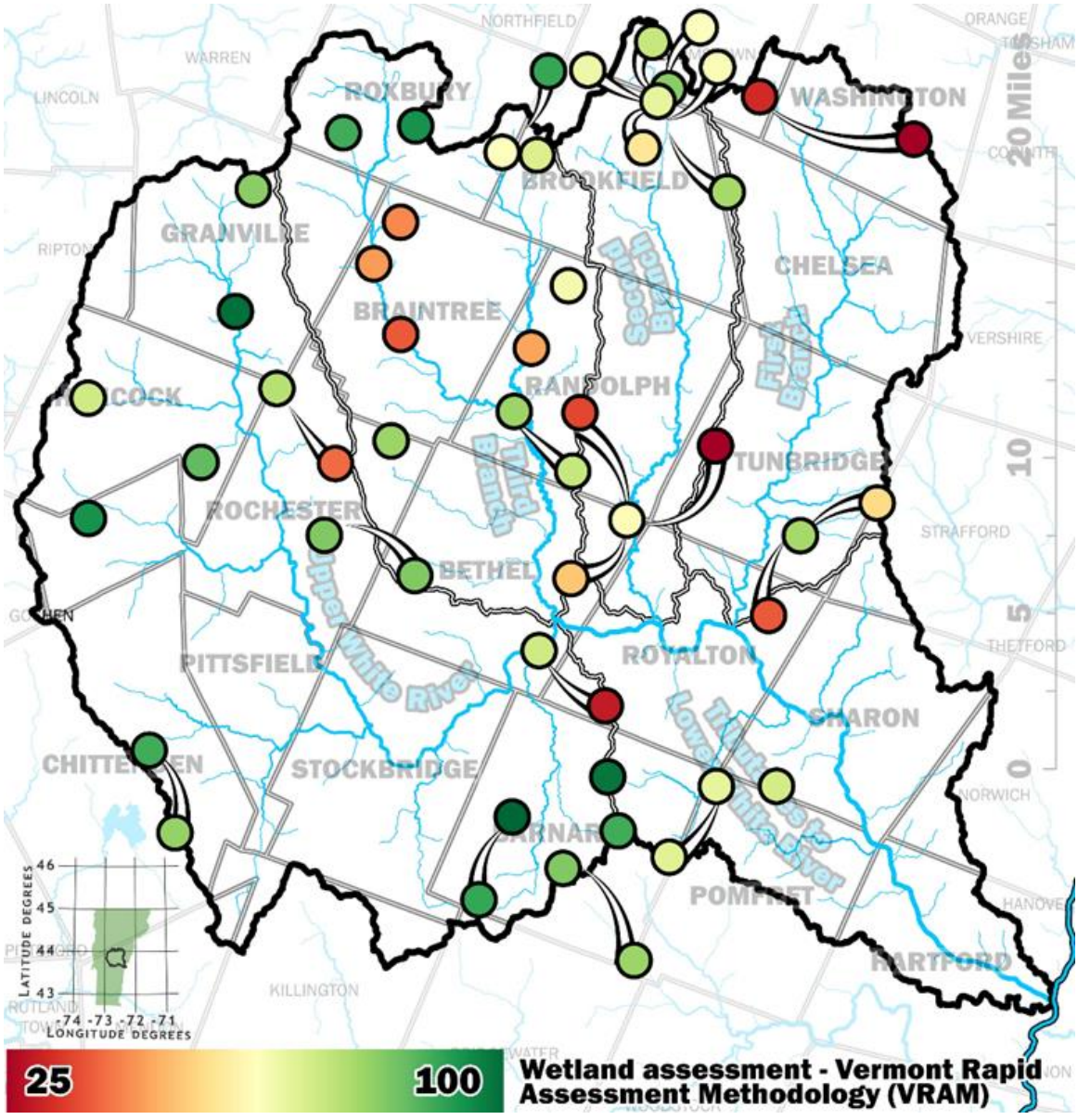


Figure 11. Completed Wetland VRAM assessments. Green indicates better wetland condition and red indicates poorer condition.

Chapter 2 – Priority Areas for Surface Water Protection

The state protects lakes, wetlands, and rivers by establishing and supporting surface water management goals. Tactical Basin Plans (TBPs) identify surface waters that consistently attain a higher level of quality and value based on physical, chemical, and biological criteria. These waters are prioritized for reclassification or designation. This allows for the establishment of enhanced management objectives and supports implementation of strategies to protect these surface waters.

Additional pathways such as land stewardship programs, local protection efforts, conservation easements, and land acquisition are also used to increase protection of priority waters. These are described in Chapter 4 - Strategies for Protection and Restoration. 45 streams in this Basin meet or exceed standards for very high-quality condition and are prioritized for reclassification.

A. Surface Water Reclassification and Designation

Vermont's surface water classification system establishes management goals and supporting criteria for designated uses in four classes of water. Designated uses include aquatic biota and wildlife, aquatic habitat, aesthetics, fishing, boating, swimming, public water supply, and irrigation. The VWQS begin classification with two broad groups based on elevation:

- All waters above 2,500 feet in elevation, are designated Class A(1) for all uses, unless specifically designated Class A(2) for use as a public water source.
- All waters at or below 2,500 feet in elevation, are designated Class B(2) for all uses, unless specifically designated as Class A(1), A(2), or B(1) for any one or more uses.

Current classifications of surface waters and their uses are published in the VWQS and are identified through the tactical basin planning process or on a case-by-case basis. Table 4 lists the possible classes for each designated use.

Table 4. Uses of Vermont waters by classification.

Classification	Applicable Uses
Class A(1)	One or more of: Aquatic biota and wildlife, aquatic habitat, aesthetics, fishing, boating, or swimming
Class A(2)	Public water source
Class B(1)	One or more of: Aquatic biota and wildlife, aquatic habitat, aesthetics, fishing, or boating
Class B(2)	Aquatic biota and wildlife, aquatic habitat, aesthetics, fishing, boating, swimming, public water source or irrigation

Surface waters may be protected by the anti-degradation policy of the VWQS (DEC, 2022) or through one of the following pathways:

- Reclassification of surface waters
- Class I Wetland designation
- Outstanding Resource Waters designation

The tactical basin planning process includes the review of ANR monitoring and assessment data to identify and document surface waters that meet the criteria for a higher classification or designation. (10 V.S.A. § 1253).

Public involvement is an essential component of protecting river, wetland, and lake ecosystems. The VWQS indicate that in the basin planning process, "Public participation shall be sought to identify and inventory problems, solutions, high quality waters, existing uses and significant resources of high public interest." The public, watershed partners, and stakeholders are encouraged to make recommendations for additional monitoring and research where very high-quality waters may exist.

In addition, the public may petition the DEC to reclassify streams and lakes, and to designate Outstanding Resource Waters. DEC has developed procedures and documents for Class I wetland designations and draft documents for stream reclassification. When the public is involved in developing proposals regarding management objectives, the increased community awareness can lead to protection of uses and values by the community and individuals.

Further information on reclassification and the petition process can be found on the following WSMD webpages: Stream Reclassification, Lakes and Ponds Reclassification, and Class I Wetlands. Strategies for enhanced protection of waters are described in further detail in the following sections. Surface waters in need of supplemental monitoring to determine their potential for enhanced management are included in Chapter 5 in the Monitoring and Assessment Table.

A(2) Public Water Sources

Three waters in the White River basin are designated as A(2) public water sources (Table 5). Only one is being actively used by the Village of South Royalton (Lake John), while two in South Royalton and Braintree have been abandoned as public water sources. A(2) waters that are no longer used as water supply are candidates for reclassification to A(1) or B(1) for better long-term management. As of spring 2024, no biological monitoring data are available for streams in these three White River watersheds. They have been added as priorities in Chapter 5's Monitoring and Assessment Table (Table 14). According to the Vermont Dam Inventory, both dams are in poor condition and are significant hazards.

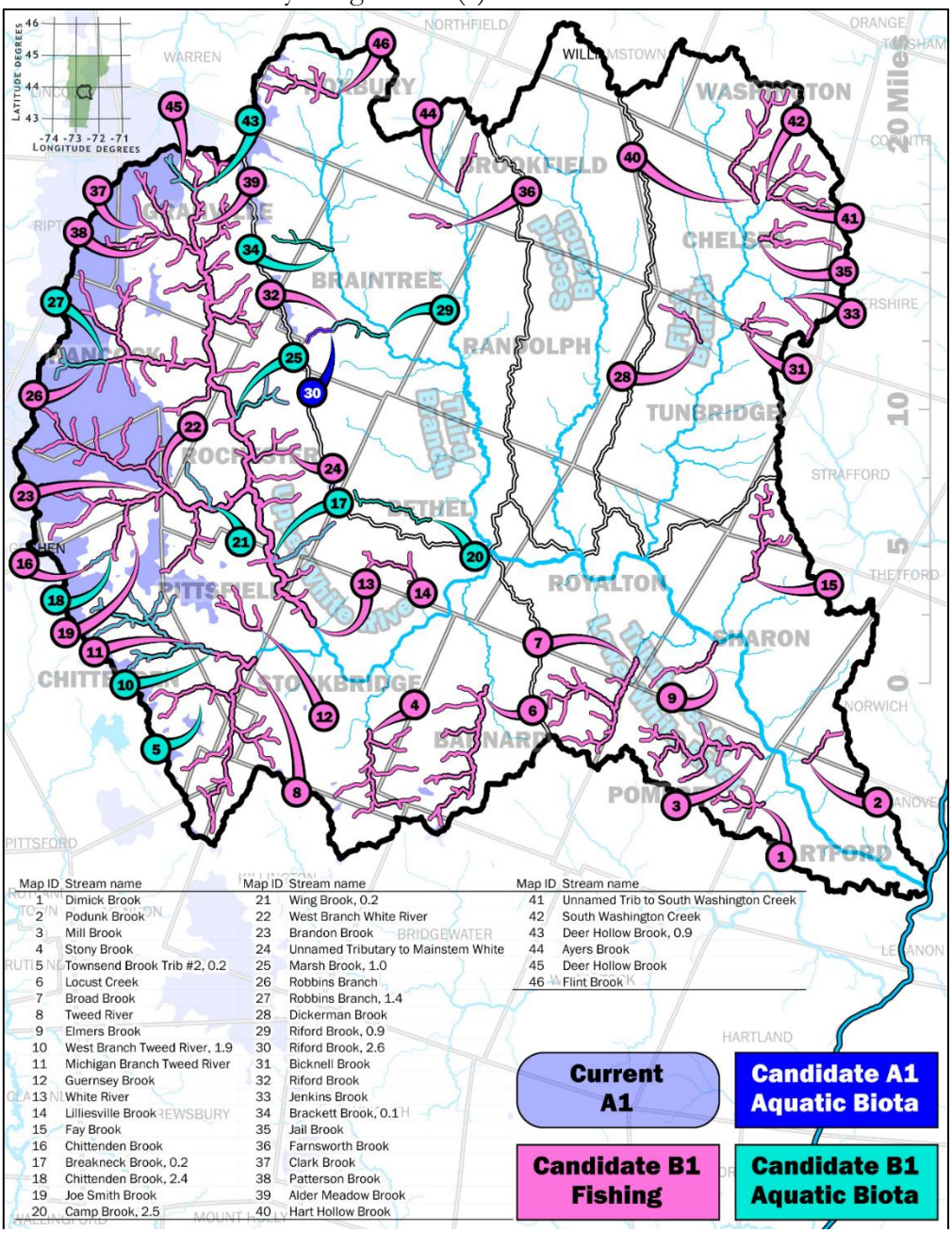
Table 5. Current and abandoned Class A(2) public water sources.

Waters	Location	Water User	Status
Farnsworth Brook	Braintree	Village of Braintree	**Abandoned.** Farnsworth Brook and all waters within its watershed in the Town

Waters	Location	Water User	Status
			of Braintree upstream of the water intake.
Lake Casper	Royalton	Village of South Royalton	**Abandoned.** Lake Casper and all waters within its watershed in the Town of Royalton.
Lake John	Royalton	Village of South Royalton	**Permanent.** Lake John and all waters within its watershed in the Town of Royalton. Water is pumped from the Carpenter Field infiltration gallery in the White River up to Lake John.

A(1) & B(1) Waters for Aquatic Biota

All waters above 2,500ft elevation, three sub-watersheds (Bingo Brook [Hancock/Rochester], Smith Brook [Rochester], and Beaver Meadows Ponds [Chittenden]), and two surface water networks within federally designated wilderness areas (Battell Wilderness and Breadloaf Wilderness) are already designated A(1) for Aquatic Biota use in the White River basin (Figure 12). In total, 92 mapped stream miles are currently designated A(1) waters.



Map ID	Stream name	Map ID	Stream name	Map ID	Stream name
1	Dimick Brook	21	Wing Brook, 0.2	41	Unnamed Trib to South Washington Creek
2	Podunk Brook	22	West Branch White River	42	South Washington Creek
3	Mill Brook	23	Brandon Brook	43	Deer Hollow Brook, 0.9
4	Stony Brook	24	Unnamed Tributary to Mainstem White	44	Ayers Brook
5	Townsend Brook Trib #2, 0.2	25	Marsh Brook, 1.0	45	Deer Hollow Brook
6	Locust Creek	26	Robbins Branch	46	Flint Brook
7	Broad Brook	27	Robbins Branch, 1.4		
8	Tweed River	28	Dickerman Brook		
9	Elmers Brook	29	Riford Brook, 0.9		
10	West Branch Tweed River, 1.9	30	Riford Brook, 2.6		
11	Michigan Branch Tweed River	31	Bicknell Brook		
12	Guernsey Brook	32	Riford Brook		
13	White River	33	Jenkins Brook		
14	Lilliesville Brook	34	Brackett Brook, 0.1		
15	Fay Brook	35	Jail Brook		
16	Chittenden Brook	36	Farnsworth Brook		
17	Breakneck Brook, 0.2	37	Clark Brook		
18	Chittenden Brook, 2.4	38	Patterson Brook		
19	Joe Smith Brook	39	Alder Meadow Brook		
20	Camp Brook, 2.5	40	Hart Hollow Brook		

Figure 12. Existing high quality and candidate stream reaches for reclassification based on draft criteria for aquatic biota and fishing uses.

Biomonitoring assessments by the WSMD identified an additional 10 surface waters in the western portion of the watershed as consistently and demonstrably attaining a higher level of quality than Class B(2) waters based on draft criteria for aquatic biota reclassification (Figure 12).

Waters In Need of Further Assessment

Twelve rivers and streams need supplemental monitoring to determine their potential for enhanced protection (Figure 13). These waters are included in Chapter 5 in the Monitoring and Assessment Table (Table 14).

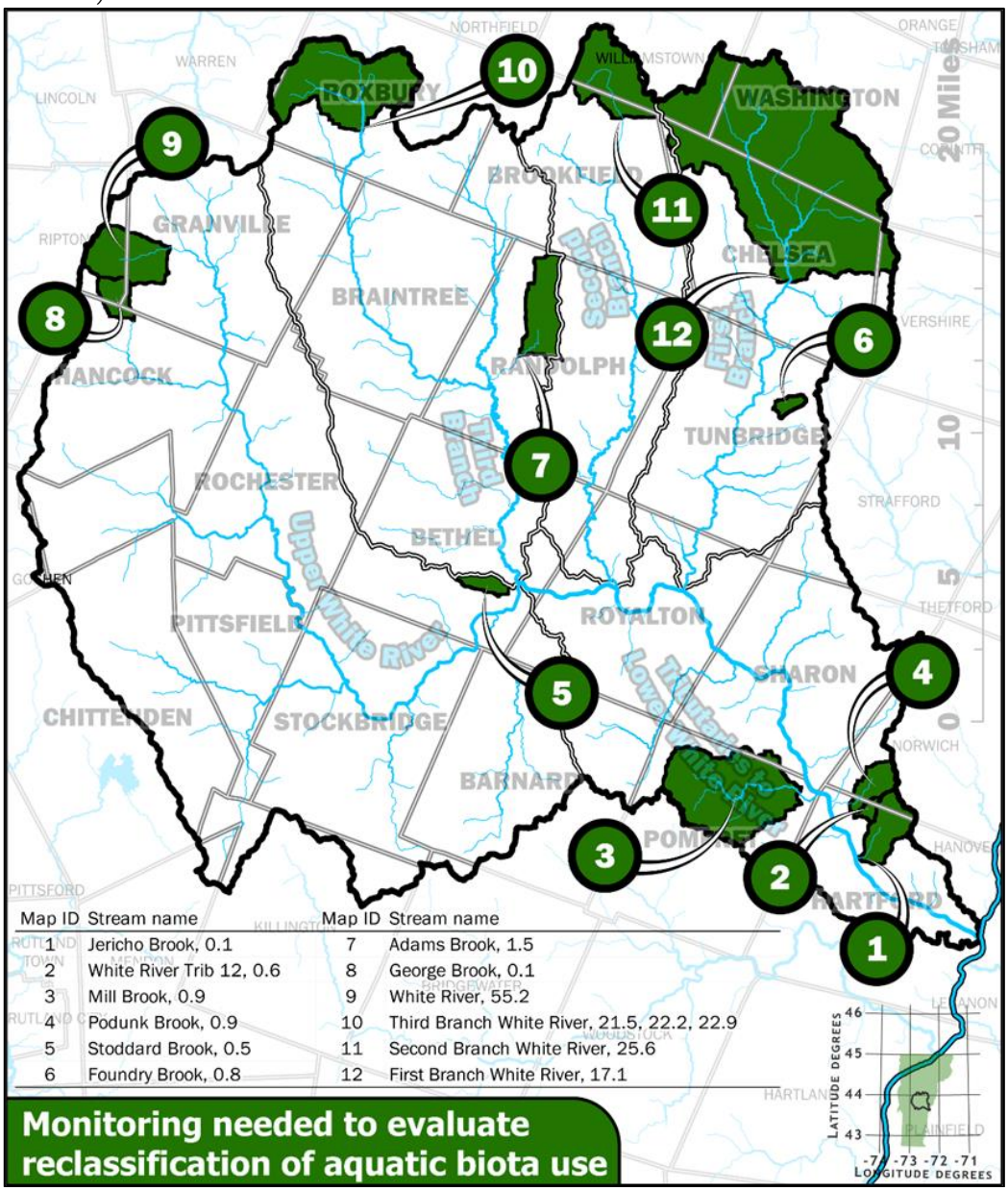


Figure 13. Priority streams for additional assessment to determine eligibility for A(1) or B(1) reclassification for aquatic biota.

B(1) Waters for Recreational Fishing

Rivers and streams classified as B(1) recreational fishing waters support wild, self-sustaining salmonid populations characterized by the presence of multiple age classes and a minimum abundance of 1,000 individuals per mile (all species/ages/sizes); and/or 200 large (> 6 inches total length) individuals per mile; and/or 20 pounds/acre (all species/ages/sizes). 34 streams meet B(1) criteria for recreational fishing (§29A-306 of the VWQS) (Figure 12; Table 6). Unless otherwise noted, B(1) classification would apply to the stream from the given point of sampling to its headwaters. These waters shall be managed to achieve and maintain the documented quality of fishing. It is important to note that all waterbodies that would naturally support fish populations are protected and maintained for this use in perpetuity.

Table 6. Streams that meet B(1) criteria for recreational fishing. Coordinates represent the biological sampling point; stream reaches including and above this point are generally considered to meet B(1) criteria.

Stream	Elevation (ft)	Latitude	Longitude	Sub-basin	Town
Locust Creek	900	43.755819	-72.636819	Upper White	Barnard
Lilliesville Brook	700	43.800753	-72.68375	Upper White	Bethel
Farnsworth Brook	1020	43.999633	-72.663959	Third Branch	Braintree
Riford Brook	960	43.948803	-72.735989	Third Branch	Braintree
Jail Brook	1050	43.992725	-72.436325	First Branch	Chelsea
Jenkins Brook	1200	43.960769	-72.417344	First Branch	Chelsea
South Washington Creek	1137	44.014364	-72.430419	First Branch	Chelsea, Washington
Unnamed Trib to South Washington Creek	1140	44.015083	-72.428806	First Branch	Chelsea
Hart Hollow Brook	1020	44.012567	-72.439131	First Branch	Chelsea, Washington
Chittenden Brook	1940	43.822877	-72.920075	Upper White	Chittenden
Joe Smith Brook	1490	43.84027	-72.898349	Upper White	Chittenden
Alder Meadow Brook	1030	44.000331	-72.853231	Upper White	Granville
Clark Brook	1360	43.9959	-72.87787	Upper White	Granville
Deer Hollow Brook	1640	44.02492	-72.861475	Upper White	Granville
Patterson Brook	1240	43.993917	-72.867004	Upper White	Granville
Robbins Branch	1280	43.926729	-72.921416	Upper White	Hancock
Michigan Branch Tweed River	1040	43.77714	-72.84446	Upper White	Pittsfield, Chittenden
Tweed River	800	43.769914	-72.805872	Upper White	Pittsfield
Ayers Brook	831	44.018446	-72.657953	Third Branch	Randolph
Brandon Brook	1020	43.857868	-72.87379	Upper White	Rochester
Unnamed Tributary to	1450	43.879987	-72.780572	Upper White	Rochester

Stream	Elevation (ft)	Latitude	Longitude	Sub-basin	Town
Mainstem White					
West Branch White River	940	43.85032	-72.85724	Upper White	Rochester
Flint Brook	1300	44.068361	-72.747661	Third Branch	Roxbury
Guernsey Brook	940	43.786214	-72.801857	Upper White	Pittsfield
Broad Brook	820	43.770536	-72.527408	Lower White	S. Royalton
Elmers Brook	445	43.77899	-72.46895	Lower White	S. Royalton
Fay Brook	830	43.812414	-72.448117	Lower White	Sharon
Stony Brook	910	43.732278	-72.722072	Upper White	Stockbridge
White River	740	43.788971	-72.763347	Upper White	Stockbridge
Bicknell Brook	820	43.945836	-72.448703	First Branch	Tunbridge
Dickerman Brook	880	43.938489	-72.480217	First Branch	Tunbridge
Dimick Brook	710	43.694164	-72.434436	Lower White	W. Hartford
Mill Brook	470	43.718981	-72.436175	Lower White	W. Hartford
Podunk Brook	680	43.716908	-72.405097	Lower White	W. Hartford

A(1) & B(1) Waters for Aesthetics

The VWQS include a designated use for aesthetic conditions. DEC has developed numeric nutrient criteria for lakes and ponds in relation to this use which are reflected in Table 3 of the VWQS. Currently no lakes meet the nutrient criteria for B(1) or A(1) aesthetics in the basin or are prioritized for additional monitoring at this time.

B. Class I Wetland Designation

The State of Vermont identifies and protects the functions and values of significant wetlands to achieve no net loss of wetlands. Based on an evaluation of the extent to which a wetland provides functions and values, it is classified as:

- **Class I**: Exceptional or irreplaceable in its contribution to Vermont's natural heritage and therefore, merits the highest level of protection.
- **Class II**: Merits protection, either taken alone or in conjunction with other wetlands.
- **Class III**: Neither a Class II nor a Class I wetland.

Impacts to Class I wetlands may only be permitted when the activity is necessary to meet a compelling public need for health or safety. The Wetlands Program Class I Wetlands website highlights the designated Class I wetlands statewide and lists those recommended for Class I designation. No wetlands have been designated as Class I in the White River basin, though two in

Barnard have either been identified as a Class I candidate (Turnpike Fen) or proposed for further study (Nyes Swamp) as noted in the 2018 TBP. Though Turnpike Fen is a high-quality wetland, its limited public access may make it a less likely candidate for Class I than other wetlands that support both significant ecological values as well as opportunities for education, recreation, research, and aesthetics.

DEC supports the further study and reclassification of wetlands and the Wetlands Program welcomes recommendations for Class I candidates. Wetlands that are found to meet criteria for designation may be proposed for reclassification through petition or departmental rulemaking authority, consistent with the Vermont Wetland Rules.

C. Outstanding Resource Waters Designation

Rivers, streams, lakes, and ponds that have "exceptional natural, cultural, recreational, or scenic values" can be protected through designation as Outstanding Resource Waters (ORW). ORW designation protects exceptional waters through permit conditions for in-stream alterations, dams, wastewater discharges, aquatic nuisance controls, solid waste disposal, Act 250[1] projects, and other activities. ORWs can be designated by the ANR through a public petition process.

There are currently no ORW designated waters in the White River Basin. As identified in the 2013 and 2018 TBPs, the ANR would support a community-led effort to petition the following waters as ORW, or other waters where petitioners can demonstrate the presence of ORW values:

- The White River mainstem from its headwaters to the confluence with the Connecticut (56 miles) based on the river's exceptional recreational values (boating, tubing, swimming, fishing). With support from a variety of federal, state, regional, town, and non-profit partners, in 2016 the White River Partnership established the formally designated White River Water Trail as a network of >40 public access points along the White River mainstem and its tributaries. 50+ volunteers help steward these access points annually and exemplify the community interest in and support of the White River as an exceptional recreational resource.

D. National Wild and Scenic Rivers Designation

Some partners have also expressed interest in evaluating the benefits and feasibility of federally designating some portion of the White River as a National Wild and Scenic River. The National Wild and Scenic Rivers System was created by Congress in 1968 to preserve certain rivers with

[1] Vermont's land use and development law, established in 1970. The law provides a public, quasi-judicial process for reviewing and managing the environmental, social, and fiscal consequences of major subdivisions and development in Vermont through the issuance of land use permits.

outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations. Rivers may be designated by Congress or, if certain requirements are met, the Secretary of the Interior. Congress has specified that some Wild and Scenic Rivers are to be administered by the Secretary of the Interior through the NPS in partnership with local governments, councils, watershed groups and non-governmental organizations, generally through the use of cooperative agreements. In these 'Partnership' Wild and Scenic Rivers communities protect their own outstanding rivers and river-related resources through a collaborative approach.

Two other Wild and Scenic River segments have been designated in Vermont (Upper Missisquoi and Trout Rivers). Potential benefits of designation include the appropriation of federal funds for projects to preserve the White River's recreational, scenic, historic, cultural, natural, and geologic resources; the increased competitiveness of partner organizations and towns in many grant programs that value Wild and Scenic designation; the establishment of a management committee including town, organization, state, and federal representatives to coordinate river management locally; the assurance of no new federal water projects that could affect the free-flowing status of the designated river; and the marketing potential for local businesses, including in the tourism industry, if there was interest.

The first step of exploring potential Wild and Scenic designation is the partner-led development of a Wild and Scenic River Reconnaissance Survey, which is an initial fact-finding, desktop assessment of a watershed's potential for Wild and Scenic River eligibility. ANR would support partner coordination to identify the Outstandingly Remarkable Values of the White River that would inform a Wild and Scenic River Reconnaissance Survey and, if warranted, to perform education and outreach to evaluate community interest in designation.

D. Identification of Existing Uses

Existing uses of waters and the level of water quality necessary to protect those existing uses shall be maintained and protected regardless of the water's classification (DEC, 2022). The ANR may identify existing uses of waters during the tactical basin planning process or on a case-by-case basis during application reviews for State or Federal permits. Consistent with the federal Clean Water Act, the VWQS stipulate that existing uses may be documented in any surface water location where that use has occurred since November 28, 1975. Pursuant to the definition of Class B(1) in Act 79, the ANR may identify an existing use as Class B(1) when that use is demonstrably and consistently attained.

The ANR stipulates that all lakes and ponds in the state have existing uses of swimming, boating, and fishing. The ANR recognizes that fishing activities in streams and rivers are widespread and too numerous to thoroughly document for the basin. In the case of streams too small to support significant fishing activity, the ANR recognizes these as potential spawning and nursery areas, which

contribute fish stocks downstream where fishing may occur. These small streams support the use of fishing and therefore, are protected at a level commensurate with downstream areas.

Existing uses listed in the basin plan should be viewed as a partial accounting of known existing uses based upon limited information. The list does not change protection under the Clean Water Act or VWQS for unlisted waters. Existing uses are listed on the White River Tactical Basin Planning webpage and include swimming, boating, fishing, and public water sources.

The public is encouraged to recommend waters for the existing uses of swimming, boating, fishing, public water source, and ecological significance given that they provide evidence of such use.

Chapter 3 – Priority Areas for Surface Water Restoration

A. Impaired and Altered Surface Waters

The DEC monitors and assesses the chemical, physical, and biological status of individual surface waters to determine if they meet the VWQS per the 2024 Vermont Surface Water Assessment and Listing Methodology (DEC, 2024). As summarized in Figure 1 of the Listing Methodology, surface waters are assessed as: full support, altered, or impaired depending on their support of existing uses and their attainment of water quality standards.

The assessment results are the basis for the biennial statewide 303(d) List of Impaired Waters and List of Priority Surface Waters Outside the Scope of 303(d) (Table 7 and 8; Figures 14 and 15), waters altered by invasive species or flow regulation, as well as the priority waters for protection for aquatic biota and wildlife (Chapter 2). The lists identify impaired or altered waters and includes preliminary information on responsible pollutant(s) and/or physical alterations to aquatic and riparian habitat and identifies the problem, if known. Altered and impaired waters become a priority for restoration. Additionally, the Vermont Lake Score Card identified lakes and ponds that have increasing nutrient trends and therefore are a priority for nutrient reduction strategies. To address documented water quality concerns, the strategies proposed in the Chapter 5 Implementation Table are prescribed based on the land use sector-specific practices outlined in the Vermont Surface Water Management Strategy.

Ten rivers and streams have biomonitoring data that indicate fair or poor condition. However, there are not enough data for these streams to fully evaluate their attainment of Aquatic Biota use, or monitoring results show volatile conditions from year to year (Figure 16). These streams are a priority for further assessment and are listed in Table 9 and Chapter 5's Monitoring and Assessment Table (Table 14).

The following figures and tables are grouped to show the impaired or altered waterbodies in the White River basin, their known or suspected pollutant sources, and monitoring needs for further evaluation.

Impaired Lakes

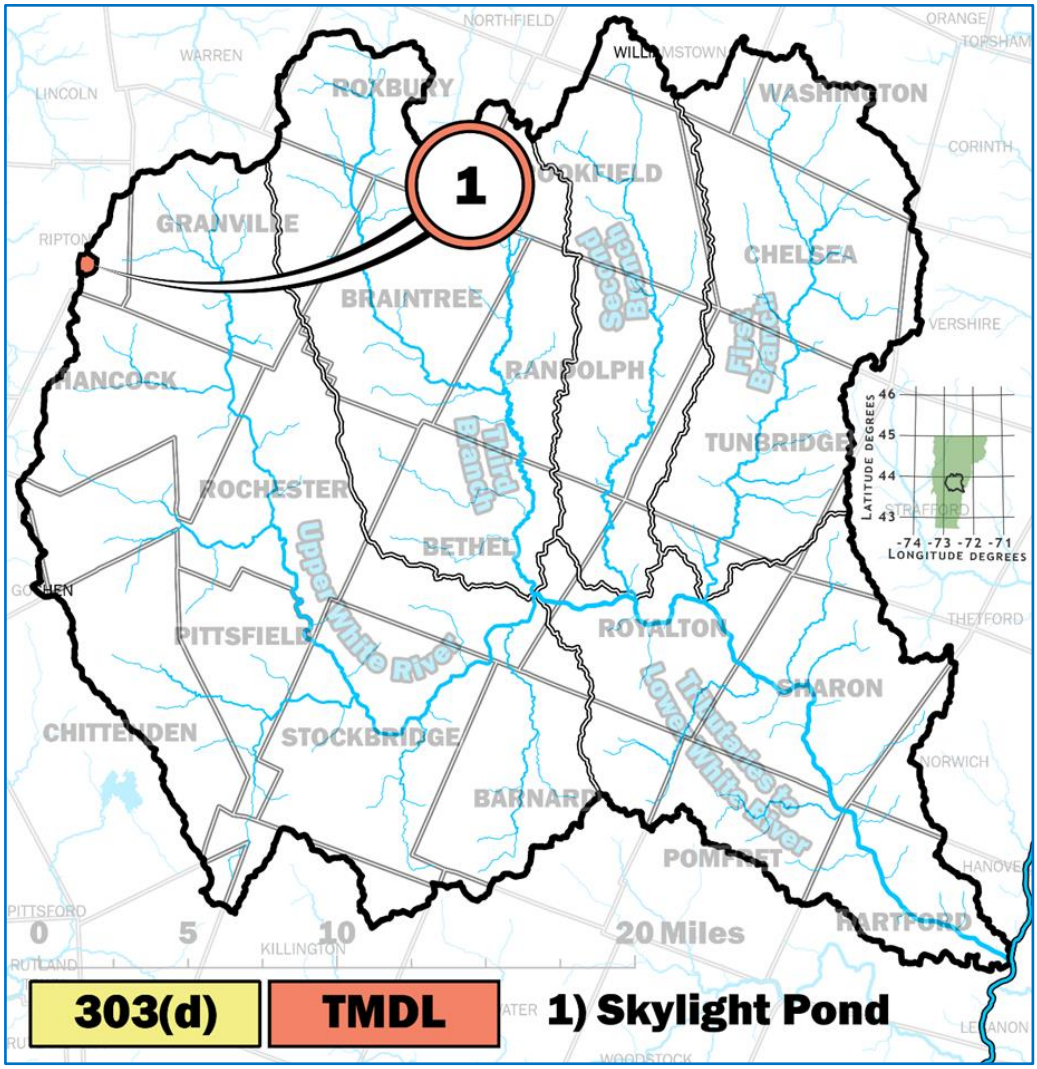


Figure 14. Impaired lakes in the White River basin. Map number corresponds with Table 7.

Table 7. Impaired lakes in the White River basin and their pollutants. 'List' indicates the part of the Priority Water list to which the waterbody belongs based on attributes described in Chapter 4 of the 2024 Vermont Surface Water Assessment and Listing Methodology.

Map #	Name	Problem	Pollutant	List
1	Skylight Pond	Atmospheric deposition, extremely sensitive to acidification, episodic acidification	Acid	D

Impaired Rivers

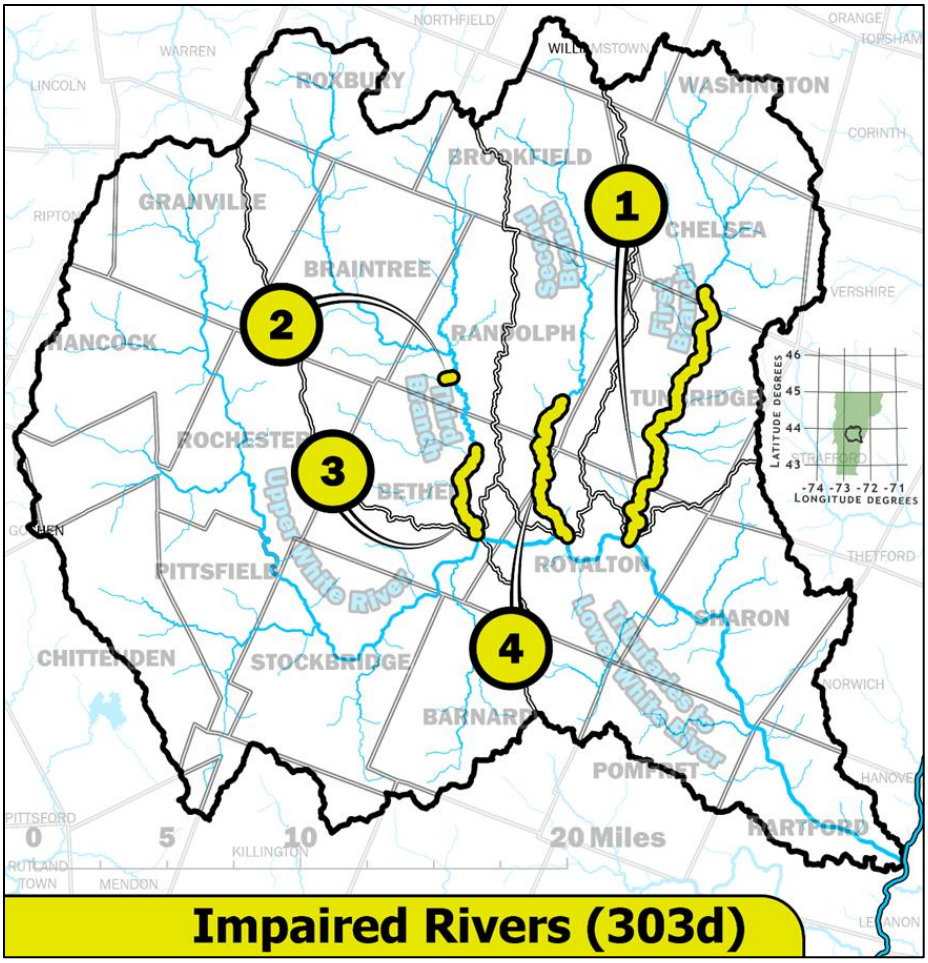


Figure 15. Impaired streams in the White River basin. Map number corresponds with Table 8.

Table 8. Impaired streams in the White River basin and their pollutants. 'List' indicates the part of the Priority Water list to which the waterbody belongs based on attributes described in Chapter 4 of the 2024 Vermont Surface Water Assessment and Listing Methodology. 'rm' = river mile.

Map #	Name	Pollutant	Problem	Impaired Use	List
1	First Branch White River, Mouth to rm 15.2	E. coli	Consistently elevated E. coli	Contact recreation	A
2	Smith Brook (Mouth to rm 0.3)	Iron	Apparent leachate from adjacent old dump	AES, ALS	A
3	Second Branch White River, Mouth to rm 9.8	E. coli	Consistently elevated E. coli	Contact recreation	A
4	Third Branch White River, Mouth to rm 4.3	E. coli	Consistently elevated E. coli	Contact recreation	A

Monitoring Priorities for Further Impairment Evaluation

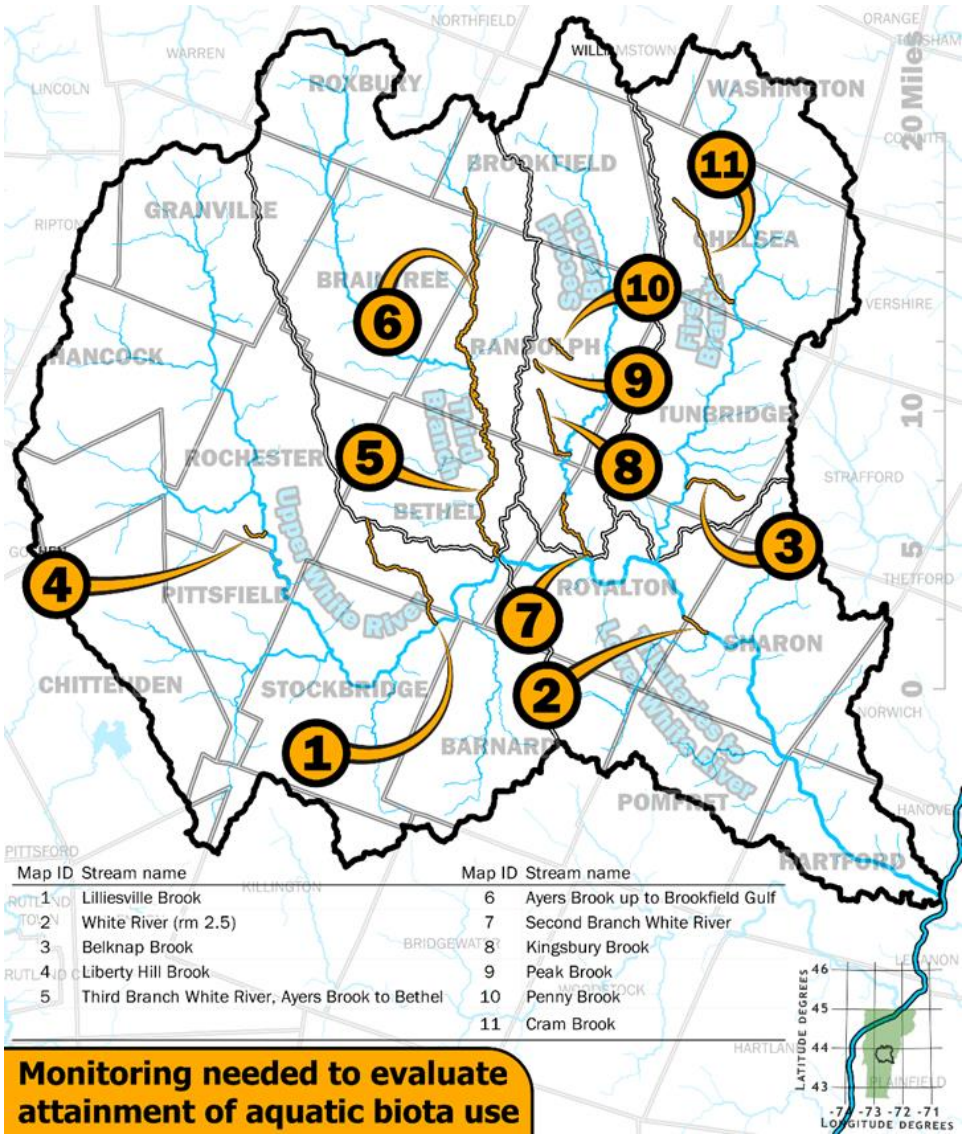


Figure 16. Monitoring needs to determine potential river segment impairment. Map IDs correspond with information in Table 9. Biomonitoring data indicate fair or poor conditions at these sites, but additional data must be collected to fully evaluate attainment.

Table 9. Monitoring needs to determine river segment impairment, from Figure 16.

Map ID	Name	Pollutant	Problem
1	Lilliesville Brook	Unknown	Fair fish community
2	White River (rm 2.5)	Community alteration due to low flows from abnormally dry/drought conditions	Unknown
3	Belknap Brook	Silt and sand	Poor fish community

Map ID	Name	Pollutant	Problem
4	Liberty Hill Brook	Unknown	Unknown
5	Third Branch White River, Ayers Brook to Bethel	Sediment, nutrients	Stormwater, agriculture, streambank erosion, loss of riparian vegetation
6	Ayers Brook up to Brookfield Gulf	Sediment	morphological instability
7	Second Branch White River (rm 0.2)	Community alteration due to low flows from abnormally dry/drought conditions	Unknown
8	Kingsbury Brook	Temperature, nutrients	Agriculture, loss of riparian vegetation
9	Peak Brook	Unknown	Land use
10	Penny Brook	Unknown	Poor fish community
11	Cram Brook	Temperature, sediment	Open canopy, land use

B. Total Maximum Daily Loads (TMDLs)

For waters that are listed as impaired, the federal Clean Water Act requires a plan that identifies the pollutant reductions a waterbody needs to undergo to meet VWQS and it must identify ways to implement those reductions. A Total Maximum Daily Load (TMDL) is the calculated maximum amount of a pollutant that a waterbody can receive and still meet VWQS. TMDLs can be calculated for reducing water pollution from specific point source discharges or for an entire watershed to determine the location and amount of pollution reductions needed.

Under certain circumstances, there are alternative restoration approaches that may be more immediately beneficial or practicable in achieving VWQS than pursuing the TMDL approach in the near-term. An alternative restoration approach is a description of actions, with a schedule and milestones, that is more immediately beneficial or practicable to achieving VWQS.

TBPs are implementation plans guiding the execution of actions necessary to meet TMDL reduction targets specific to each planning basin, see Chapter 4 and the implementation table for associated strategies.

TMDLs and alternative plans in the White River basin include:

- Vermont Statewide 2011 Bacteria-impaired TMDL
- 2004 Acid-Impaired Lakes TMDL (including Skylight Pond)
- Northeast Regional Mercury TMDL
- 2000 Long Island Sound Dissolved Oxygen TMDL

The Mercury and Acid TMDLs are primarily focused on regional efforts to reduce atmospheric deposition and so are not described in greater detail beyond the link provided above (and see more information about the long-term monitoring of Vermont's acid lakes). The White River's bacteria-impaired segments are not currently addressed by a TMDL, but the application of general land use management, protection, and restoration activities listed in the Statewide 2011 Bacteria-impaired TMDL is expected to help reduce bacterial loads through time.

Long Island Sound Dissolved Oxygen TMDL

The Long Island Sound watershed encompasses 16,820 square miles in five states. It is the second largest estuary on the East Coast and receives water from 16,000 miles of rivers and streams. The 410-mile-long Connecticut River is its largest tributary. 42% or 3932 square miles of Vermont, drains to the Connecticut River, including the White River basin's 710 square miles. The White River is the longest un-dammed tributary to the Connecticut, and the longest Connecticut tributary in Vermont.

The Long Island Sound Dissolved Oxygen TMDL released in 2000 is designed to address low dissolved oxygen or hypoxia in Long Island Sound bottom waters. It is often referred to as the Connecticut River Nitrogen TMDL because it is linked to an overabundance of nitrogen discharging into the Sound from the Connecticut River and other tributaries. While nitrogen is essential to a productive ecosystem, too much nitrogen fuels the excessive growth of algae. When the algae die, they sink to the bottom, where they are consumed by bacteria. The microbial decay of algae and the respiration of these organisms uses up the available oxygen in the lower water column and in the bottom sediments, gradually reducing the dissolved oxygen concentration to unhealthy levels (New York DEC; Connecticut DEP, 2000).

Due to the Long Island Sound TMDL, nitrogen is a key pollutant of concern in the Connecticut River watershed. Total Nitrogen (TN) levels show correlation with development and impervious surface increases. Wastewater discharges, stormwater and agricultural runoff are common contributors of nitrogen.

Vermont's nitrogen export to LIS is estimated to be about 12% of the total load to the Sound based on the United States Geological Survey (USGS) SPARROW model (Astor, 2019). The White River basin is responsible for approximately 19% of Vermont's total load. This delivered loading consists of <1% from municipal wastewater treatment, 10% from developed land runoff, 9% septic system effluent, and 15% from agriculture through nitrogen fixing crops, farm fertilizer and manure. Approximately 66% of nitrogen from the White River basin comes from atmospheric deposition. Figure 17 shows the delivered loading in percent contribution. Efforts to reduce atmospheric deposition have been occurring at the national level through the 1990 Clean Air Act and its amendments. Total atmospheric nitrogen deposition has declined since 1985 (Astor, 2019).

In 2017, USEPA embarked on its Nitrogen Reduction Strategy to investigate and better define control strategies to reduce nitrogen in the Long Island Sound. Information on the most current developments and strategies can be found in USEPA's Long Island Sound Study.

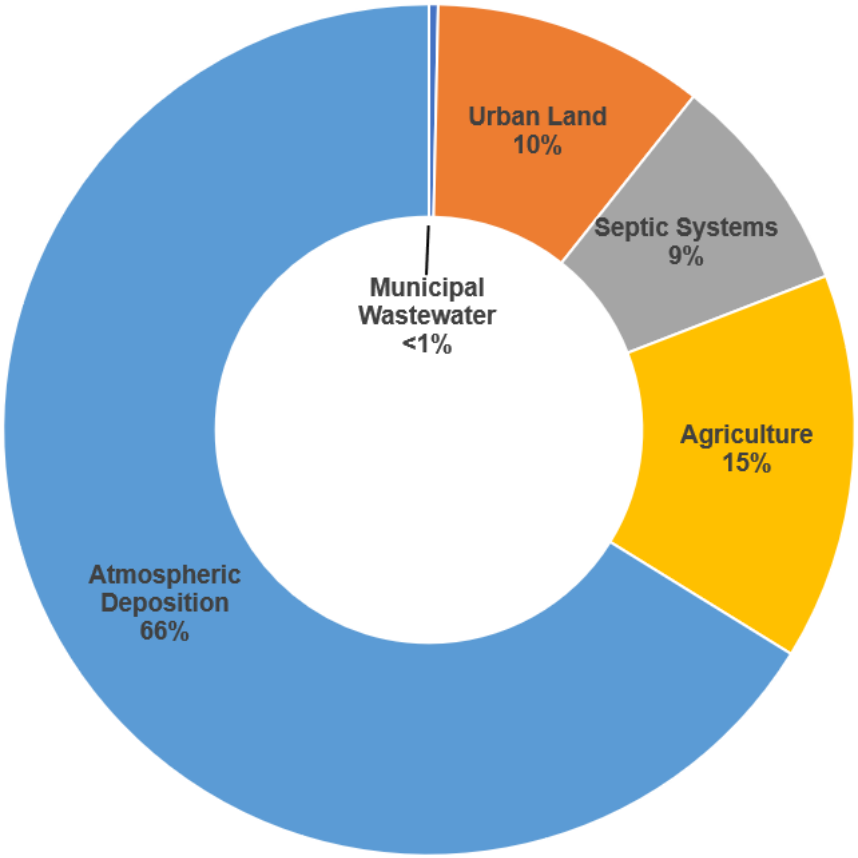


Figure 17. USGS SPARROW model estimates of percent contribution by source to basin-wide nitrogen loading in the White River Basin.

The sources of nitrogen to be addressed in Vermont include wastewater and septic discharges, agricultural lands, developed lands, and forest practices. Act 64, the Vermont Clean Water Act, helps implement overarching strategies and steps required to meet loading reductions for the Long Island Sound's TMDL. Each of the five watershed states completed a section of the LIS TMDL Enhanced Implementation Plan Report in 2013. To meet TMDL requirements, Vermont has implemented both regulatory and non-regulatory initiatives. These include the creation of the State's engagement strategy to develop, maintain, and enhance the Agency's partnerships; support for those partnerships, support for project prioritization, funding, and implementation; and advanced tracking methods for each land use sector.

The Vermont Enhanced Implementation Plan for the Long Island Sound TMDL (DEC, 2013) was added to the LIS-TMDL to address four goals:

- To identify the Vermont sources of nitrogen as they are currently understood, across broad land use sectors, such as developed, agricultural and forested lands;
- To identify the status and trends of important drivers of nitrogen export such as the intensity of agricultural and development activities and investigate how these might have changed since the TMDL baseline period of 1990;
- To identify the management programs, operating at that time, that address these drivers of nitrogen loading that have a significant effect on reducing or preventing nitrogen export. A part of this is to identify a timeline as to when programs were initiated or enhanced; and
- Using a weight-of-evidence approach, to assess the combined management programs/projects to develop a qualitative evaluation as to whether management efforts are sufficient to meet the original 2000 TMDL of a 10% non-point source nitrogen reduction and if these strategies are sufficient to maintain that control into the future (DEC, 2013)

The Vermont State section tasks TBPs with identifying actions and priority projects for the remediation of impaired and altered waters. Action items include both data collection and assessment efforts and specific implementation activities (DEC, 2013). The Implementation Table in Chapter 5 offers strategies and actions to address nitrogen reductions that are necessary to achieve compliance with the TMDL. Additionally, the Monitoring Table (Table 14) recommends continued and supplemental monitoring efforts to support the goals and fill current data gaps in nitrogen trends and source tracking.

One effort is underway for the agricultural sector. In 2023 the Windham County Natural Resources Conservation District received funding from the Long Island Sound Futures Fund of the National Fish and Wildlife Foundation to address nitrogen inputs to the upper Connecticut River watershed of Vermont and New Hampshire.

The project, titled *Working with Agricultural Producers and Partners to Restore and Protect Water Quality in the Upper Connecticut River Basin,* has identified and gathered a bi-state team of key stakeholders and partners working in agriculture in the upper Connecticut River Valley to select best management practices for reducing Nitrogen pollution to Long Island Sound. The team will design and plan implementation trials and monitoring and assessment studies to identify BMP practices with the greatest impact on reducing Connecticut River nitrogen inputs.

To date progress toward the reduction of nitrogen to the Sound is being made particularly through efforts in the lower watershed in Connecticut and New York through investments in wastewater treatment and agriculture. These efforts have resulted in the total area of the hypoxic waters being

reduced from 208 square miles (1987-1999 average baseline) to 102 square miles (2019-2023 5-year average), a reduction of 51% (Figure 18; LIS Study 2024).

Significant reductions in the nitrogen load are still needed to meet water quality goals by the attainment date goal of 2035. This plan puts forward strategies to help better understand and reduce Vermont's contribution.

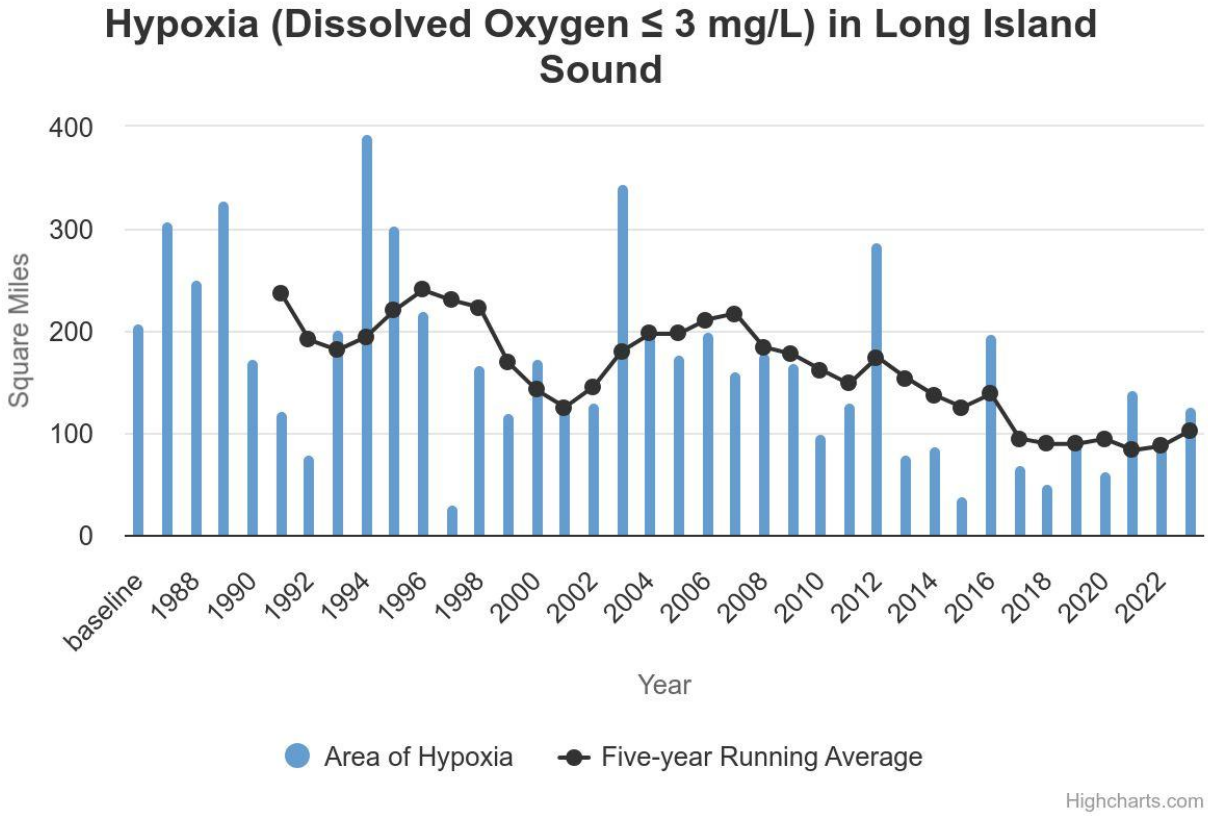


Figure 18. Downward trend in the area of hypoxia in Long Island Sound 1987 – 2023, from the Long Island Sound Study, 2024.

State Programs to Meet Regulatory Targets

Regulatory programs play a significant role in ensuring that pollutants and stressors responsible for degraded water quality are addressed. To meet TMDL requirements, Vermont has implemented both regulatory and non-regulatory initiatives including a wide array of permits meant to protect all Vermont's natural resources from degradation. These regulatory programs can be found through the Environmental Assistance Office which provides assistances to Vermonter's in need of permits.

Engagement Strategy

The Watershed Planning Program engages partners using strategies that strengthen the partners' sense of ownership and therefore participation in the planning process and implementation. The desired outcomes of the state's engagement strategy work toward:

- Multi-partner collaboration across sectors and localities to assist with developing, writing, and implementing TBPs;
- Strategic inclusion and engagement with different sectors and localities throughout the planning process to ensure that all concerns, needs, and goals are addressed; and
- Strategic communication efforts to ensure understanding of and support for the plan among key stakeholders as well as throughout the watershed;
- Financial and technical assistance to partners and develop programs to expand capacity in our stakeholder networks.

Chapter 4 – Strategies to Address Pollution by Sector

ANR's approach to remediation of degraded surface waters and protection of high-quality waters includes the use of both regulatory and non-regulatory tools with associated technical and financial assistance to incentivize implementation. Tactical basin plans address water quality by land use sector (Figure 19). Ongoing protection and restoration efforts and recommendations to meet water quality objectives are developed for each sector. These recommendations support the development of the strategies in the Chapter 5 Implementation Table.

Figure 19. Land use sector framework with practices used to enhance, maintain, protect, and restore water quality.

A. Agriculture

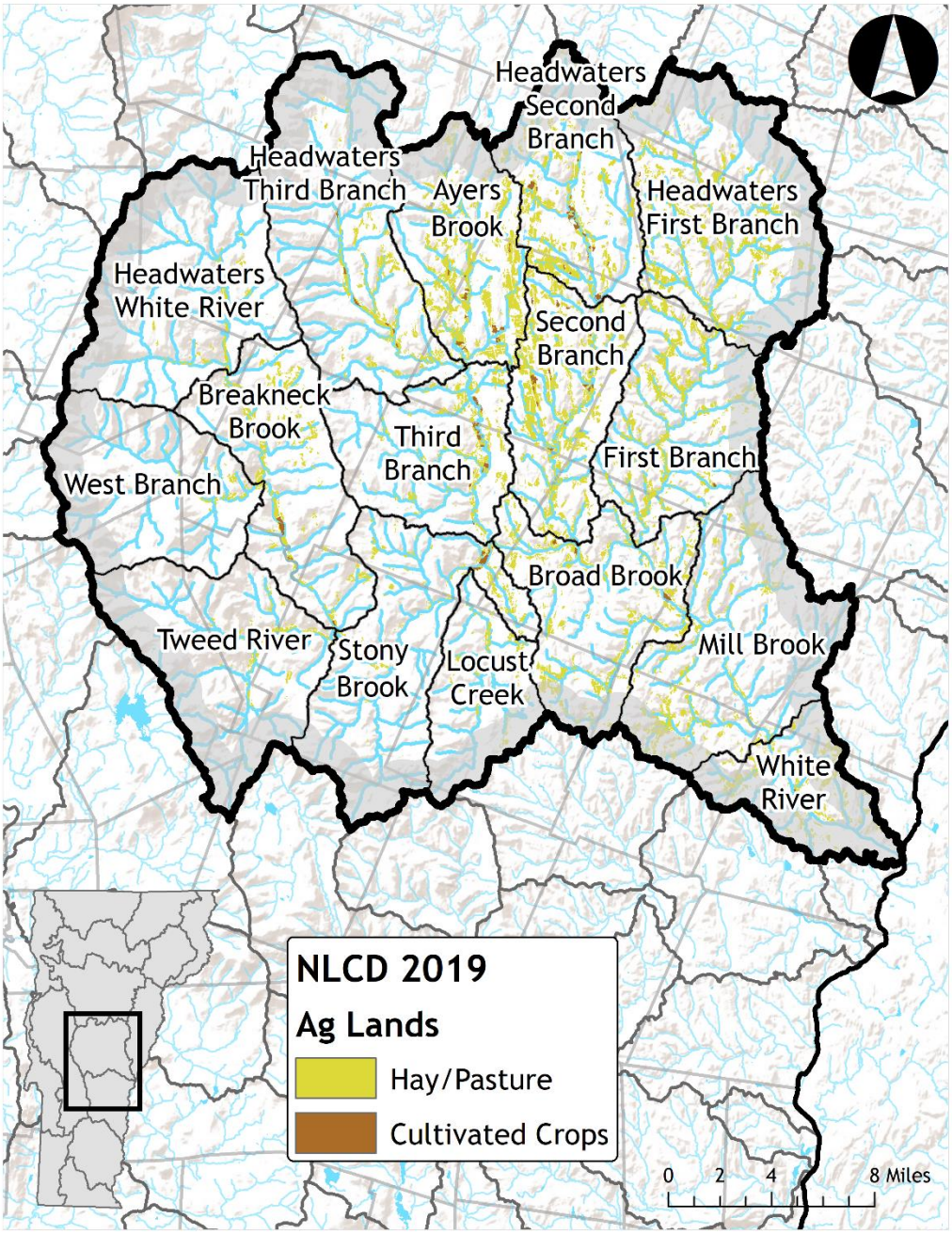


Figure 20. Agricultural land cover in the White basin.

As of 2019, Agricultural land cover makes up 8.4 percent of the White River basin with 2.4 percent in cultivated crop and 6 percent in hay or pasture (note: these numbers likely change on an annual

basis). At the sub-basin scale, the highest concentrations of agricultural land are within the First (12 percent), Third (9 percent), and especially Second Branches (18 percent), largely coincident with the extent of remnant fertile soils from glacial Lake Hitchcock. At smaller catchment scales, agricultural land constitutes particularly high concentrations of watershed drainage areas in parts of Randolph, Brookfield, Chelsea, Tunbridge, Barnard, Pomfret, and northern Rochester (Figure 20). Pasture and hay production is most widespread, with some cultivated cropland mainly in the Second and Third Branches.

Agricultural runoff constitutes 15% of the White River basin's estimated TMDL baseline total nitrogen loading (kg/yr) to the Connecticut River and Long Island Sound. The Long Island Sound TMDL section of Chapter 3 above provides additional detail on agricultural partner efforts in Vermont to reduce nitrogen loads from this sector. Agricultural runoff may also be one of several contributing factors to E. coli stream impairments in the lower portions of the First, Second, and Third Branches (Chapter 3 Figure 15).

The following sections describe regulatory programs and non-regulatory tools to address agricultural runoff to surface waters during this plan cycle. When appropriate, agricultural partner efforts will target several sub-basins in which agricultural density is high (Figure 20).

Regulatory programs

Vermont Agency of Agriculture, Food, and Markets (AAFM) regulatory programs work towards protecting surface waters by requiring baseline farm management practices to ensure environmental stewardship. The revisions of the Required Agricultural Practices (RAPs) in 2016 and 2018 aim to reduce nutrients such as phosphorus and nitrogen entering state waterways. The RAPs apply to different types of farms, farm sizes and farming activities. In addition to the RAPs, Vermont farms are regulated by additional sets of rules promulgated by the AAFM based on farm animal numbers into large, medium, certified small and small farms.

There is one Large Farm Operation and four Medium Farm Operations in the basin. Large farms are inspected annually and medium farms are inspected once every three years by AAFM. These farms must comply with the Required Agricultural Practices (RAPs), Large Farm Operation Rule and Medium Farm Operation permitting program requirements as applicable, and the VWQS.

As of the writing of this plan, an estimated 12 Certified Small Farm Operations, that are required to certify annually with the Agency, will be inspected at least once every seven years, and need to comply with the RAPs. The AAFM estimates there are 88 Small Farm Operations in the basin that do not meet the thresholds of a certified small farm and are not required to receive a routine inspection by AAFM, but still need to comply with the RAPs. Outreach will continue to help landowners understand where they fall within the RAP farm categories and the RAP requirements.

AAFM regulatory programs support farmers to ensure their clear understanding of the RAPs and program rules, while helping assess, plan, and implement any conservation and management practices necessary to meet water quality goals. Inspections by AAFM include assessments of farm nutrient management plans, production area assessments of all facilities associated with the permitted or certified operation, and cropland management assessments in accordance with RAPs and permit rules as applicable. As a result of regulatory farm inspections, 57% of farm facilities inspected in the basin in SFY 2023 had production areas that were compliant with RAPs and farm permits. The compliance rate of production areas in the White River Basin is lower than the overall Connecticut River Basin compliance rate in SFY 2023, in which approximately 66% of farm facilities inspected had production areas that were compliant. However, increases in technical and financial assistance, regulatory visits, as well as increases in enforcement actions, when necessary, are likely to improve compliance over time. Information regarding farm inspections, compliance, and enforcement actions can be reviewed on AAFM's Water Quality Interactive Data Report.

Technical and Financial Assistance

Availability of technical and financial assistance throughout the basin is provided by the White River Natural Resources Conservation District, UVM Extension, AAFM, and the Natural Resources Conservation Service (NRCS), who help facilitate compliance with water quality regulations and the voluntary adoption of conservation practices. AAFM and NRCS funded programs provide most of the financial support directly to farmers as well as to the agricultural partner organizations. Outreach, education, technical assistance, and financial assistance is available for farmers to implement field Best Management Practices (BMPs), such as cover cropping, crop rotation, and reduced tillage practices, and available for farmers to implement farmstead BMPs, such as waste storage facilities or clean water diversion practices. These agricultural assistance and outreach programs are essential tools in promoting field and farmstead BMPs that protect water quality, improve soil health, and increase farm viability. Practices funded and reported through AAFM and NRCS programs are illustrated in Figure 21. Note that practices not receiving State or Federal cost share and therefore not reported through programs are not included. Cover cropping is the most popular BMP implemented in the White River basin, while conservation tillage approaches, rotational grazing, and manure injection cover fewer acres and are more annually variable (Figure 21). Additional water quality improvements can be realized through pasture, hay, and trapping/control practices, some of which are being assessed for their nitrogen reduction efficacy via a NFWF Long Island Sound Futures Fund grant (see Chapter 3 TMDL section).

Many factors may influence producers' capacity and interest to implement water quality-focused agricultural BMPs. Lack of access to capital equipment (e.g., drag lines for manure injection, no till drills for cover cropping and crop to pasture/hay conversion), lack of familiarity of resources available to farmers (especially for non-traditional or emerging programs), and overwhelming or inefficient coordination with a variety of technical service provider specialists have been just some recently mentioned barriers to BMP implementation, especially for smaller or newer farms.

Outreach, education, and technical assistance may help increase awareness of the resources available to implement these water quality-benefitting practices.

To this end, AAFM and partners provide educational opportunities and technical assistance to farmers to promote and assist with conservation practice adoption. Between 2018-2022, AAFM and the Agricultural Clean Water Initative Program partners supported 20 education events with 404 attendees in the White River basin. Since 2020, service providers funded by AAFM conducted approximately 189 technical asssitance visits to 46 farms in the basin.

The White River NRCD's Farm Team model, in which technical service providers from multiple organizations coordinate their assistance to individual farms, provides one approach to streamline communication about water quality BMPs. Likewise, the Connecticut River Watershed Farmers Alliance (CRWFA) — a farmer-led organization dedicated to helping Connecticut River agricultural producers improve stewardship practices for clean waterways, healthy soil, and productive landscapes— is providing multiple avenues of direct farmer education and assistance in both Vermont and New Hampshire. CRFWA administers a rental library of no-till drills and soil health assessment kits, offers on-farm demonstrations and workshops, and engages both farmers and

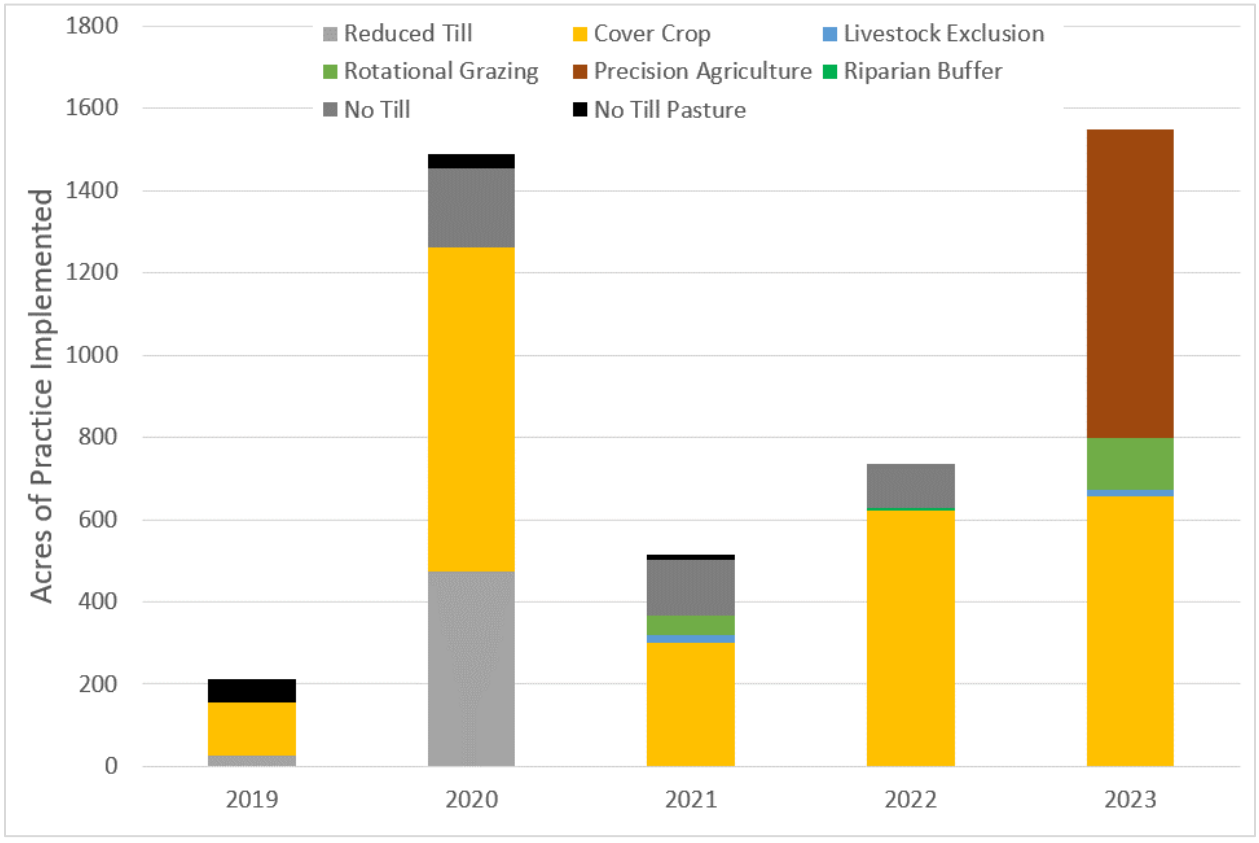


Figure 21. Implemented agricultural practices in the White River basin by state fiscal year. 2023 data are not yet complete. Reported practices included those funded by AAFM or NRCS.

service providers in water quality-related BMP and policy discussion through multiple modes including an online farmer forum, monthly and annual meetings, and member surveys.

Statewide resource guides like Franklin County Natural Resource Conservation District's Assistance for Agricultural Producers may be a helpful complement to WRNRCD's and CRFWA's regional outreach and programs. In addition to traditional state and federal funding programs, the guide highlights emerging resources for new farmers, small-scale farmers, and under-served and marginalized farmers meant to improve equity in agricultural funding opportunities. A capacity building project to support diverse and new farming audiences, spearheaded by UVM Extension's New Farmer Project and the Women's Agricultural Network, is one recent example effort addressing this need via the participation of 24 agricultural service providers.

While technical service providers offer assistance to all farmers, additional water quality-related outreach may be warranted where significant opportunities exist for the implementation of voluntary natural resource projects like wetland restoration, in-stream process based restoration, or riparian buffer expansions beyond the RAPs. According to a preliminary analysis by the watershed planner using VT's high resolution land cover product, about 21% of all riparian acreage within the basin (75ft buffer) is classified as agricultural pasture, hay, or cropland lacking forested canopy cover. The analysis allows for summarizing this potentially restorable agricultural riparian area at multiple spatial scales, including at a parcel level most useful for farmer outreach. The analysis— in combination with projects identified in the Watersheds Project Database via existing Stream Geomorphic Assessments, River Corridor plans, or other assessment documents (see Chapter 4 – Rivers)— may provide a starting point for collaboration among agency, watershed group, and agricultural service providers to identify and prioritize outreach for potential natural resource projects in agricultural riparian areas.

B. Developed Lands

ANR considers developed lands to include hard or impervious surfaces like parking lots, sidewalks, rooftops, and roads. Stormwater runoff from developed lands is a significant threat to water quality in Vermont. Stormwater runoff is any form of precipitation that flows over the land during or after a storm event or snowmelt. Along this route stormwater picks and carries pollutants with it to the waterbodies it enters. On undeveloped lands, such as forests and meadows, a portion of this runoff is absorbed into the ground through infiltration while the rest takes a relatively slow path to nearby rivers, lakes, and ponds. On developed lands, however, infiltration is reduced by impervious surfaces which increase the velocity and volume of runoff into rivers and lakes. This leads to an increased frequency and intensity of flooding as well as a greater likelihood that runoff will become

contaminated with pollutants. The result is increased erosion and property damage, degraded aquatic and terrestrial habitats, and threats to public health via contaminated drinking water and recreational pursuits.

Developed lands make up about 5.5% of the land cover in the White River basin, with locally higher concentrations in the lower White River (8%) and Second Branch (7.6%) sub-basins. These lands include the general land use classes of urban, residential, and industrial areas, as well as paved and unpaved roads. Nitrogen loading from developed lands accounts for approximately 10% of all nitrogen loading from the White River basin to the Connecticut River. The following sections describe regulatory programs and non-regulatory tools to address stormwater runoff to surface waters during this plan cycle.

Stormwater

The tactical basin planning approach engages local, regional, and federal partners in the development of strategies needed to accelerate adoption and monitoring of stormwater-related Best Management Practices (BMPs) to meet the state's clean water goals. Basin stakeholders have been actively participating in voluntary actions and implementing priority projects and municipalities are working on meeting regulatory requirements and are working to remediate identified discharges.

Stormwater mapping, Indirect Discharge Detection and Elimination studies and Stormwater Master Plans are the tools used to identify stormwater actions needed to address stormwater-related water resource impairments.

Regulatory requirements ensure proper design and construction of stormwater treatment and control practices as well as construction-related erosion prevention and sediment control practices, necessary to minimize the adverse impacts of stormwater runoff to surface waters throughout Vermont. Stormwater permits for developed lands include:

- Operational Stormwater Permits
- Construction Stormwater Discharge Permits
- Municipal Separate Storm Sewer System (MS4) General Permits
- Multi-Sector General Permit (Industrial)

Stormwater General Permit 3-9050 (Three-Acre General Permit)

General Permit 3-9050 addresses runoff from impervious surfaces. This permit covers all

General Permit 3-9050 addresses runoff from impervious surfaces. This permit covers all operational stormwater permitting, including new development, redevelopment, and permit renewal. Projects that expand or redevelop one half-acre (0.5 acres) or more of impervious surface are required to apply for stormwater operational permit coverage. Additional information on the ½ acre threshold can be found on the stormwater program website. This permit serves as the statutorily required "Three-Acre General Permit" under the Vermont Clean Water Act which takes effect in the White River basin in 2033.

Stormwater Mapping and Master Planning

Stormwater infrastructure mapping projects are completed for municipalities by the Clean Water Initiative Program to supplement any existing drainage data collected by towns with the intention of providing a tool for planning, maintenance, and inspection of stormwater infrastructure. Town reports can be found on the municipal stormwater website and in Table 10. As of spring 2024, all major municipalities in the basin have been mapped except for Braintree, Brookfield, Chittenden, Pomfret, and Stockbridge.

The reports and maps for each town provide an overall understanding of the connectivity of the storm drainage systems on both public and private properties, raise the awareness of the need for regular maintenance, and identify potential stormwater retrofit opportunities. These reports identify potential priority projects and provide information necessary to develop a stormwater master plan. Stormwater Master Plans are developed with municipal and public involvement and further prioritize projects identified in initial mapping efforts, offering a strategic approach to address stormwater runoff in the plan focus area. Stormwater master planning has been completed for 7 of 22 major municipalities in the basin (Table 10). Hartford and Royalton would still benefit from a more complete Stormwater Master Planning process, with South Royalton and DEC initiating a stormwater master planning effort in summer 2024. Projects identified as high priority in the stormwater mapping reports and master plans may be implemented by towns with the aid of watershed partners.

Table 10. Towns with completed stormwater assessments. See also the Stormwater Infrastructure Mapping Directory to access town-specific stormwater mapping reports, infrastructure maps, and master plans. Towns are supported by the number of priority projects identified in mapping reports.

Town	Year(s) Stormwater Mapped	Priority Projects Identified within White River Basin	Stormwater Master Plan(s) Completed
Randolph	2015/2022	15	2016 Ayers Brook SWMP; 2015 Vermont Tech SW Report; 2019 Village SWMP
Royalton	2015	7	2019 Vermont Law SW Report
Bethel	2015	6	2023 Village SWMP
Hartford	2015	6	

Town	Year(s) Stormwater Mapped	Priority Projects Identified within White River Basin	Stormwater Master Plan(s) Completed
Rochester	2015	4	2018 Village SWMP
Chelsea	2015	3	
Sharon	2015	2	
Braintree			2016 Ayers Brook SWMP
Brookfield			2016 Ayers Brook SWMP
Barnard	2016	1	
Tunbridge	2015	1	
Pittsfield	2015	1	
Chittenden			
Granville	2015	0	
Hancock	2015	0	
Norwich	2014	0	
Pomfret			
Roxbury	2018	0	
Stockbridge			
Strafford	2018	0	
Washington	2015	0	
Williamstown	2013	0	2023 Townwide SWMP (no White River basin projects)

SWMP = Stormwater Master Plan

Illicit Discharge Detection & Elimination Studies

Illicit discharges are discharges of wastewater or industrial process water into a stormwater-only drainage system. All towns in the basin with mapped stormwater infrastructure (Table 10) have completed IDDE studies. Study outcomes are provided in four reports:

- White River Basin Illicit Discharge Detection and Elimination Study (2018)
- Statewide Contract No 2 Illicit Discharge Detection and Elimination Study (2019)
- Statewide Contract No 3 Illicit Discharge Detection and Elimination Study (2021)
- Illicit Discharge Detection and Elimination Statewide Project #4 (2023)

Most of these illicit discharges have been identified and eliminated. Where sources were difficult to locate, compliance was difficult, or the infrastructure was no longer in use follow-up actions are identified in the reports. This plan recommends follow-up on any outstanding recommended actions from previous studies.

Stormwater Outreach and Education

Many of the stormwater issues associated with developed lands can be prevented or mitigated using Low Impact Development and Green Stormwater Infrastructure systems and practices. These concepts strive to manage stormwater and pollutants by restoring and maintaining the natural hydrology of a watershed. Rather than funneling stormwater off site through pipes and infrastructure, these systems (gardens or permeable materials) focus on infiltration, evapotranspiration, and storage as close to the source as possible to capture runoff before it gets to surface waters.

The Vermont Green Infrastructure Toolkit is a project of the ten Regional Planning Commissions of the Vermont Association for Planning and Development Agencies and the Agency of Natural Resources' Water Investment Division. The toolkit is a clearinghouse of information useful to municipalities to promote the adoption of Green Infrastructure policies and practices to combat the problems caused by urban, suburban, and rural stormwater runoff.

Voluntary actions by individual landowners and residents can also reduce local stormwater runoff issues if adopted at scale. Outreach campaigns can encourage practices like reducing lawn mowing and fertilizing, using permeable pavers, redirecting downspouts, picking up pet waste, lessening salt application, and installing rain barrels. Nationwide, the Environmental Protection Agency provides general Stormwater Smart Outreach Tools to promote sound stormwater management.

Roads

It is estimated that more than 75% of Vermont roads were constructed prior to any requirements for managing stormwater runoff (ANR, 2012). Where road networks intersect stream networks, roads and their ditches effectively serve as an extension of the stream system. Roads can increase stormwater runoff, and unpaved roads are an important source of sediment to receiving waterbodies. Roads can impinge on stream floodplains and be a barrier to aquatic organism passage due to undersized or perched culverts. Road runoff also results in sediment that may contribute to elevated chloride or phosphorus concentrations in streams and lakes; therefore, Lake Wise efforts and Lake Watershed Action Plans (described in the Lakes section below) consider the outcomes of road erosion assessments alongside other sources of water quality degradation.

Tactical basin planning engages local, regional, and federal partners to accelerate the implementation of transportation-related practices to meet the state's clean water goals. Two regulatory programs,

the Municipal Roads General Permit (MRGP) and the Transportation Separate Storm Sewer System Permit (TS4) are driving road water quality implementation efforts in the basin.

Municipal Roads General Permit

Road Erosion Inventories (REI) are used by Vermont municipalities to:

- identify sections of local roads in need of sediment and erosion control,
- determine individual road segment compliance with MRGP required practices,
- prioritize road segments that pose the highest risks to surface waters, and
- estimate costs to remediate those sites using Best Management Practices.

As of 2023, road segments are surveyed and scored according to either open drainage REI or closed drainage REI supplemental documents. The latest REI survey and scoring documents (2023) are available for roads with either open or closed drainages. REIs are required by the Municipal Roads General Permit. The MRGP is intended to achieve significant reductions in stormwater-related erosion from municipal roads, both paved and unpaved. The permit is required by the Vermont Clean Water Act (Act 64).

The implementation of the priorities identified in REIs will reduce sediment, nutrients, and other pollutants associated with stormwater-related erosion generated from unpaved municipal roads and outfalls. A secondary benefit of upgrading roads to MRGP standards is improving the flood resilience of the municipal transportation system from the increased frequency of localized high intensity rain events associated with climate change. The inventories are conducted for "hydrologically-connected roads." Hydrologically connected roads are those municipal roads within 100' of or that bisect a wetland, lake, pond, perennial or intermittent stream or a municipal road that drains to one of these water resources. These road segments can be viewed using the Stormwater - Road Segment Priority layer on the ANR Natural Resource Atlas and REI results by town can be viewed in the MRGP Implementation Table.

Based on protocols developed by DEC with the assistance of the Regional Planning Commissions, all the towns in the basin have completed initial REIs as of spring 2024. Towns were required to bring 15% of connected segments scoring *Partially Meeting* or *Not Meeting* to the MRGP standards or *Fully Meeting* status by December 31, 2022. Towns report and manage their progress annually via the MRGP Implementation Table Portal database. For additional information see the DEC Municipal Roads Program.

The Department reissued the MRGP in January 2023. The new permit continues the implementation requirements of the previously issued permit, requiring towns to upgrade at least 7.5% of their non-compliant segments to meet MRGP standards annually. The re-issued permit requires a second, town-wide reassessment of all hydrologically connected segments by the Fall of 2027. Beginning in 2026, 20% of total *Very High Priority* segments will be required to be upgraded to

meet MRGP standards each year, as part of the 7.5% annual requirement mentioned above. One change in the reissued MRGP is that the Active Channel Width is now required for new intermittent stream crossings, as well as replacements to existing non-compliant intermittent structures.

This plan recommends that technical and financial assistance be provided to towns to complete the new, required REIs and for towns interested in implementing road projects with water quality benefits. Priority projects for water quality are those projects that are "*very high priority*" (Figure 22). Resources available from the Clean Water Fund (e.g., VTrans Municipal Grants-in-Aid, VTrans Better Roads grants) assist with development of designs, capital budgets, cost estimates and

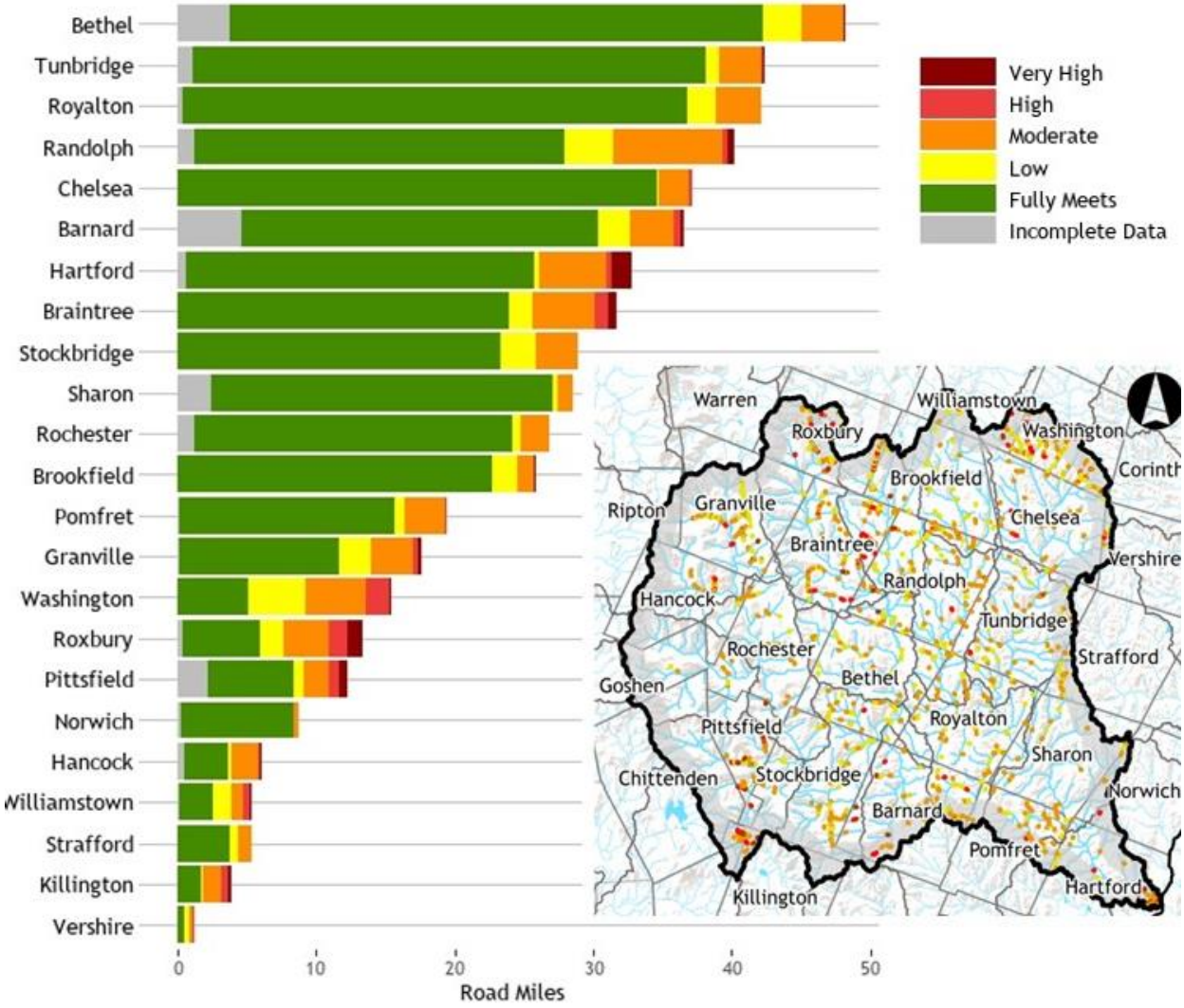


Figure 22. Road miles by MRGP improvement priority in White River basin towns and the distribution of non-compliant segments across the basin. Visit the ANR Atlas for segment data. Fully compliant segments or those with incomplete data are not mapped here.

implementation of road projects. Completion of these projects may be counted towards meeting the requirements of the MRGP.

Randolph, Hartford, Braintree, Washington, and Roxbury are priority towns for funding because they have the highest number of non-compliant roads to be improved (Figure 22). Priorities for funding road assessments or improvements may also include priority road-related projects identified in stormwater mapping reports and Master Plans (Table 10).

VTrans Municipal Grants in Aid & Vermont Local Roads

The VTrans Municipal Grants In Aid Program provides technical support and grant funding to municipalities to promote the use of erosion control and maintenance techniques that save money, while ensuring best management practices are implemented in accordance with the MRGP. The Vermont Local Roads team provides training, technical assistance, communication tools and opportunities for information exchange to assist municipalities in improving their road networks. These programs help implement the strategies described here and listed in Chapter 5.

Transportation Separate Storm Sewer System General Permit – TS4

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

VTrans has also developed the Vermont Transportation Resilience Planning Tool as a web-based application that assesses the risk to bridges, culverts, and road segments based on their vulnerability to damage from floods and the criticality of their location in the roadway network, and then identifies potential mitigation measures based on the factors driving the vulnerability.

Vermont Transportation Resilience Planning

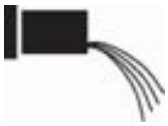
VTrans has also developed the Vermont Transportation Resilience Planning Tool as a web-based application that assesses the risk to bridges, culverts, and road segments based on their vulnerability to damage from floods and the criticality of their location in the roadway network, and then identifies potential mitigation measures based on the factors driving the vulnerability. The use of this tool to prioritize projects is part of the VTrans Resilience Improvement Plan.

Vermont Road and Bridge Standards

In addition to the MRGP, towns can voluntarily adopt the most current version of the Vermont Road and Bridge Standards. These standards are administered by VTrans and go above and beyond

MRGP standards. For example, municipalities may adopt MRGP standards for non-hydrologically connected roads. Towns adopting the Vermont Road and Bridge Standards may be entitled to higher cost share rates in federally declared flood event reimbursements. DEC will coordinate with VTrans District Offices to gather up to date information on annually adopted Road and Bridge Standards, coordinate outreach to municipalities, and update the Vermont Flood Ready website.

Managing for road runoff in the upper watershed catchments will lessen the pressure on the downstream areas receiving larger contributions of runoff. Waters being impacted or impaired lower in the watershed do not negate the need for action higher up in the watershed. Lack of good management in the upper parts of the sub-basins can often be the cause of water quality issues further downstream due to cumulative impacts. For this reason, road BMPs for water quality are recommended basin wide and particularly on steep slopes.



C. Wastewater

Wastewater discharges to surface waters or ground waters represent a regulated and readily measurable and controlled source of pollutants, including pathogens and phosphorus. Vermont addresses these discharges primarily through implementation of the National Pollutant Discharge Elimination System (NPDES) permit program as well as state permit programs. DEC provides financial assistance and technical assistance to municipalities and other permittees to upgrade wastewater treatment infrastructure and along with partners supports the community's development of community onsite systems and maintenance of residential onsite systems.

Direct Discharges from Wastewater Treatment Facilities

Most municipal wastewater, originating from a combination of domestic, commercial, and industrial activities, is collected and conveyed with a wastewater collection system (WWCS) to a wastewater treatment plant (WWTP), and treated to established standards identified in permits before being directly discharged into a receiving water. Collectively the WWCS and the WWTP are the wastewater treatment facility (WWTF). The four municipal wastewater treatment facilities in the White River basin process about 92 million gallons of wastewater per year. (Table 11). Nitrogen loading from wastewater facilities accounts for <1% of all nitrogen loading from the White River basin to the Connecticut River.

Table 11. Summary of permit requirements for the wastewater treatment facilities in the White River basin. To view the permits, see the Vermont's Wastewater National Pollutant Discharge Elimination System Permit webpage.

Facility (Permit ID)	Permit Expiration	Design Flow (MGD[1])	Current Percent of Design Flow[2]	Treatment Type	Receiving Water
Bethel (3-1280)	12/31/2027	0.115	33.4%	Oxidation ditch	Mainstem White
Chelsea (3-1197)	6/30/2021	0.055	43.8%	Oxidation ditch	First Branch
Randolph (3-1198)	9/30/2020	0.400	39.6%	Sequencing batch reactor	Third Branch
Royalton (3-1165)	6/30/2024	0.070	44.3%	Aerated Lagoon	Mainstem White

[1]MGD = Million gallons per day

[2]Percentage was calculated using the average monthly flows (Effluent Gross Value) for the period 5/1/2022 to 5/1/2023.

An overarching consideration for the issuance of wastewater discharge permits in the Basin is the Long Island Sound TMDL for nitrogen. This multi-state TMDL has been promulgated with interim waste load and nonpoint source nitrogen load allocations. At issuance of this Plan, all facilities are operating under permits developed under a nitrogen permitting strategy whereby all Vermont WWTFs ultimately discharging to the Connecticut River must, collectively, discharge no more than 1,727 lbs. TN/day. Each individual facility has a unique Total Nitrogen loading limit. In addition to the nitrogen loading limit, WWTFs are required to develop optimization plans for maximizing nitrogen removal and regularly monitor for nitrogen compounds.

Before issuing the permit, the DEC WSMD also conducts a reasonable potential analysis to ensure all water quality criteria in receiving streams are met. The Wastewater Management Program is working with the Monitoring and Assessment Program to increase the frequency of instream sample collection upstream of WWTFs prior to permit renewal. The upstream data is used during the reasonable potential analysis, described below, to calculate the resulting downstream concentration once mixed with the WWTF effluent under critical conditions to determine if there is reasonable potential to violate VWQS. The increased instream sampling as well as increased effluent sampling requirements being incorporated into WWTF permits contribute to more statistically accurate, data-based determinations for WWTF permit effluent limits.

Permit limitations must control all regulated pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which are or may be discharged at a level that will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality. At each renewal, permit writers use this "reasonable potential analysis" to determine whether a discharge, alone or in combination with other sources of pollutants to a waterbody and under a set of conditions arrived at by making a series of reasonable assumptions, could lead to an excursion above an applicable water quality standard. If the expected receiving water concentration determined exceeds the applicable VWQS at critical conditions, limits are included in the permit. A permit writer conducts a reasonable potential analysis

using effluent and receiving water data, and the findings are included in the permit issuance documentation, which can be viewed on the Wastewater Program's discharge permit database.

The Agency also works with municipalities to minimize overflows from combined sewer systems, an additional source of nutrients and pathogens to surface waters. A combined sewer system collects sewage and stormwater in the same pipe and directs it to the wastewater treatment facility. Although the systems work well in dry weather, the runoff from strong storms or snowmelt overwhelms the combined system. To prevent sewage backups into basements or onto roadways, some of the untreated wastewater is diverted into lakes and rivers via outfall pipes. After issuing a 1272 order, DEC works cooperatively with the communities to ensure that comprehensive plans with a high probability of success will be created. After these Long-Term Control Plans are finalized, DEC issues a new 1272 order with the schedule of activities planned to eliminate or abate combined sewer system overflows (CSOs) and annual reports to summarize Long-Term Control Plan activities completed each year. Currently no WWTFs in the White River basin have a 1272 order.

The Wastewater Management Program website includes additional information regarding specific 1272 orders, Long-Term Control Plans, and CSO annual reports. A summary of work completed by facilities and expected upgrades to meet WWTF permits is located at the end of this section. Permit issuance documentation can be viewed on the Wastewater Program's discharge permit database.

In addition to the improved WWTF functioning achieved through Optimization Plans, Elimination/Reduction Plans and CSO Long-Term Control Plans, large contributions of commercial discharges to facilities now receive pretreatment. The Wastewater Management Program issues permits under the Federal Pretreatment Permit program for certain industrial and commercial discharges to municipal WWTFs. The conditions of the DEC pretreatment permit help minimize the potential that industrial or commercial discharges will interfere with the operation of the treatment facility, resulting in the release of untreated wastewater to the environment. The list of operations with pretreatment permits that discharge to White River basin WWTFs can be viewed on DEC's Wastewater Pretreatment Permit webpage (currently only Randolph landfill to the Randolph WWTF).

Technical and Financial Assistance

The DEC and partners assist municipalities in discharge permit compliance by providing access to funding and technical assistance. Vermont provides loans and grants to supports municipal WWTF and associated infrastructure upgrades through the Clean Water State Revolving Fund, Vermont Pollution Control State Revolving Fund, and the Vermont Engineering Planning Advance Program; and grants via the Vermont Pollution Control Grants and the Clean Water Fund (created via Act 64: the Vermont Clean Water Act). The US Department of Agriculture also provides loans via USDA Rural Development Water and Environmental Loans and Grants.

The DEC Wastewater Management Program works cooperatively with local organizations, such as Vermont Rural Water Association and Vermont Energy Investment Corporation, to facilitate technical assistance related to optimization of nutrient removal and energy efficiency at WWTF.

The DEC and partners are also available to assist municipalities with asset management planning, which includes needed upgrades and timeline as well as funding sources and deadlines. Without a plan, facilities tend to delay upgrades and therefore Clean Water State Revolving Fund funding requests until required by permits. As permit reauthorization occurs at the same time for all facilities within the same basin, they may end up competing for a set amount of annual funding. With an asset management plan in place, municipalities could plan over a longer time period as well as multiple Clean Water State Revolving Fund cycles.

Facility–specific information

The WWTF projects described below, as well as those in the Priority List of Vermont Waters, will provide water quality benefits by addressing the Long Island Sound and/or Bacterial TMDLs. In addition, any WWTF and infrastructure upgrades or other wastewater management projects within a DEC-specified distance upstream of a swimming hole identified as an existing use (existing uses lists are found on the White River Planning webpage) would also benefit water quality. The projects are also required to uphold Vermont's Anti-Degradation Policy.

The Water Investment Division will consider each of the wastewater treatment facilities and associated infrastructure upgrades listed below that have municipal support for future drafts of the Project Priority List articulated in the DEC's Intended Use Plan. Please see the Intended Use Plan for the list of White River basin municipalities with projects currently on the Project Priority List.

Bethel

The Town of Bethel WWTF is an oxidation ditch plant with secondary treatment followed by disinfection by ultraviolet light units. Sludge from the secondary clarifiers is wasted to sludge holding tanks where it is stored until being hauled once a year to the Montpelier Wastewater Treatment Facility for processing. The collection system consists of approximately 4.2 miles of pipe and four pump stations.

Chelsea

The Town of Chelsea WWTF consists of an in-plant pump station, an oxidation ditch, two clarifiers and chlorination/dichlorination for disinfection. Biosolids generated at the facility are temporarily stored in the aerated storage tanks and dewatered as needed. Biosolids are removed from the site by an independent contractor. Since the 2018 TBP, the town has hired an engineering firm to design a refurbishment of the pump station and address other issues related to the plant's age and performance.

Randolph

The Town of Randolph WWTF was upgraded from an activated sludge process to a sequencing batch reactor with chlorine disinfection prior to the 2018 TBP. Also before the 2018 TBP, the town had eliminated the two remaining combined sewer overflows; the Central Street (Route 66) Pump Station and the Prince Street (manhole C-3).

Royalton

The Royalton WWTF is an aerated lagoon facility utilizing chlorine disinfection. The collection system conveys all wastewater through one pump station located off South Windsor Street. The aeration system and chlorine contact chamber were replaced in 2017.

PFAS Monitoring

As part of a statewide investigation of potential conveyors of PFAS, DEC will support a sampling program for wastewater treatment facilities. Other sources included in the investigation are industry, land application sites, and landfills. As part of implementing the DEC 2023 PFAS Road Map, $1.25 million dollars of American Rescue Plan Act funding has been dedicated for a two-phased project to (1) quantify PFAS in municipal wastewater discharges across the State and (2) focus resources on identifying and reducing or eliminating PFAS sources in select communities. DEC will partner with a contractor to conduct quarterly influent and effluent sample collection at each of Vermont's 94 municipal WWTFs and analysis for PFAS utilizing current analytical methods. This first phase of the project is expected to take place over one year. Upon completion of phase 1, the information obtained will be used to select municipalities for additional PFAS investigation. The second phase will involve collaboration with DEC and municipal officials to plan and conduct targeted collection system sampling for PFAS analysis to identify sources and mass loading to municipal WWTFs.

Soil-Based Wastewater Disposal Systems (Septic Systems)

In Vermont's mostly rural landscape, the majority of wastewater is treated through soil-based wastewater disposal systems. If not installed appropriately, wastewater may reach groundwater that enters surface waters or be discharged to surface waters. Nitrogen loading from septic systems accounts for approximately 9% of all nitrogen loading from the White River basin to the Connecticut River.

Since 2007, the State of Vermont has had regulatory jurisdiction over the design, permitting, and installation of all new wastewater systems and potable water supplies including septic systems. All new wastewater systems and potable water supplies under 6,499 gallons per day must obtain a Wastewater System and Potable Water Supply Permit.

Larger systems of 6,500 gallons per day and over are permitted through Vermont's Indirect Discharge Program, a NPDES permit. Indirect discharge systems are soil-based disposal systems, which also include primary treatment, and may include secondary or tertiary treatment levels depending on discharge requirements. Water quality related indirect discharges are monitored. Systems can be municipality or privately owned.

There are 6 permitted indirect discharge systems in the White River basin with a total treatment capacity of 126,020 gallons per day.

Financial and Technical Assistance

For residential systems under 6,440 gallons, state financial assistance is available to qualifying homeowners for system upgrades and until 2024 includes American Rescue Plan Act funding. Technical assistance and education are provided by Town Health Officers, including investigating citizen concerns about failed septic systems.

The WSMD Lakes and Ponds Management and Protection Program and the Drinking Water and Groundwater Protection Division support outreach to homeowners during neighborhood gatherings organized by partners. At these wastewater workshops, homeowners learn about the options for a well-functioning onsite wastewater system and good maintenance practices for wastewater systems on lakeshores. Silver Lake, with its populated shoreline and fair water quality trend, could benefit from a wastewater workshop. Other communities where residential development is dense and adjacent to waterways may also benefit from these workshops (see 'Wastewater Workshop' strategy focal areas: Table 13), and all interested river and lake communities are encouraged to participate. More information can be found at the Wastewater Workshop website.

Village Wastewater Solutions

Many historic villages do not have municipal treatment facilities. Closely spaced on-site septic systems adjacent to waterways can be the source of elevated levels of contamination. Failed or poorly functioning systems can contribute *E. coli*, phosphorus, or nitrogen to surface waters. Additionally, failed systems can cause cross-contamination of nearby drinking water wells. Momentum has been growing in rural villages to explore options to deal with concerns about pollution from septic systems and the need for economic growth in village centers that is limited by the lack of centralized shared wastewater systems.

DEC provides direct funding and technical assistance to small communities without municipal treatment to help evaluate and plan for wastewater needs. It is anticipated there will be a steady demand by small communities for wastewater evaluations and planning in the coming years. Small lots and older on-site sewage systems, without municipal treatment infrastructure, re-development or the re-sale of property may require expensive upgrades. Another factor is the economic viability

of small communities which cannot support commercial or residential growth due to the lack of wastewater treatment options. Alternative treatment systems are available to communities not wishing to build large waste treatment facilities, including several advanced technologies for small community scale systems that have been approved for use in Vermont.

Resources available for assisting municipalities include the Clean Water State Revolving Fund, Northern Borders Regional Commission, and the USDA Rural Development Water Environment Program. No White River basin towns are included in the draft Clean Water State Revolving Fund Project Priority List articulated in the draft FFY23/FFY24 "Intended Use Plan" as developed by the DEC Water Investment Division, though the IUP is updated annually. However, a project is in planning in Chelsea.

Assistance in planning for on-site systems as well as connections to existing sewer is also available through the Vermont Engineering Planning Advance Program. The loan program is available to municipalities without existing municipal water or sewer systems for conducting a feasibility study for community-based wastewater solutions. Consulting engineers assess the town's needs and goals offering treatment options.

To support towns with limited staff for supporting wastewater studies, Vermont has formed an interagency Village Wastewater Solutions Initiative. The program offers the following resources:

- Organizing Village Wastewater Solutions
- Wastewater Solutions for Vermont Communities

Northern Border Regional Commission grants are also available to White River basin municipalities for addressing wastewater. A current collaboration between DEC and partners and the villages of Wolcott, East Burke, and West Burke (Lamoille basin) to identify cost-effective wastewater solutions is being supported through the grant. This wastewater solutions project is expected to provide a model for other villages throughout Vermont.

Historic village centers with dense, septic-based development could benefit from alternative wastewater solutions. Like many of Vermont's basins, most of the White River basin's villages lack community sewer systems. In 2018 the village of Rochester updated its community soil-based wastewater systems, originally built in the 1970s, using the Clean Water State Revolving Fund, maintaining support for its vital mixed residential and commercial village area. In 2024 the village of Roxbury, which straddles the divide between the Dog River (Winooski basin) and the Third Branch of the White, initiated a community wastewater study. This tactical basin plan encourages outreach and education and technical and financial assistance, in coordination with DEC, to any villages potentially interested in community wastewater. From a water quality perspective, those larger,

riverside villages with designated village centers and outdated or failing existing systems or expectations for future growth are particularly important focus areas.

D. Natural Resources

Forests, lakes, ponds, rivers, floodplains, and wetlands are all examples of natural systems that provide continuing benefits both socially and ecologically. Natural resource restoration and protection projects help to prevent and reduce nutrient and sediment pollution, improve flood resiliency by mitigating flood hazards, enhance habitat function, and support Vermont's outdoor recreational opportunities. These projects are also the most economical and have a long-term benefit with little to no maintenance requirements. Restoration and protection of natural systems offer a cost-effective, long-term means to mitigate water quality and the effects of climate change and enhance the ecosystem services - flood control, wildlife habitat, filtration of pollutants - these natural resources provide.

While Agency regulatory programs protect natural resources, the Agency's also works to support landowner interest in natural resource protection and restoration and depends on partners to provide some of this assistance.

Rivers

In response to historic channel management, floodplain and riparian corridor encroachments, and watershed-wide land use and land cover changes, most Vermont rivers are actively adjusting their shape, size, and course as they seek to re-establish equilibrium (i.e., balance). Human activities can prevent or disrupt this balance by changing flow inputs to the channel (e.g., deforestation, increasing impervious surfaces and runoff, or water withdrawals) or by changing the sediment regime (e.g., dams, dredging). Legacy and present-day impacts, such as development within riparian corridors, channel straightening, berm and dam construction, removal of riparian vegetation, and construction of undersized crossing structures, have contributed to stream instability state-wide. The key consequence of these activities is degraded water quality and loss of resilience and the ecosystem services provided by rivers that fully achieve dynamic equilibrium.

Fluvial geomorphic equilibrium is the condition in which a persistent stream and floodplain morphology is created by the dynamic fluvial processes associated with the inputs of water, sediment, and woody debris from the watershed. The stream and floodplain morphology are derived within a consistent climate; and influenced by topographic and geologic boundary conditions. When

achieved at a watershed scale, equilibrium conditions are associated with minimal erosion, watershed storage of organic material and nutrients, and aquatic and riparian habitat diversity.

Improving all forms of connectivity, upstream-to-downstream and river-to-floodplain, encourages river equilibrium. Enhanced equilibrium will also help to achieve climate resilience through mitigating impacts of increased runoff and streamflow (see Climate Change section). Tactical basin planning engages local, regional, and federal partners in the development of strategies needed to accelerate practices to move toward equilibrium and increase river connectivity to meet the state's clean water goals. The ANR's strategies to enhance stream stability and storage include implementing projects such as active in-stream restoration, the removal of constraints, the protection of natural processes through easements, floodplain restoration to reduce channel incision, dam removals, and other efforts that move the river and floodplain toward equilibrium conditions. The Rivers Program supports partners in project identification and prioritization using stream geomorphic assessments and River Corridor Plans. The Rivers Program and ANR provide technical support and financial assistance for project implementation as well.

River Corridor Plans

A River Corridor Plan (RCP) is a synthesis of the physical data collected during Phase I and II Stream Geomorphic Assessments (SGAs) based on protocols and guidelines developed by the Rivers Program. These plans identify causes of channel instability and make recommendations for restoration and protection projects. All SGAs and RCPs can be found at: Stream Geomorphic Assessment - Final Reports, and White River basin plans are linked in Table 12.

Rivers are in a constant balancing act between the energy they produce from the slope of the channel, and the volume and weight of the moving water and the energy they expend to carry water, sediment, and debris downstream. A change in any one of these factors will trigger adjustments of the other variables until the river system comes back into equilibrium. These changes can be caused by natural events such as storms and by human activity such as channel manipulation. The impact of these changes may be seen immediately and for decades after the activity occurred.

The legacy from Tropical Storm Irene in 2011 and other large flood events like those in July 2023 will be felt for years to come. While such flooding impacts are unlikely to be fully mitigated, the goal of managing toward, protecting, and restoring the equilibrium condition of Vermont rivers is to lessen or avoid conflicts between human investments and river dynamics in a manner that is technically sound, and both economically and ecologically sustainable. In addition, it will help to mitigate impacts of increased runoff and streamflow from climate change.

River disequilibrium is likely a major cause of downstream sediment and nutrient export, reduced aquatic habitat diversity and availability, and available flood storage in the White River basin. The findings of the available SGAs/RCPs in the basin indicate extensive loss of historic floodplain access, channel straightening, and loss of streambed and floodplain roughness due to natural

material removal. These impacts can be attributed to historic industries along the river, the establishment of the current transportation corridor, land use change and land clearing in upland environments, and historic responses to flooding. These flood responses most recently include extensive channel and floodplain management responses to Tropical Storm Irene, prior to the establishment of stricter regulations with respect to flood response efforts along and within rivers. These short-term flood responses were perhaps most widespread and impactful in the White River of all the state's basins, impacting dozens of river miles (FWD report on Irene Impacts to Stream Habitat and Wild Trout Populations: Kirn 2012). Cumulative historic impacts and potential solutions to them are detailed in each RCP (Table 12). Given the basin's widespread fingerprint of historic channel management and land use, the basin's steep mountainous setting, and predicted increasing precipitation trends in central Vermont, working towards equilibrium stream conditions through protection and restoration action is a paramount focus in the White River basin TBP.

Where funding, local support, and interest exists, priority projects and objectives identified in RCPs and SGAs should be pursued. SGAs or RCPs may not have been completed on some stream segments or may be outdated and require updated field assessments because of substantial probability of geomorphic change (e.g., for plans developed before Tropical Storm Irene). However, limited resources require that SGA/RCPs are evaluated and prioritized with respect to their need for collecting current data. The Planner and partners should coordinate with the Vermont Rivers Program as it determines a process for updating SGA and should prioritize sub-watersheds for SGA completion or updates where previous assessments don't exist (Upper Third Branch) or are possibly out-of-date (e.g., mainstem Tweed, Upper White River, Ayers Brook) but communities have expressed interest in new project development.

Table 12. Stream Geomorphic Assessments and River Corridor Plans are available for most of the White River basin's major river segments and sub-watersheds. SGA results were reported in RCPs unless a standalone SGA document is indicated.

River	Plan(s) Completed
Ayers Brook	2006 SGA Phase 2; 2007 RCP
First Branch and tributaries	2014 RCP
Second Branch	2021 RCP
Lower Third Branch, adjacent mainstem, and tributaries	2014 RCP
Lower mainstem and tributaries - Sharon	2010 RCP
Tweed River	2008 RCP
Upper White River (above the Tweed)	2007 RCP
Middle and Upper White Tributaries	2015 RCP

River Restoration and Conservation

Active river restoration can include, but is not limited to, the reconnection of floodplains through berm removal, dam removals, woody buffer plantings (trees and shrubs), in-stream wood additions,

head-cut stabilization, encroachment removal, and upgrading structure size. See the Report Card (Appendix A) for a summary of projects implemented since the 2018 plan.

Scientific research also strongly supports the value of planting trees and shrubs along stream and lake shorelines for both water quality and wildlife habitat. Shoreline vegetation filters and cleans polluted runoff from uphill land uses, provides shoreland and shallow water habitat, stabilizes banks, and increases lake and river aesthetics. A significant proportion of White River basin riparian area is not forested. According to a preliminary analysis by the watershed planner using VT's high resolution land cover product, about 21% of all riparian acreage within the basin (75ft buffer) is classified as agricultural pasture, hay, or cropland. Partners actively implement projects to restore buffers where landowners express interest. Moreover, see Chapter 4's Agriculture section for potential opportunities to further scope and develop buffer projects in this basin.

However, regional tree stock shortages as well as difficulties in funding and implementing invasive species management in the riparian zone can hamper buffer implementation. As efforts to increase inventory ramp up, this plan recommends partners continue to evaluate and implement innovative buffer solutions in coordination with AAFM, DEC, FWD, US Fish and Wildlife Service, and other agencies active in this area. Appropriate methods are context-dependent but might include tree nursery establishment, hydroseeding, passive restoration, invasive species mapping and novel management techniques, or limited agroforestry (where species selection and buffer management can remain consistent with ANR programs' riparian goals). The Franklin County Natural Resource Conservation District's Northwestern Vermont Riparian Planting Guide further details many of the Vermont-specific challenges and opportunities in riparian restoration, and DEC would support working groups on White River-relevant topics.

In addition, ANR prioritizes river reaches that are identified as high priority sediment and nutrient storage areas for conservation. One option for protection, outside of land acquisition, is purchasing river corridor easements to avoid future encroachment and flood damage as well as to restrict channel management activities. River Corridor Easements protect rivers from channel management like armoring and straightening that can degrade the river and functions of a river corridor. River Corridor Easements have been purchased on 302 acres in the White River basin, mainly on the Third Branch and middle and upper mainstem White River.

The White River Partnership and the town of Royalton are identifying and performing outreach to riparian landowners whose undeveloped lots are priority protection opportunities for flood resilience with nutrient and sediment storage co-benefits. The project is supported by Vermont Emergency Management's Flood Resilient Communities Fund which was established by the Vermont Legislature under Act 74 with the intent of improving landscape and community resilience and reducing the future public safety and water quality impacts of climate-related flood hazards in Vermont, focusing on buyouts of flood-vulnerable properties. While this project is leading to

immediate landowner outreach in Royalton, it may also serve as an assessment and outreach model that can be replicated in other basin towns where interest exists and funding is available.

Process-based Restoration

Process-based restoration is defined by Beechie et al. (2010) as work that "aims to reestablish normative rates and magnitudes of physical, chemical, and biological processes that create and sustain river and floodplain ecosystems (e.g., rates of erosion and deposition, channel migration, growth and succession of riparian vegetation)." One area that process based restoration has been focused on restoring is the incorporation of wood back into river systems through different formats to help generate those processes that help move a stream toward equilibrium. Large woody material is a critical component of rivers. It improves fish habitat, stream stability, floodplain connection, nutrient processing, and sediment storage, but it is generally lacking in most Vermont streams due to past and present river management practices to accommodate land uses such as logging, agriculture, and urban and residential development.

Likewise, the long-term absence of beaver populations from many stream basins due to past overharvest has likely contributed to more streams becoming single-threaded, flashy, and incised than would have historically existed on the landscape. Strategic wood addition, beaver dam analog construction, and post-assisted log structures are examples of low tech process-based restoration techniques meant to initiate stream channel evolution toward a more complex, connected, resilient configuration where sited, designed, and implemented appropriately. Process-based restoration should move the stream toward becoming self-sustaining, such that over time additional work to maintain these or other created structures is not needed to achieve the goals of the project.

Wood addition and wood removal from stream channels is regulated by ANR via the Stream Alteration Rule. The re-introduction of wood to wood-starved channels is a restoration focus in the basin, through the use of strategic wood addition and process-based wood addition restoration. Strategic wood and process-based wood addition restoration projects are generally located in small streams, under 20 ft wide, and are away from developed areas and transportation infrastructure. These projects provide important areas in headwater streams to help trap sediment and other wood along the length of the stream system; helping reduce what is transported to the larger downstream rivers. Recent wood and other debris removal done after historic flooding in 2023 and 2024 is only necessary in limited instances to protect life or property from fluvial erosion hazards. The Stream Alteration Rule ensures that excessive woody debris removal does not significantly impact the dynamic equilibrium of local stream processes. Wood addition and wood removal projects are reviewed for level of permitting requirements based on their complexity, location, risks to other infrastructure, channel stability, flood response, goal of the project, and other relevant data for the site and project.

Process-based restoration continues to be implemented in several areas of the White River basin including strategic wood additions in the Green Mountain National Forest (63 total miles across 8 upper White River streams proposed in US Forest Service's 2018 Robinson Integrated Natural Resource Assessment) and a beaver dam analog project by the White River Partnership in Bethel. There is a growing interest in this work among partners as funding opportunities expand (e.g., Natural Resource Conservation Service, National Fish and Widlife Foundation), regional partners share their expertise through active Agency- and partner-led working groups, and successful project examples become more common in Vermont.

When projects are proposed that improve both water quality and habitat and are supported by both FWD and the Rivers Program, funding should be prioritized. Given current interest and external funding opportunities, this plan tentatively identifies the White River headwaters and the headwaters of the First and Second Branches as focal areas for process-based restoration work. However, viable projects can be identified basin-wide by targeting initial field assessments on streams that adhere to the general stream slope and width recommendations of the Vermont Rivers Program or FWD strategic wood policy. A further layer of prioritization focusing on B(1) fishing candidate streams would add wildlife co-benefits and potentially help leverage other funding sources for this work.

For clean water funding consideration, partners should consult early with the Rivers Program and other trained partners to collect appropriate field data to assess whether a project has a high probability of providing water quality benefits. Additionally, training and workshops on assessment and implementation of this work are needed to grow the knowledge base required to increase implementation.

VTDEC's Watershed Planning Program is developing a desktop analysis and simple web application to assist partners in identifying potential stream reaches with slope, width, and other characteristics that make them good candidates for further process-based restoration field assessments. DEC is receiving technical and financial support from the Environmental Protection Agency and TetraTech and is working in consultation with the VT Fish and Wildlife Department and other process-based restoration stakeholders to develop this application. On Green Mountain National Forest land in the White River basin, this tool will be compared to another process-based restoration planning tool (Utah State University's Beaver Restoration Assessment Tool) to both determine the complementarity of the two planning tools and to identify and implement beaver dam analogs in ecologically and geomorphically effective headwater stream locations.

Aquatic Organism Passage Workgroup

Bridges and culverts convey the flow of water under transportation corridors. Transportation corridors include federal, state, and local roads, logging and forest roads, private roads and driveways, and railroads. Most of this infrastructure was built before engineers and scientists fully understood the balance required for managing sediment and flow to protect stream channels (and

adjacent developed lands). The correct sizing and placement of bridges and culverts plays a significant role in protecting water quality in the basin. Correctly sized and installed structures prevent erosion and scouring upstream and downstream, allow for the passage of fish and wildlife, and reduce impacts from flooding. Monitored upper White River basin structures that accommodated a stream's bankfull width largely withstood flooding from Tropical Storm Irene, whereas undersized crossings largely did not (Gillespie et al. 2014). White River Partnership's informal White River basin survey of 10 recently upsized culverts similarly demonstrated no structural damage after the July 2023 flooding. Replacing structures with ones that meet the current geomorphic and connectivity standards also allows fish to move among complementary foraging, spawning, thermal refuge, and overwintering habitats. Without access to essential habitat, fish diversity and abundance decline. Vermont's Stream Alteration Rule and permit ensures that any new or replaced structures are required to meet these sizing standards that generate water quality, flood resilience, and aquatic habitat benefits.

The White River Partnership works with the US Fish and Wildlife Service, Vermont Fish and Wildlife, the US Forest Service, DEC's Rivers Program, and Two Rivers-Ottauquechee Regional Commission to identify priority culverts for retrofit or replacement to restore aquatic organism passage and improve crossing compatibility with its geomorphic setting. Finding these mutually beneficial projects can be an important strategy given the relatively large expense of crossing projects and cost share opportunities with fish and wildlife-focused or transportation-focused funding programs.

To date the group has focused in the upper White River and Tweed River watersheds to assess and prioritize crossings and will continue to develop and implement priority upgrades in these basins over the next five years. The White River Partnership is also expanding assessment and prioritization work to the First and Second Branches of the White River beginning in 2024 with support from the National Fish and Wildlife Foundation. Basin-wide, more than 1200 crossings have been assessed for fish passage and geomorphic compatibility; however, about half of the basin's crossings may still be unassessed. These unassessed crossings are distributed evenly across the basin, and partners should continue to focus new assessments where replacements would be ecologically and geomorphically beneficial and where towns express support and interest in replacement efforts.

Dams and Dam Safety

There are records of 80 dams of different types, sizes, and condition in the White River basin. While some dams are used to generate energy and support recreational opportunities such as boating, fishing, and swimming, dams also impede a river's ability to transport flow and sediment; cause streambank erosion and flooding problems; degrade and alter fisheries habitat; create barriers to fish and other aquatic organisms' movement and migration; alter downstream water temperature; degrade water quality; and impede river-based recreational activity.

Of the 80 inventoried dams, 46 are in-service, 20 are fully breached, 3 are partially breached, 2 are drained, and 9 have been removed. The 51 active in-service, drained, or partially breached dams may constrict the stream channel enough to reduce sediment transport, prevent lateral movement, and inhibit aquatic organism passage if mitigating actions have not been taken (e.g., fish ladder). Additional dam information can be found in Appendix B.

The Vermont Dam Safety Rules are in place to protect public safety and provide for the public good through the inventory, inspection, and evaluation of dams in the State. The Vermont Dam Safety Program administers the rules which apply to all non-power dams (dams that do not relate to the generation of electricity energy for public use) and all non-federal dams (dams that are not owned by the US or are subject to Federal Energy Regulatory Commission license or exemption). The rules set requirements and standards on dam registration, classification, inspection, application, and approval to construct, re-construct, alter, repair, breach, or remove a dam, as well as related standards including design standards, operation and maintenance standards, inspection standards, and Emergency Action Plans.

All dams, even small dams for backyard ponds, are significant structures that can have major public safety and environmental implications. 13 of the 51 active inventoried dams are considered high or significant hazards (Appendix B), indicating that either direct loss of life is probable from an incident, uncontrolled release, or dam failure (high hazard) or that major property losses, disruption of critical services, and environmental losses are probable (significant hazard).

Opportunities for habitat restoration may exist as the risk to public safety and ownership liability associated with aging and deteriorating dams becomes more evident. Dam owners are encouraged to contact the Vermont Dam Safety Program and their Watershed Planner if they are interested in discussing dam removal. Dam removals are pursued by private and public dam owners, often with the help from watershed groups and partners.

The Vermont Dam Task Force is an interdisciplinary team of natural resource professionals that collaborate to share and investigate current dam removal protocols, watershed science, funding, and dam removal opportunities. The group meets bi-monthly to collaborate on projects. The Nature Conservancy also provides statewide support, most recently through the 2023 publication of the Scaling Up Dam Removal Guide.

Within the White River basin, dam removal partners (e.g., landowners, municipalities, White River Partnership, US Fish and Wildlife Service, FWD, Greater Upper Valley Trout Unlimited) have removed 10 dams (Appendix B; four since the last basin plan include the Eaton Dams, Camp Killooleet, and Hyde Mill) opening more than 200 miles of upstream habitat for fish. Descriptions of recent projects are available through the White River Partnership's Fish Passage webpage. An additional two dams (Farnham Bros. Dam on the First Branch and Gulf Road Dam, the last remaining dam along the Second Branch) are being actively pursued for removal by basin partners.

This plan recommends that the remaining dams of Appendix B are prioritized for scoping to determine the need for, feasibility of, and owner interest in removal. Dam removal is a priority basin-wide where the removal will result in restoration of stream equilibrium, habitat, fish passage, flood resilience, and mitigation of public safety risks. Information on a dam's current ownership, purpose, hazard potential classification, and condition are available through Appendix A and the Vermont Dam Inventory. To begin evaluating the relative ecological benefit of dam removals, The Nature Conservancy and the University of Massachusetts have developed the Critical Linkages project and the Northeast Aquatic Barrier Prioritization Tool that model the effects of individual northeastern dams (including in the White River basin) on habitat connectivity for both anadromous and resident fish species.

FEMA Maps

The Federal Emergency Management Agency (FEMA) is currently updating the Flood Insurance Rate Maps in Vermont for the National Flood Insurance Program. This will be the first map update for many towns since the 1970s or 1980s. This new update will cover the entire state in stages and may become effective in some counties as soon as 2025 as part of FEMA's Risk Mapping, Assessment, and Planning program. White River basin towns had an initial discovery meeting with FEMA in May 2020. During the meetings, stakeholders, including FEMA, state, and community officials, discussed areas of flooding concern and project goals, milestones, and products. The next map work meetings are planned for Summer 2024, with map preparation deadlines of Fall 2026 for most towns in the basin.

Most high-risk flood hazard areas in the basin will be mapped as Zone A, using a new Baseline Engineering strategy that combines computer modeling and high-resolution ground elevation data (lidar). Other areas with existing detailed flood studies will be labeled as Zone AE, with the older studies aligned with current topography. The new Flood Insurance Rate Maps will include aerial photographs that show houses and roads.

Flood Insurance Rate Maps are the basis of floodplain regulations and the National Flood Insurance Program. When the new maps go into effect, FEMA requires that town bylaws meet current standards for participation in the National Flood Insurance Program. To support towns in the timely adoption of updated bylaws, DEC provides a model bylaw that meets or exceeds the National Flood Insurance Program requirements, addresses river corridors consistent with Act 250 review, and ensures municipal eligibility for the maximum amount from the Emergency Relief and Assistance Fund. For ease of adoption in the limited time that will be available to the towns, it was designed for use as either a stand-alone bylaw or an appendix to a zoning bylaw.

The regional planning commissions, with financial and technical support coordinated by the DEC regional floodplain managers, are facilitating the planning commissions' and selectboards' bylaw adoption. This process also benefits from the participation of other partners in the support of

meaningful community engagement in consideration of public safety, equity, and the multiple benefits of functioning river corridors and floodplains. The DEC Rivers Program details the FEMA mapping process in Vermont online. Although DEC supports a town's adoption of enhanced river floodplain protection, the current update to a town's bylaw is a time-sensitive priority. As such, this TBP recommends regional planning commissions perform targeted outreach to communities to adopt model flood hazard bylaws as part of the map update process. Flood hazard bylaw updates reduce river and infrastructure conflicts, ultimately mitigating downstream erosion and pollutant transport by increasing stream lateral and longitudinal connectivity.

Two Rivers Ottauqechee Regional Commission and the Central Vermont Regional Planning Commission have been reviewing by-laws of member municipalities and several towns in the basin will need to update bylaws to be compliant with the minimum NFIP standards as part of the map update process. With funding support from ANR, planning commissions will target municipalities needing updates for outreach and technical assistance.

Lakes

A lake's physical characteristics are driven by its watershed size, topography, geology, soil fertility and erodibility, and vegetation. A lake's water quality is impacted by human activities and the land uses on the immediate shoreland and farther up into the watershed. The loss of native vegetation at the shoreline, the locations of roads, the development pressures around the shoreline and along tributaries, and into the watershed, and activities such as agriculture and forestry all contribute to overall lake and pond health. All these activities impact how water moves across the landscape and ultimately into the lake and ponds.

Preventing and mitigating water quality degradation, preserving and enhancing lake habitat and shoreline stability and ensuring recreational uses of lakes and ponds are priorities for the basin. Recommendations included are guided by data from the VT Inland Lakes Scorecard depicting the condition of lakes and ponds, along with input from the Lakes and Ponds Management Program and basin stakeholders.

Protecting and Improving Lakeshore Condition

The Shoreland Protection Act (Chapter 49A of Title 10, §1441 et seq.), regulates shoreland development within 250 feet of a lake's mean water level for all lakes greater than 10 acres in size. The intent of the Act is to prevent degradation of water quality in lakes, preserve habitat and natural stability of shorelines, and maintain the economic benefits of lakes and their shorelands. The Act seeks to balance good shoreland management and shoreland development.

In 2022, the Vermont Lakes and Ponds Program released new guidance to help property owners protect and restore lakeshore properties. The Shoreland Best Management Practices guidance is comprised of multiple Best Management Practice documents. Each document highlights different shoreland management activities to improve water quality and the health of lakeshore habitat. Examples of activities include planting native trees and shrubs, installing rain gardens to absorb runoff, improving driveways and pathways, and creating no-mow zones. Small practices can be implemented by landowners directly, but larger projects may require support from local partners and additional clean water funding.

The Lake Wise Program encourages lakeshore owners to implement best management practices that improve and protect lake water quality conditions and habitat. The program awards lake-friendly shoreland properties including state parks, town beaches, private homes, and businesses. Lake Wise assessments review shoreland practices for their benefit to water quality and wildlife habitat and suggest actions if improvements are needed. Lakes with a Fair or Poor shoreland score will benefit from implementing Lake Wise Program best management practices.

No lakes in the basin have a poor shoreland habitat condition rating from the VT Lake Scorecard, and 10 are rated fair. Sunset and Silver Lakes are identified as priorities for Lake Wise assessments because of the shoreland condition and number of lakeshore residents. If other communities in fair-rated shorelands are interested in pursuing Lake Wise, they can contact the Lake Wise Program. The LPMPP is beginning outreach with the Silver Lake community in 2024 and assessment of community interest at Sunset Lake is planned over the next five years.

Lake users interested in becoming involved in the health of their favorite lake or pond can find information on the VDEC Lakes and Ponds website as a first step to moving toward a healthier lake or pond.

Lake Watershed Action Plans

Lake Watershed Action Plans (LWAPs) are assessments to identify pollution sources in the lake watershed that result in water quality and habitat degradation. LWAPs result in a prioritized list of projects and strategies to address the sources of pollution and habitat degradation identified in the assessment. The plan may also contain recommendations to preserve natural features and functions, encourage use of low impact green stormwater infrastructure, and maintain the aesthetic and recreational uses of lakes. To date no lakes in the basin have completed LWAPs or have received funding to develop an LWAP.

Silver Lake has a decreasing Secchi depth trend, fair condition shoreline, and moderately disturbed watershed. If water quality trends continue to decline it could become an LWAP candidate; however, it is not currently a high priority statewide. The lake has an active lake association, and Vermont's Department of Forests, Parks, and Recreation (FPR) previously implemented some lake friendly projects after a Lake Wise assessment was completed at Silver Lake State Park. Ongoing outreach from the Vermont LPMPP (e.g., through Lake Wise activities above) can help to determine continued interest from FPR and broader community support for assessment and lake and watershed restoration.

Preventing Aquatic Invasive Species

Aquatic invasive species can affect water quality by degrading shoreline habitat, generating imbalance in lake food webs, and altering chemical and physical factors important to aquatic systems (e.g., hydrology, nutrient transport, and oxygen concentration). Of the 15 lakes and ponds assessed for AIS in the basin, none have received poor scores for AIS.

New AIS introductions occur mainly in waterbodies that have launch sites for motorboat watercraft, are near infested waters, and lack spread prevention programs. Incoming motorboats from AIS infested waters are a high risk for introducing AIS in and on motors, propellers, trailers, and boating equipment. Vermont Fish and Wildlife Department (FWD) manages five lake access areas in the basin. The VT Public Access Greeter Program, the Vermont Invasive Patrollers, and the Vermont Invasive Patrollers for Animals are spread prevention programs that incorporate AIS identification training, surveying and monitoring, watercraft inspection, and decontamination programs. VT Public Access Greeter Programs are supported by DEC's Aquatic Nuisance Control Grant-in-aid funding. Greeters interact with boaters at boat access areas, inspect watercraft, identify and remove any suspicious matter, and collect and report AIS data. Greeters also distribute educational material on aquatic invasive species. Vermont Invasive Patrollers Program trainings are offered on an annual basis.

The Aquatic Nuisance Control Grant-in-aid Program provides financial assistance to municipalities community-led groups, municipalities and agencies of the state for aquatic invasive and nuisance species management programs. While the primary goal is spread prevention and control of new infestations in a waterbody, the remaining assistance is directed to associations and towns for reoccurring management of infestations, primarily through mechanical harvesting operations to protect recreational opportunities. No lakes in the basin currently have an active Greeter Program. Given several factors, Silver Lake is considered a priority by LPMPP for establishing a greeter program. Rood and McIntosh Ponds would also benefit from a greeter program if any community interest exists. A map of active greeter and control efforts is available online.

Wetlands

Wetlands cover about 1.4% of the basin, with a preponderance of small headwater seeps and springs less than 5 acres in the basin's steep mountainous terrain and limited floodplain wetlands along valley mainstems. While covering a small proportion of the basin and easily overlooked, these wetlands help safeguard high-quality surface waters. As recently as the 1950s, wetlands were seen as obstacles to development, agriculture, and transportation, and consequently, were systematically drained and altered. These losses and alterations diminished the important ecosystem services provided by wetlands such as sediment and nutrient attenuation, wildlife habitat, and flood water storage. Protecting the remaining wetland resources is an important strategy in the basin. Additionally, restoring degraded wetlands is essential to improving water quality. Wetland conservation and restoration and identifying sites with the greatest potential for improving water quality are priority recommendations.

Wetland Assessment and Protection

The Wetlands Program regulates wetlands in accordance with the Wetlands Rules which are focused on protecting wetland functions and values. The Program also monitors and assesses wetland conditions. The Program relies on wetland mapping to help preliminarily identify the locations of regulated wetlands (Class II and Class I). Enhanced wetland mapping is being developed by the Program, is expected to be complete in the White River basin in SFY2025, and will eventually cover the entire state. Current maps can be found at Wetland Inventory Map.

Enhanced protection, in the form of a Class I wetland determination, can be afforded to wetlands determined to be exceptional or irreplaceable in their contribution to Vermont's natural heritage, based on their functions and values. Two wetlands were previously identified as candidates for Class I assessment and support for reclassification. Nye Swamp in Barnard is publicly accessible and may be a good candidate for reclassification; it should be further assessed for Class I. Turnpike Fen in Barnard was assessed last planning cycle and does meet Class I conditions. However, this wetland is relatively inaccessible and may not provide some of the societal, educational, and/or cultural benefits of other wetlands of similar ecological value.

This plan recommends conducting the Nye Swamp wetland assessment and evaluating community interest in reclassification of other qualifying wetlands. Stakeholders are encouraged to reach out to their basin planner and Wetlands Program staff for technical support to research and submit Class I wetland designation petitions for review, including for additional wetlands not mentioned here which may qualify.

Wetland Restoration

Wetland restoration is the process of returning a degraded wetland to an approximation of its pre-disturbance condition. The United States lost over half of its wetlands through ditching and filling between 1780 and 1980, and Vermont has lost as much as 35 percent. While conservation and protection of wetlands are critical for preventing continued loss of remaining intact wetlands, wetland restoration is essential for rehabilitating those that have historically been degraded or lost. Clean water goals for wetland restoration include assessing areas of degraded and prior converted wetlands and areas of hydric soils for restoration potential and implementing restoration as sites and opportunities are identified. This plan recommends that wetland restoration and conservation be explored where water pollution reduction and flood protection is evident.

Recommendations for wetland restoration and conservation can be found in Stream Geomorphic Assessments and River Corridor Plans (Table 12) and through a recently completed pocket wetlands identification and evaluation effort carried out locally by the White River Natural Resources Conservation District with support from the NRCS Regional Conservation Partnership Program. Additional field surveys and landowner outreach may be necessary to develop these projects.

Wetlands can also be protected through easements or other conservation programs that restrict certain uses within the eased area. Such conservation programs include the Farm Service Agency's Conservation Reserve Program, Natural Resource Conservation Service's Wetland Reserve Easement program, a 2020-2025 RCPP opportunity administered by the Clean Water Initiative Program that targets smaller privately owned wetlands (10-50 acres), and Vermont's River Corridor Easement program. For the latter, VT Wetlands and Rivers Programs are developing template language so that river corridor easement footprints can be readily expanded to protect wetlands adjacent to the river corridor.

Wetland restoration and protection has the potential to reduce downstream nitrogen loading, improve water quality, reduce flooding, enhance aquifer recharge, and mitigate climate change through carbon storage. The Clean Water Initiative Program's current RCPP wetland easement program allows for limited restoration (e.g., tree planting) on smaller 10 – 50-acre wetlands, while Wetland Reserve Easements allow more intensive active restoration efforts. In small headwater and lowland streams, growing interest in process-based restoration techniques like beaver dam analogues and stage zero floodplain restoration is also likely to enhance wetland restoration in the basin.

Forests

Forest lands cover approximately 83% of the basin. As the dominant land cover, forests are important for safeguarding many high-quality surface waters. Reducing runoff and erosion from forests is important to meeting the state's clean water goals. Forest management activities offer many benefits, maintaining healthy forest communities, improving wildlife habitat, addressing non-native invasive species, contributing to the working landscape economy, and remediating poor legacy road infrastructure. Improving management and oversight of harvesting activities by following the Acceptable Management Practices (AMPs) and providing educational outreach and technical assistance to forest landowners and land managers are basin priorities. Providing funding to implement improvement practices will grow the practice of good stewardship and water quality protection.

Forestry AMPs and Skidder Bridge Programs

Acceptable Management Practices for Logging Jobs are scientifically proven methods designed for loggers, foresters, and landowners to prevent soil, petroleum products, and excessive logging slash from entering the waters of the State and to minimize the risks to water quality.

Stream crossings can have a significant negative impact on water quality. These impacts can be minimized by making sure that stream crossing structures are properly sized and installed correctly before crossing streams with logging equipment. The Department of Forests, Parks and Recreation (FPR) and watershed partners provide portable temporary bridge rental opportunities for use during timber harvests. These "Skidder" bridges reduce the occurrence of sedimentation, channeling, and degradation of aquatic habitat, allowing loggers to harvest timber in compliance with AMPs. When properly installed, used, and removed, Skidder bridges provide better protection from stream bank and stream bed disturbance than do culverts or poled fords. These reusable bridges are also economical, easy to install, and can be transported from job to job.

Specifications for building skidder bridges can be found at: Temporary Wooden Skidder Bridges. Information on the bridge rental program is found at: Temporary Bridge Rentals. These bridges should be utilized on logging projects basin-wide especially on steep slopes and areas with erodible soils adjacent to surface waters.

Additional guidance is available from FPR in the Vermont Voluntary Harvesting Guidelines to Protect Forest Health and Sustainability, and through support for local skidder bridge programs, and forest land conservation efforts. FPR used Clean Water funding to re-launch skidder bridge construction and rental programs in 2023.

Enhanced coordination between ANR and the US Department of Agriculture – Natural Resources Conservation Service such as the Regional Conservation Partnership Program (RCPP) has also brought additional technical and financial assistance statewide to forest landowners developing and implementing water quality improvement projects in Vermont, including buffer establishment, stream habitat and stream crossing improvement, forest trail and landings improvement, and forestry easements. After an initial grant of $16 million in 2015, this RCPP grant was extended for five years in 2020 with an additional $10 million in assistance to farmers and forest landowners. DEC has also received an additional $10.7 million in 2022 to provide further funding for water quality improvement, while also prioritizing flood resilience and habitat improvement. Importantly, RCPP is a standalone program from the US Department of Agriculture – Environmental Quality Incentives Farm Bill program, allowing separate caps of $450,000 for each program per landowner.

Use Value Appraisal Program & AMPs

Vermont's Use Value Appraisal Program (UVA) enables eligible private landowners who practice long-term forestry or agriculture to have their land appraised for tax purposes based on the property's value for the production of forest or agricultural products rather than on its residential or commercial development value. Compliance with UVA requires that the AMPs be employed to the maximum practicable extent. If AMPs are not employed on the UVA parcel resulting in a discharge, it may affect parcel eligibility in UVA and be a water quality violation. While there is overlap between requirements of the AMPs and UVA, they should be viewed as distinct from each other. In addition, Act 146 creates a new enrollment subcategory in the Managed Forestland category called 'Reserve Forestland,' with enrollments in the subcategory beginning July 1, 2023. This change to UVA accelerates the development of old forest conditions, and it does so in a way that preserves working lands as the primary focus of the Managed Forestland category of the UVA program.

About 46% of the basin (210,814 acres) is enrolled in the UVA program (Figure 23). Increased enrollment in the UVA program is encouraged wherever landowners express interest. Additional voluntary forestland protections beyond UVA enrollment such as forest easements, deed restrictions, or long-term leases are also encouraged and available via a variety of funding programs. More information is available on the UVA Reserve Forestland website. County Foresters are available for consultation when questions arise about UVA, AMPs, and other practices to protect water quality.

The White River basin also includes large areas under federal (71,810 acres), state (16,500 acres), municipal (2,552 acres), or non-profit (27,506 acres) stewardship (26% of the basin). These lands include a large portion of the Green Mountain National Forest (Upper White River); state resources like Les Newell Wildlife Management Area (Upper White headwaters), Roxbury State Forest (Third Branch headwaters), and Ainsworth State Park (Second Branch headwaters); numerous properties held in easement or fee simple by The Nature Conservancy, Vermont Land Trust, or others (basin-wide); and many other parks, forests, and wildlife management areas. Combined, protected and

UVA-enrolled lands make up 67% of the White River basin (because many protected lands stewarded by non-profits and some towns are also enrolled in UVA, UVA and protected lands are not additive).

Federal lands of the Green Mountain National Forest are managed by the US Forest Service via the Robinson Integrated Resource Project to achieve the goals of the Green Mountain Land and Resource Management Plan. While not subject to the AMPs, Green Mountain National Forest managers implement a variety of identified actions to improve aquatic habitat, stream equilibrium, and water quality including installing road and trail best management practices for runoff, replacing and resizing culverts, restoring river channels, floodplains, and adjacent wetlands.

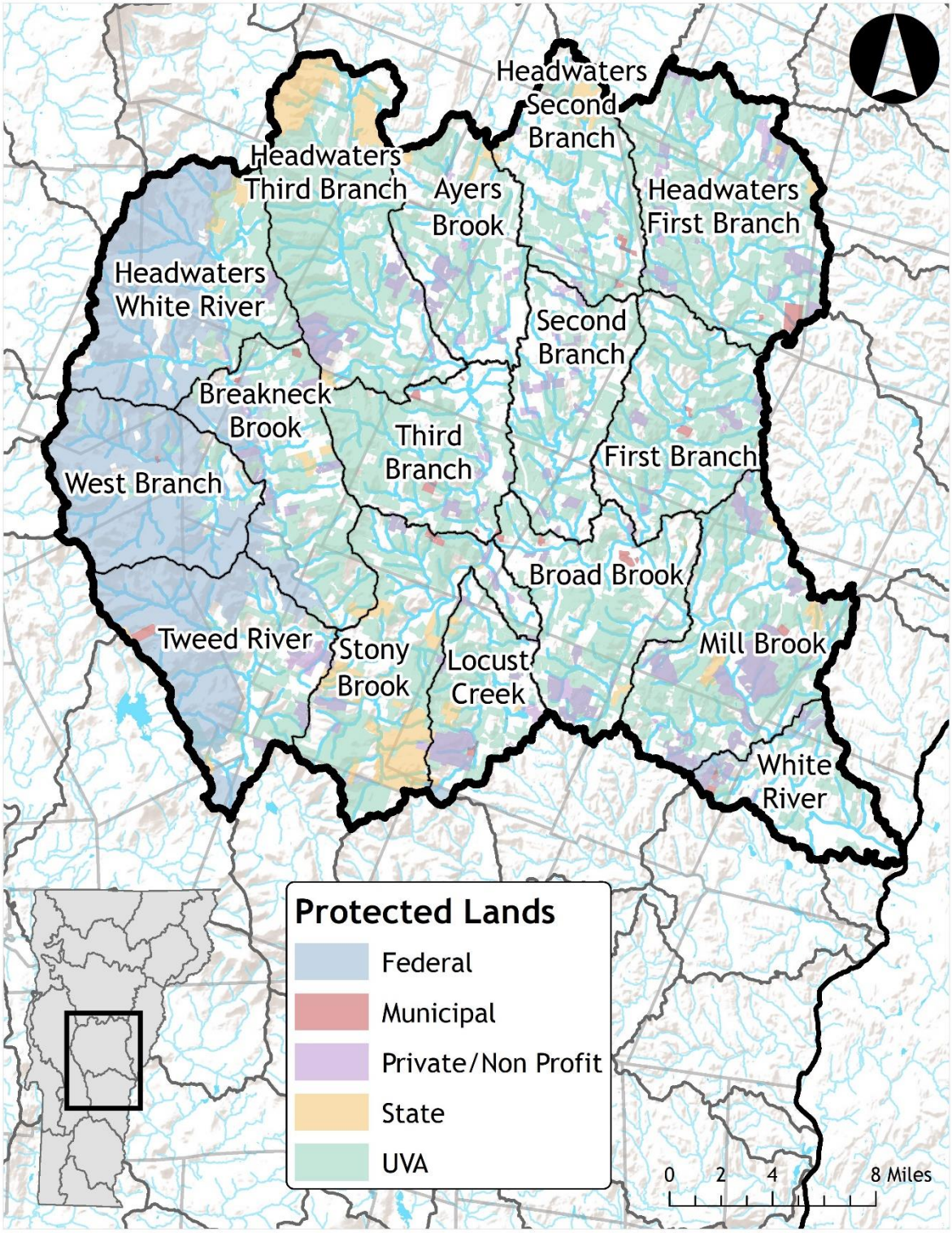


Figure 23. White River basin protected lands and parcels enrolled in the Use Value Appraisal program. Note that many non-profit lands and some town-owned lands are also enrolled in UVA.

Forest Road Assessments and Management

The ANR is in the process of assessing and prioritizing erosion issues along hydrologically connected forest roads on ANR-owned lands. Not all state lands have roads, but there are 16,500 acres in the Basin under state ownership that could potentially be assessed. When completed, these inventories will identify potential road projects which can reduce hydrologic connectivity and sediment to surface waters in the basin.

The ANR Private Forest Road Erosion Inventory App will become a resource for contractors and volunteers on other public and private lands in the future. The downloadable app can be used to assess and prioritize road segments in the field. Landowners may use this app to prioritize forest land projects and for supporting funding requests. This plan recommends first piloting these tools—in coordination with regional planning commissions, conservation commissions, and land trusts—on municipal or non-profit forest lands to encourage increased forest land project implementation and to become familiar with the tools' use before engaging landowners outside protected lands.

Watershed Planning and Social Equity

Vermont's natural resources are held in trust for everyone and should be a source of inspiration and enjoyment for all. The Agency of Natural Resources is committed to ensuring that everyone living in and visiting Vermont has meaningful access and equal opportunity to participate in Agency programs, services, and activities and that everyone feels safe and welcome on Vermont's public lands. The Agency's Office of Civil Rights and Environmental Justice, led by Director Karla Raimundí, advances this mission.

ANR is committed to the work needed to engage our state's diverse population in shaping our shared work. As an Agency, we strive to be inclusive, both leading and supporting important work needed around diversity, equity, and inclusion – in our land management practices, in our environmental policies and permitting, and in ensuring our public processes are accessible, equitable and transparent.

Ensuring clean surface water for consumptive and recreational uses, ensuring fish caught in Vermont are safe for consumption, ensuring access to waters for all abilities and in all communities, providing open space availability in more densely populated areas, and ensuring clean water projects are equitably implemented in all communities are areas where tactical basin planning can work toward equity and environmental justice.

Focus areas for the basin include:

- Clean surface water for consumptive and recreational uses;
- Safe consumption of fish caught in Vermont for subsistence anglers;
- Access to waters for recreation for all abilities and economic levels in all communities; and
- Equitable implementation of clean water projects in all communities

Chapter 5 – The White River Basin Implementation Table

A. Progress in the Basin

The previous White River basin plan was completed in 2018. A total of 60 strategies were identified in the plan. 47 (or 78%) have been implemented or are in progress by ANR and its watershed partners, 8 are awaiting action and have been carried over to this plan, and 5 have been discontinued.

The TBP addresses all impaired and altered waters in the basin as well as protection needs for high quality waters. The list of strategies in the Implementation Table (Table 13) and the Monitoring and Assessment Table (Table 14) cover future assessment and monitoring needs, as well as projects that protect or restore waters and related education and outreach.

The process for identifying priority strategies is the result of a comprehensive review and compilation of internal ANR and external watershed partner monitoring and assessment data and reports. The monitoring and assessment reports include Stormwater Master Plans and stormwater mapping reports, Stream Geomorphic Assessments, River Corridor Plans, bridge and culvert assessments, Hazard Mitigation Plans, flood modeling, agricultural modeling and assessments, Road Erosion Inventories, biological and chemical monitoring, lake assessments, wetland assessments, fisheries assessments, and natural communities and biological diversity mapping.

The Water Investment Division's Clean Water Initiative Program funds, tracks, and reports on priority projects to restore Vermont's waters, and communicates progress toward meeting the water quality restoration targets outlined in the TMDLs. The Clean Water Initiative Program also coordinates funding, tracking, and reporting of clean water efforts for state partners, including the Agencies of Agriculture, Food and Markets; Commerce and Community Development; Transportation, and other ANR Departments (FWD and FPR), and federal partners including the Natural Resources Conservation Service and the US Fish and Wildlife Service's Partners for Fish and Wildlife Program.

Progress toward the 60 strategies from the 2018 plan are available in Appendix A. Progress made in addressing the strategies in the 2024 White River Basin Implementation Table will be reported in the 2029 TBP.

B. Public Participation

Public input is key to the development of this Plan and the strategies included in the Implementation Table. Public participation is sought throughout the planning process with guidance from the Watershed Planning Program Communication Plan. The planning process for the White River basin kicked off in the fall of 2023 with the release of a story map and public survey. The

survey and links to the story map were posted to local list servs and distributed through partner newsletters, email lists, and social media posts.

The primary goals of the on-line survey and web map are to provide an opportunity for stakeholders to contribute information to the planning process and to educate the community. The survey was distributed through state and partner networks. 42 respondents from 13 in-basin towns offered their input. 45% of respondents provided contact information to remain engaged in the planning process and 21% asked to be contacted about developing clean water projects on their property.

Although not a representative sample of all stakeholders in the basin, public meeting input and survey results can help inform the topics, strategies, and projects addressed in this plan. Survey respondents identified mainly as basin residents (30), recreationists (25), and/or municipal officials (12). 17 respondents used White River recreational access points more than 10 times per year, and swimming and fishing uses were identified as most impacted by water quality issues in the basin. Respondents most often identified agricultural and road runoff, flooding, loss of floodplains and wetlands, excessive erosion, and invasive species as threats to waters in the White River basin. Specific fishery management recommendations are outside the scope of the basin plan, but the importance of wild trout fisheries was a common theme in survey responses. Respondents' recommendations to address water quality issues included supporting continued water quality monitoring and public education campaigns; hosting local agricultural water quality workshops for small-scale farmers; buffer planting; wetland protection and restoration; expanded public access to waters; B(1) stream reclassification; and increased funding and implementation of flood-mitigating practices. Where specific waterbodies and pollutants were identified or interest in clean water project development was expressed, the planner will coordinate with state and watershed partners to further evaluate the concern or project opportunity.

C. Coordination of Watershed Partners

There are several active organizations undertaking watershed monitoring, assessment, protection, restoration, and education and outreach projects in the basin in coordination with the ANR. These partners are non-profit, private, state, federal, or other organizations working on both private and public lands. Partnerships are crucial in carrying out non-regulatory projects to improve water quality. The White River Partnership (WRP), Two Rivers Ottauquechee Regional Commission (TRORC), White River Natural Resource Conservation District (WRNRCD), Connecticut River Watershed Farmers Alliance (CRWFA), Connecticut River Joint Commission (CRJC), Central Vermont Regional Planning Commission (CVRPC), US Department of Agriculture Natural Resources Conservation Service (NRCS) and Forest Service (USFS), UVM Extension Service, US Fish and Wildlife Service (USFWS), AAFM, Vermont Agency of Transportation (VTrans), Vermont Land Trust (VLT), Vermont River Conservancy (VRC), Trout Unlimited (TU), Vermont Natural Resources Council (VNRC), The Nature Conservancy (TNC), and municipal groups are active in:

- providing outreach and education to local stakeholders, private landowners, and municipalities;
- developing stream and floodplain protection and restoration projects (e.g., river corridor easements, tree plantings, culvert and bridge upgrades, dam removals, stream channel habitat restoration);
- developing stormwater projects (e.g., Stormwater Master Plans, road erosion inventories, implementation of town road Best Management Practices);
- working with farms in the basin developing and implementing Best Management Practices for water quality; and
- monitoring water quality (e.g., lay monitoring program on lakes and rivers).

The work necessary to meet water quality goals in this basin requires collaboration among all these groups to maximize the effectiveness of the watershed partners and the funding investments. Without funding or partners, little of this work would be possible. The Agency is grateful for the active engagement and long-term commitment of so many partner organizations and interested citizens.

D. Implementation Table

The Implementation Table (IT) (Table 13) provides a list of 41 priority strategies created as the go-to implementation guide for watershed action. The IT provides specificity for where each strategy should focus by identifying priority sub-basins and towns. A list of related individual project entries is found in the online Watershed Projects Database. Projects in the Database vary in level of priority based on the strategies outlined in the table. All projects in the Watershed Projects Database are not expected to be completed over the next five years, but each strategy listed is expected to be implemented and reported upon in future TBPs.

As projects are developed, priority for Clean Water Initiative Program funding is given to those projects that achieve the highest water quality benefits. Projects that provide cumulative benefits (i.e., flood resiliency, water quality improvement, water resource protection, aquatic organism passage) receive additional consideration for prioritization. The Vermont ANR relies on collaboration with partners and stakeholders to help carry out the strategies identified in the basin plan and achieve implementation priorities.

Table 13. Implementation Strategies. Acronyms are listed on Page 111.

	Strategy	Priority Area or Watershed	Town(s)	Partner(s)	Funding
Strategies to address runoff from Agricultural Lands					
1	Provide technical support to farmers to maintain and implement Nutrient Management Plans and to support participation in AAFM's Pay for Performance Program.	First, Second and Third Branches, and other catchments with locally high agriculture in stream valleys	Randolph, Chelsea, Tunbridge, Brookfield, Royalton, Braintree, Pomfret, Barnard, Bethel, Rochester	AAFM, CRWFA, DEC, NRCS, WRNRCD	NRCS, AAFM, RCPP
2	Provide education, outreach, and technical assistance to farmers to develop and implement grazing plans and pasture and hayland BMPs, including livestock exclusion.	Strategy 1 focal areas, especially bacteria-impaired reaches	Strategy 1 towns	AAFM, CRWFA, DEC, NRCS, WRNRCD	AGCWIP, RCPP, TBPSG, NRCS, AAFM
3	Coordinate with existing regional agricultural meetings that encourage sharing of issues, needs, funding opportunities, and concerns within the basin to address water quality issues.	Strategy 1 focal areas	Strategy 1 towns	CRWFA, Southeast VT Agricultural Water Quality Partnership, AAFM, DEC, NRCS, WRNRCD	VAWQP, TBPSG
4	Promote and expand the existing list of locally available equipment necessary for BMP implementation (e.g., cover crop, crop to hay conversion, conservation tillage, manure injection) and assist farmers in accessing this equipment through local rental programs, cost-shares, or cooperative applications to funding programs.	Strategy 1 focal areas	Strategy 1 towns	AAFM, CRWFA, DEC, NRCS, WRNRCD	VHCB, AGCWIP, TBPSG

	Strategy	Priority Area or Watershed	Town(s)	Partner(s)	Funding
5	Develop additional capacity for case managers to work with farmers on grant applications and to streamline service provider outreach to farmers (e.g., Farm Teams).	Strategy 1 focal areas	Strategy 1 towns	AAFM, CRWFA, DEC, NRCS, WRNRCD	AGCWIP, TBPSG, Workforce Capacity Grant
6	Identify opportunities and prioritize outreach to farms with water resource restoration and protection potential.	Strategy 1 focal areas	Strategy 1 towns	AAFM, CRWFA, DEC, NRCS, WRNRCD, WRP, TRORC, USFWS	CWI, TBPSG, CREP, USFWS
Strategies to address runoff from Developed Lands - Stormwater					
7	Develop stormwater master plans.	Lower and Middle White	Hartford, Royalton	DEC, TRORC, Towns	CWI, NFWF Long Island Sound Futures Fund, DOT Thriving Communities
8	Support the design and implementation of high priority projects identified in stormwater master plans and stormwater mapping reports, or other stormwater plans.	Basin wide	See Table 10, but especially: Royalton, Bethel, Hartford, Rochester, Chelsea, and Sharon	DEC, TRORC, Towns	CWI, NFWF Long Island Sound Futures Fund, DOT Thriving Communities
Strategies to address runoff from Developed Lands - Roads					
9	Assist municipalities in updating REI and prioritizing and implementing roads projects to meet the Municipal Roads General Permit.	Basin wide	All towns, including Randolph, Hartford, Braintree, Washington, and Roxbury	DEC, CVRPC, TRORC, Towns	VTrans Municipal Assistance Grants

	Strategy	Priority Area or Watershed	Town(s)	Partner(s)	Funding
Strategies to address Wastewater					
10	Support municipalities pursuing Wastewater Treatment Facility optimization, refurbishment projects, and upgrades, and encourage development of pollution prevention programs and pretreatment programs.	First Branch, Third Branch, Mainstem	Bethel, Chelsea, Royalton, Randolph	DEC, TRORC, Towns, USDA Rural Development, Vermont Rural Water Association	CWSRF, USDA-Rural Development
11	Educate onsite septic owners about septic system maintenance and alternative systems through local outreach and education programs such as Wastewater Workshops.	Basin-wide	Communities with trending lakes (Silver Lake - Barnard) and designated village centers without WWTFs, especially larger ones adjacent to waterways such as Hartford, Sharon, Royalton, Pittsfield, Tunbridge, North Tunbridge, Randolph Center, Hancock, Roxbury	DEC, TRORC, LPMPP	TBPSG

	Strategy	Priority Area or Watershed	Town(s)	Partner(s)	Funding
12	Assist communities in developing solutions to inadequate individual on-site wastewater treatment, including community wastewater systems (e.g., ANR Village Wastewater Solutions) or innovative/alternative on-site systems.	Basin wide	Any interested communities, particularly those in Strategy 11	DEC, CVRPC, TRORC	ARPA, CWSRF, EPA Engineering Planning Advance, MPG, TBPSG, USFA Community Facilities Program, USDA-RD SEARCH Grant
Strategies to support Natural Resource Protection and Restoration - Rivers					
13	Develop or update Stream Geomorphic Assessments or River Corridor Plans using agency-supported approaches.	Upper Third Branch (high priority); Ayers Brook, Tweed River, and Upper White River Mainstem (secondary priorities)	Braintree, Roxbury, Randolph, Granville, Rochester, Pittsfield, Stockbridge	VRP, WRP	CWI, TBPSG
14	Develop and implement an assessment method for identifying and prioritizing corridor easements or floodplain buyouts.	Basin wide	All towns with significant mapped flood hazard area, piloted in Royalton	WRP, WID, VRP, VEM, TRORC	Flood Resilient Communities Fund, TBPSG
15	Support outreach, training, or technical assistance on innovative agency-supported approaches that address tree stock shortage or invasive species concerns when establishing buffers or accelerate landowner interest in buffer adoption.	Basin wide	All towns	WRP, WRNRCD, CRWFA	FWD Watershed Grant, TBPSG, AAFM/NRCS

	Strategy	Priority Area or Watershed	Town(s)	Partner(s)	Funding
16	Develop and implement priority protection and natural resource restoration projects identified in Stream Geomorphic Assessments, River Corridor Plans, or identified in FWD's Irene Stream Habitat and Wild Trout Impacts Report.	Assessment/plan-identified sites	All towns	VRP, WRP, TRORC, FWD, USFS, USFWS	Building Resilient Infrastructure and Communities Fund, Flood Resilient Communities Fund, CW Project Development and Design and Implementation Block Grants, NFWF Long Island Sound Futures Fund, NFWF Northeast Rivers and Forests Fund, Eastern Brook Trout Joint Venture

	Strategy	Priority Area or Watershed	Town(s)	Partner(s)	Funding
17	Develop and implement buffer planting projects.	Basin-wide, but especially in SGA/RCP-identified sites, agricultural priority watersheds (Strategy 1), or based on landowner interest	All towns	WRP, WNRCD, TRORC	CREP, Enhancement, WBBG
18	Pilot the identification, design, and implementation of low tech, process-based restoration projects (e.g., beaver dam analogs, post-assisted log structures) to restore fluvial processes in small drainages.	Basin wide	All towns	VRP, FWD, WRP, TU, USFS	Maine Community Foundation, TBPSG, NRCS RCPP, funding sources in Strategy 16
19	Identify, develop and implement strategic wood addition projects on conserved or large private landownerships following ANR technical guidance.	Basin wide, but especially White River headwaters, First and Second Branches, and Stony Brook subwatershed	All towns	VRP, FWD, WRP, TU, USFS	See Strategies 16, 18
20	Field-assess culverts without ecological or geomorphic compatibility data and prioritize all assessed structures for replacement based on their ecological, stream equilibrium, and hazard reduction benefits.	Basin wide	All towns	VRP, FWD, WRP, USFWS, TRORC	NFWF Northeast Rivers and Forests Fund; TBPSG (for working group)
21	Prioritize remaining dams for project development based on their ecological, stream equilibrium, and hazard reduction benefits and potential owner interest.	Basin wide	All towns	VRP, FWD, WRP, USFWS, TRORC	TBPSG; Clean Water Project Development

	Strategy	Priority Area or Watershed	Town(s)	Partner(s)	Funding
22	Develop, design, and implement high-priority culvert replacements.	Strategy 20-identified structures	All towns	VRP, FWD, WRP, USFWS, VTrans	Strategy 16 funding, FEMA, VTrans Municipal Assistance, FHWA
23	Develop, design, and implement high-priority dam removals.	Strategy 21-identified structures	All towns	VRP, FWD, WRP, USFWS	Strategy 16 funding, FEMA
24	Support recreational river access through the establishment and maintenance of stable access areas.	White River Water Trail priorities	All towns	WRP	Watershed Grant; VOREC; DDIBG (if a water quality component exists)
25	Coordinate river cleanups that address aesthetic, aquatic habitat, and hazard mitigation goals while building community support for water quality efforts.	Basin wide, especially White River Water Trail priorities and potentially responsive to flood events	All towns	WRP	Clean Water Workforce Capacity Grant
26	Educate towns about and assist them in adopting new FEMA flood maps using model flood hazard bylaw or similarly protective language.	Basin wide	TRORC priorities	TRORC, CVRPC, VRP	FEMA, TBPSG
27	Support outreach to towns on opportunities to petition reclassifying waters to B(1) or A(1).	Multiple: See Figure 13, Table 6	Multiple	TRORC, CVRPC	604(b); TBPSG
28	Support partner coordination (e.g., working group meetings) to identify outstanding resource values, develop a Wild and Scenic River Reconnaissance Study, and perform outreach to towns on opportunities for Outstanding Resource Water or Wild and Scenic designation.	Basin wide	All towns	WRP, TRORC	TBPSG, Clean Water Workforce Capacity Grant
29	Support engagement with landowners of abandoned landfill as interested in remediation efforts.	Smith Brook, Third Branch	Randolph	DEC , TRORC, WRP, Town	BRELLA, WISPr, CWSRF, TBPSG, Enhancement

	Strategy	Priority Area or Watershed	Town(s)	Partner(s)	Funding
Strategies to support Natural Resource Protection and Restoration - Lakes					
30	Evaluate community support for and conduct Lake Wise assessments.	Silver Lake, Sunset Lake	Barnard, Brookfield	LPMPP, FPR, Towns, Lake Association	CWI; TBPSG
31	Evaluate community support for and develop Lake Watershed Action Plans.	Silver Lake	Barnard	LPMPP, FPR	CWI
32	Develop, design, and implement priority projects identified through Lake Wise assessment or other planning efforts.	Silver Lake, Sunset Lake	Barnard, Brookfield	LPMPP, Town, FPR	CWI, EDDIBG
33	Establish Public Access Greeter Programs.	Silver Lake (high priority); Rood Pond, McIntosh Pond (secondary priorities)	Barnard, Williamstown, Royalton	LPMPP	Aquatic Nuisance Control Grant
Strategies to support Natural Resource Protection and Restoration - Wetlands					
34	Identify potential wetland restoration sites and support partner outreach to landowners to develop projects.	Basin wide	All towns	DEC, WRNRCD, WRP	TBPSG, NFWF LISFF, RCPP
35	Develop, design, and implement identified wetland restoration projects.	Sites identified through VRAM, RCPP, or other scoping efforts (e.g., Strategies 6, 18, 19)	All towns	VWP, AAFM, CWIP, WRNRCD, WRP	EDDIBG, RCPP, ACEP-WRE
36	Support local efforts to reclassify Class I wetland candidates.	Basin wide	All towns	VWP, Municipalities, TRORC, CVRPC	TBPSG

	Strategy	Priority Area or Watershed	Town(s)	Partner(s)	Funding
37	Support outreach to towns and the public – especially zoning administrators, prospective land purchasers, wastewater designers, and realtors – regarding updated wetlands mapping available in the White River basin in 2025.	Basin wide	All towns	Wetlands, Municipalities, TRORC, CVRPC	TBPSG
Strategies to support Natural Resource Protection and Restoration - Forests					
38	Pilot the identification and prioritization of forest road segments with water quality impacts via the Forestland Erosion Assessment tool and subsequent private forest REIs.	State, municipal, and protected private lands with significant road and stream networks	All towns	DEC, FPR, TRORC, CVRPC	CWI, TBPSG
39	Implement AMPs and high priority forest road projects on state, municipal, and private lands.	Basin wide; High priority forest REI segments	All towns	DEC, FPR, CVRPC, NRCS	CWI, EQIP, RCPP
40	Reinvigorate skidder bridge programs, increasing bridge use through direct grants to foresters to purchase bridges.	Basin wide	All towns	FPR	CWI
41	Continue to support restoration actions identified in the Robinson Integrated Natural Resource Assessment.	US Forest Service lands of the Upper White River	Rochester, Pittsfield, Stockbridge, Hancock, Chittenden	USFS, DEC, WRP, TU	NFWF, Maine Community Foundation, Watershed Grant, EBTJV

E. Monitoring and Assessment Table

The Monitoring and Assessment Table (Table 14) provides a preliminary list of water quality monitoring priorities to guide monitoring over the next five years. The ANR's Water Quality Monitoring Strategy describes the monitoring programs supported by ANR and its partners, who are listed in Chapter 2. Common goals for monitoring efforts across programs include identifying water quality conditions, tracking water quality trends, identifying pollution sources, and evaluating improvements over time. The table includes more sites than there is capacity to monitor and as such, will be further prioritized before monitoring occurs.

Table 14. Priorities For Monitoring and Assessment. Acronyms are listed on Page 111. 'ID' number links listed catchments to their location in Figure 8: Rivers in Need of Assessments, and asterisks identify streams with unofficial names.

Waterbody	Project Description	Location	Partner(s)	Purpose
Lakes and Ponds				
Silver Lake	Chemical monitoring, chlorophyll-a, Secchi, chloride, cyanobacteria	Barnard	LPMPP; Lay Monitoring	Continue tracking increasing Secchi trend; consider monitoring chloride and cyanobacteria levels; possible B(1) reclassification
Sunset Lake	Identify a lay monitor and initiate sampling; Secchi	Brookfield	LPMPP; Lay Monitoring	Initiate Secchi monitoring; consider monitoring chloride levels; possible B(1) reclassification
McIntosh Pond	Chemical monitoring	Royalton	LPMPP	Oligotrophic, possibly trending lake (Spring TP)
Mitchell Pond	Chemical monitoring	Sharon	LPMPP	Oligotrophic, possibly trending lake (Spring TP)
Standing Pond	Chemical monitoring	Sharon	LPMPP	Evaluate lake with high spring TP (37.1 µg/l); possibly naturally occurring, lower priority
Silver Lake	Complete AIS survey and plankton net survey	Barnard	LPMPP	Update AIS status of high-use lake
Colton Pond	Complete AIS survey and plankton net survey	Killington	LPMPP	Update AIS status of high-use lake
Rivers and Streams				
White River basin swimming areas (n = 22)	Continue *E. coli*, turbidity, conductivity, Swim Smart monitoring program	Multiple	WRP	Inform safe recreation and general education and outreach to the community
First, Second, Lower Third	Evaluate need for and possibly	Multiple	DEC, WRP	Target areas for restoration within bacteria-

Waterbody	Project Description	Location	Partner(s)	Purpose
Branch	implement an *E. coli* source tracking effort			impaired stream reaches
Basin-wide	LaRosa Partnership Program	TBD	WRP, LaRosa	Where LaRosa is noted below, and/or other sites identified during this planning cycle that adhere to the LaRosa Partnership Program's Monitoring Matrix goals/guidelines
First, Second Branches	Pilot temperature monitoring effort	Multiple	DEC, WRP	Evaluate accuracy and utility of rapid stream temperature assessment method for watershed characterization and potential outreach
Smith Brook	Chemical monitoring	Randolph	DEC, Landowner	Coordinate on monitoring needs if landowner expresses interest in landfill cleanup
White River, 15.4; 43.7930, -72.4944	Biological monitoring	Sharon	BASS	Current indeterminant condition (*Fair to Good*)
White River, 32.4; 43.771, -72.7463	Biological monitoring	Stockbridge	BASS	Current indeterminant condition (*Fair to Good*)
Second Branch White, 17.4; 43.9602, -72.5519	Biological monitoring	Randolph	BASS	Current indeterminant condition (*Fair to Good*)
Ayers Brook, 0.4; 43.9296, -72.6553	Biological monitoring	Randolph	BASS	Current indeterminant condition (*Fair to Good*)
Lilliesville Brook, 0.4; 43.7964, -72.6826	Biological monitoring	Stockbridge	BASS	Fair fish community scores contrast Good to Excellent macroinvertebrate scores
Smith Brook, 0.9; 43.9118, -72.6688	Biological monitoring	Randolph	BASS	Fair fish community scores contrast Good to Excellent macroinvertebrate scores
White River Tributary 12, 0.6; 43.709, -72.4016	Biological monitoring	Hartford	BASS	Determine potential for reclassification.
Mill Brook, 0.9; 43.7221, -72.4400	Biological monitoring	Pomfret	BASS	Determine potential for reclassification.
Podunk Brook, 0.9; 43.7168, -72.4047	Biological monitoring	Hartford	BASS	Determine potential for reclassification.
Stoddard Brook, 0.5; 43.8216, -72.6424	Biological monitoring	Bethel	BASS	Determine potential for reclassification.
Adams Brook, 1.5; 43.9415, -72.6342	Biological monitoring	Randolph	BASS	Determine potential for reclassification.
George Brook, 0.1;	Biological monitoring	Hancock	BASS	Determine potential for reclassification.

Waterbody	Project Description	Location	Partner(s)	Purpose
43.9584, -72.9023				
White River, 55.2; 43.995, -72.8783	Biological monitoring	Granville	BASS	Determine potential for reclassification.
Third Branch White, 21.5, 22.2, 22.9; 44.0533, -72.744	Biological monitoring	Roxbury	BASS	Determine potential for reclassification.
Jericho Brook, 0.1; 43.6893, -72.3982	Biological monitoring	Hartford	BASS	Determine potential for reclassification.
Second Branch White, 25.6; 44.0611, -72.5630	Biological monitoring	Brookfield	BASS	Determine potential for reclassification.
White River, 2.5; 43.666, -72.3573	Biological monitoring	Hartford	BASS	Determine attainment of aquatic biota use.
Belknap Brook, 0.7; 43.8662, -72.4867	Biological monitoring	Tunbridge	BASS	Determine attainment of aquatic biota use; Poor fish community scores contrast Good to Excellent macroinvertebrate scores
Liberty Hill Brook, 0.1; 43.8386, -72.8013	Biological monitoring	Rochester	BASS	Determine attainment of aquatic biota use.
Third Branch White, Ayers Brook to Bethel; 43.8276, -72.6348	Biological monitoring	Randolph, Bethel	BASS	Determine attainment of aquatic biota use.
Ayers Brook up to Brookfield Gulf; 43.9345, -72.6576	Biological monitoring	Randolph, Braintree, Brookfield	BASS	Determine attainment of aquatic biota use.
Kingsbury Brook, 0.5; 43.8808, -72.5908	Biological monitoring	Randolph	BASS	Determine attainment of aquatic biota use.
Peak Brook, 3.1; 43.92539, -72.60519	Biological monitoring	Randolph	BASS	Determine attainment of aquatic biota use.
Penny Brook, 2.4; 43.93386, -72.58794	Biological monitoring	Randolph	BASS; LaRosa	Determine attainment of aquatic biota use; Poor fish community scores (0 fish recorded in 2020, possibly due to drought conditions) contrast Good to Excellent macroinvertebrate scores; Clarify contrasting DEC and FWD sampling results.
Cram Brook, 0.7; 43.9637, -72.4725	Biological monitoring	Chelsea	BASS	Determine attainment of aquatic biota use; Current indeterminant condition (*Fair to Good*)

Waterbody	Project Description	Location	Partner(s)	Purpose
ID 23: Bear Hill Brook*; 43.995, -72.647	Biological monitoring, chemical monitoring	Braintree	BASS, LaRosa	Data gap in medium watershed with more than 20% agricultural and developed lands.
ID 24: Cleveland Brook; 43.812, -72.635	Biological monitoring, chemical monitoring	Bethel	BASS, LaRosa	Data gap in small watershed with more than 20% agricultural and developed lands.
ID 38: Mitchell Brook; 43.735, -72.436	Biological monitoring	Sharon	BASS	Data gap in large watershed with less than 5% agricultural and developed lands.
ID 14: Fletcher Brook; 43.738, -72.729	Biological monitoring	Stockbridge	BASS	Data gap in large watershed with less than 5% agricultural and developed lands.
ID 10: Sandusky Brook; 44.029, -72.76	Biological monitoring	Granville	BASS	Data gap in medium watershed with less than 5% agricultural and developed lands.
ID 17: Braintree Hill Brook; 44.007, -72.751	Biological monitoring	Braintree	BASS	Data gap in medium watershed with less than 5% agricultural and developed lands.
ID 7: Guernsey Brook; 43.779, -72.799	Biological monitoring	Pittsfield	BASS	Data gap in medium watershed with less than 5% agricultural and developed lands.
ID 8: Thatcher Brook; 43.952, -72.835	Biological monitoring	Granville	BASS	Data gap in medium watershed with less than 5% agricultural and developed lands.
ID 9: East Granville Brook; 44.015, -72.761	Biological monitoring	Granville	BASS	Data gap in medium watershed with less than 5% agricultural and developed lands.
ID 36: High Pole Branch; 43.773, -72.449	Biological monitoring	Sharon	BASS	Data gap in medium watershed with less than 5% agricultural and developed lands.
ID 5: Kendall Brook; 43.987, -72.845	Biological monitoring	Granville	BASS	Data gap in medium watershed with less than 5% agricultural and developed lands.
ID 4: Alder Meadow Brook; 44.018, -72.85	Biological monitoring	Granville	BASS	Data gap in small watershed with less than 5% agricultural and developed lands.
ID 20: Little Stony Brook; 43.766, -72.698	Biological monitoring	Stockbridge	BASS	Data gap in small watershed with less than 5% agricultural and developed lands.
ID 1: Patterson Brook; 44.000, -72.871	Biological monitoring	Granville	BASS	Data gap in small watershed with less than 5% agricultural and developed lands.
ID 19: Davis Hill Brook; 43.726, -72.716	Biological monitoring	Stockbridge	BASS	Data gap in small watershed with less than 5% agricultural and developed lands.
ID 12: Rogers Brook; 43.851, -72.801	Biological monitoring	Rochester	BASS	Data gap in small watershed with less than 5% agricultural and developed lands.
ID 3: Albee Brook; 43.969, -72.84	Biological monitoring	Granville	BASS	Data gap in small watershed with less than 5% agricultural and developed lands.

Waterbody	Project Description	Location	Partner(s)	Purpose
ID 13: Cold Brook; 43.813, -72.778	Biological monitoring	Rochester	BASS	Data gap in small watershed with less than 5% agricultural and developed lands.
ID 15: Johnson Brook; 43.704, -72.733	Biological monitoring	Stockbridge	BASS	Data gap in small watershed with less than 5% agricultural and developed lands.
ID 2: Gulf Brook; 43.987, -72.859	Biological monitoring	Granville	BASS	Data gap in small watershed with less than 5% agricultural and developed lands.
ID 27: Broad Brook; 43.787, -72.484	Biological monitoring	Sharon	BASS	Data gap in large watershed with mixed land use
ID 34: Fay Brook; 43.797, -72.459	Biological monitoring	Sharon	BASS	Data gap in large watershed with mixed land use
ID 35: Hart Hollow Creek*; 44.012, -72.439	Biological monitoring	Chelsea	BASS	Data gap in large watershed with mixed land use
ID 25: Pond Brook; 43.759, -72.631	Biological monitoring	Barnard	BASS	Data gap in large watershed with mixed land use
ID 37: Quation Brook; 43.784, -72.451	Biological monitoring	Sharon	BASS	Data gap in medium watershed with mixed land use
ID 26: Barnard Creek*; 43.747, -72.547	Biological monitoring	Barnard	BASS	Data gap in medium watershed with mixed land use
ID 18: Flint Brook; 43.959, -72.725	Biological monitoring	Braintree	BASS	Data gap in medium watershed with mixed land use
ID 32: Farnham Branch; 43.876, -72.49	Biological monitoring	Tunbridge	BASS	Data gap in medium watershed with mixed land use
ID 28: Rix Creek*; 43.843, -72.52	Biological monitoring	Royalton	BASS	Data gap in medium watershed with mixed land use
ID 11: Bethel Mountain Brook*; 43.876, -72.804	Biological monitoring	Rochester	BASS	Data gap in medium watershed with mixed land use
ID 33: Potash Hill Brook*; 43.882, -72.49	Biological monitoring	Tunbridge	BASS	Data gap in small watershed with mixed land use
ID 30: Spring Creek*; 43.891, -72.496	Biological monitoring	Tunbridge	BASS	Data gap in small watershed with mixed land use
ID 31: Honey Brook*; 43.76, -72.451	Biological monitoring	Sharon	BASS	Data gap in small watershed with mixed land use
ID 29: Falls Hill Brook*; 43.881, -72.507	Biological monitoring	Tunbridge	BASS	Data gap in small watershed with mixed land use

Waterbody	Project Description	Location	Partner(s)	Purpose
ID 21: Trout Brook; 43.901, -72.657	Biological monitoring	Randolph	BASS	Data gap in small watershed with mixed land use
ID 16: Music Creek*; 43.792, -72.751	Biological monitoring	Stockbridge	BASS	Data gap in small watershed with mixed land use
ID 6: Clark Brook; 43.976, -72.84	Biological monitoring	Granville	BASS	Data gap in small watershed with mixed land use
ID 22: Maple Brook; 43.913, -72.645	Biological monitoring	Randolph	BASS	Data gap in small watershed with mixed land use
Wetlands				
Nye Swamp	Wetland assessment	Barnard	Wetlands	Recommended for further study
Other high-quality wetlands proposed by local communities	Wetland assessment	Basin-wide	Wetlands	Recommended for further study

List of Acronyms

104	Federal Clean Water Act, Section 104
319	Federal Clean Water Act, Section 319
604(b)	Federal Clean Water Act, Section 604b
A(1)	Class A(1) Water Management
A(2)	Class A(2) Water Management
AAFM	Agency of Agriculture, Food and Markets
ACEP-WRE	Agricultural Conservation Easement Program – Wetland Reserve Easements
AGCWIP	Agricultural Clean Water Initiative Grant Program
AIS	Aquatic Invasive Species
AMP	Acceptable Management Practice
ANR	Agency of Natural Resources
ARPA	American Rescue Plan Act
B(1)	Class B(1) Water Management
B(2)	Class B(2) Water Management
BASS	Biomonitoring and Aquatic Studies Section, DEC Watershed Management Division
BMP	Best Management Practice
CREP	Conservation Reserve Enhancement Program
CVRPC	Central Vermont Planning Commission
CWI	Clean Water Initiative
CWIP	Clean Water Initiative Program
CWSP	Clean Water Service Provider
CWSRF	Clean Water State Revolving Fund
DEC	Department of Environmental Conservation
EDDIBG	Enhancement Development, Design, and Implementation Block Grant
EPA	US Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
ERAF	Emergency Relief and Assistance Fund
FEMA	Federal Emergency Management Agency
FFI	Functioning Floodplain Initiative
FPR	Vermont Forests, Parks and Recreation
FWD	Vermont Fish & Wildlife Department
GIA	Grants-in-Aid
LCBP	Lake Champlain Basin Program
LPMPP	Lake and Ponds Management and Protection Program
LWAP	Lake Watershed Action Plan
MRGP	Municipal Roads General Permit
MS4	Municipal Separate Storm Sewer System
NFWF	National Fish and Wildlife Foundation
NGLA	Next Generation Lake Assessment
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
ORW	Outstanding Resource Water
PDBG	Project Development Block Grant
PFW	Partners for Fish and Wildlife
RAP	Required Agricultural Practice

RCEBG	River Corridor Easement Block Grant
RCP	River Corridor Plan
RCPP	Regional Conservation Partnership Program
REI	Road Erosion Inventory
SFY	State Fiscal Year
SGA	Stream Geomorphic Assessment
SWG	State Wildlife Grant
SWMG	Stormwater Management Grant
SWMP	Stormwater Master Plan
SOP	Standard Operating Procedure
TBP	Tactical Basin Plan
TBPSG	Tactical Basin Planning Support Grant
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TP	Total Phosphorus
TRORC	Two Rivers-Ottauquechee Regional Commission
TS4	Transportation Separate Storm Sewer System Permit
TU	Trout Unlimited
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
UVA	Use Value Appraisal program, or Current Use Program
UVM Ext.	University of Vermont Extension
VAWQP	Vermont Agricultural Water Quality Partnership
VLT	Vermont Land Trust
VNRC	Vermont Natural Resources Council
VRAM	Vermont Rapid (Wetland) Assessment Method
VRC	Vermont River Conservancy
VSA	Vermont Statutes Annotated
VTrans	Vermont Agency of Transportation
VWQS	Vermont Water Quality Standards
WBBG	Woody Buffer Block Grant
WRNRCD	White River Natural Resource Conservation District
WRP	White River Partnership
WSMD	Vermont Watershed Management Division
WWTF	Wastewater Treatment Facility

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Appendix A. 2018 Tactical Basin Plan Report Card

Since the 2018 White River Tactical Basin Plan was published a network of local partners has worked closely with the Vermont Department of Environmental Conservation (VDEC) to implement or initiate work on 78% of the 60 strategies in the plan. These same local partners and VDEC have provided updates to these strategies below which have guided the development of strategies for the 2024 plan update. These strategies are broken down into those that have a status of:

- Completed – where a discrete strategy has largely been completed, or where a strategy without a discrete endpoint has been successfully implemented throughout the plan cycle
- In progress – where significant progress has been made on a discrete strategy without fully accomplishing it, or where a strategy without a discrete endpoint has been pursued by not widely implemented
- Awaiting Action - where there has not been significant progress
- Discontinued – where there has not been progress on the strategy but the strategy is not considered to be relevant or a priority

Table A1. Strategies of the 2018 White River Tactical Basin Plan with 2024 updates.

Strategy ID	Strategy Description	Priority Waterbodies	Priority Towns	Final Status	Explanation
1	Develop a Phase II SGA and River Corridor Plan for the Second Branch of the White River	Second Branch of White River	Royalton, Randolph, Bethel, Brookfield, Williamstown	Completed	WRP developed a Phase II SGA and River Corridor Plan in 2021. Projects identified in this effort will be prioritized and pursued in the 2024 plan.
2	Rank, develop and implement projects in the First Branch River Corridor Plan that will reduce bacteria, sediment and nutrient input to the river	First Branch of White River	Royalton, Tunbridge, Chelsea, Washington	In progress	WRP, municipalities, and other partners have implemented riparian plantings (4), dam removals (2), bridge and culvert replacements (2), floodplain infrastructure removals (2), and a floodplain protection purchase (1) stemming from this corridor plan. Additional work related to the corridor plan is ongoing, including additional dam removal engineering and local project identification and prioritization along the Tunbridge mainstem. This work will carry over into the 2024 plan.

Strategy ID	Strategy Description	Priority Waterbodies	Priority Towns	Final Status	Explanation
3	Rank, develop and implement projects in the Third Branch River Corridor Plan that will reduce bacteria, sediment and nutrient input to the river	Third Branch of White River	Bethel, Randolph	In progress	WRP, Vermont Land Trust, FWD, and other partners have implemented riparian plantings (7), a floodplain restoration project (1), and river corridor easements (4) stemming from this corridor plan. Additional work related to the corridor plan is ongoing, including interest in another river corridor easement. This work will carry over into the 2024 plan.
4	Rank, develop and implement projects on agricultural lands that will reduce agricultural runoff in areas where bacteria and nutrient levels are above the VT Water Quality Standards	First, Second and Third Branches	Royalton, Tunbridge, Chelsea, Bethel, Randolph, Brookfield	In progress	Between 2019 and 2023, 4500[1,2] acres were treated with water quality best management practices with technical assistance from AAFM, WRNRCD, and other service providers (see Figure 22 of the basin plan). There are approximately 38,000 agricultural acres in the basin. The 2024 plan recommends continued farmer outreach, technical assistance, and funding to support traditional agricultural BMPs as well as expanded identification of potential natural resource restoration projects on agricultural lands. [1]Data are still incomplete for 2023 [2]Some practices, like cover cropping, are annual. Therefore, this total may re-count some fields if they were cover cropped by state or federal funding across multiple years.
5	Continue WRP water quality study to analyze *E.coli* and nutrient levels above and below dams	First Branch, Second Branch	Tunbridge, Royalton, Bethel	In progress	WRP has monitored total phosphorus, total nitrogen, and chloride, and E. coli above and below 3 dam complexes on the First, Second, and Third Branches of the White River since 2018. Results are complex but currently consistent with some research demonstrating that persistent e. coli populations can become established in fine sediment biofilms. As more natural sediment transport processes are re-established at dam removal sites (presumably coarsening streambed conditions), E. coli counts are predicted to decline. The 2024 plan recommends continued monitoring bracketing dam removal sites and potentially additional sites.
6	Continue monitoring popular swimming areas for the protection of public health	First Branch, Second Branch, Third Branch	Royalton, Tunbridge, Chelsea,	Completed	WRP completed its 20th monitoring season during this planning cycle, sampling across 22 sites. This will remain a monitoring strategy in the 2024 plan as the effort provides significant data-driven outreach and education engagement and generates a sense

Strategy ID	Strategy Description	Priority Waterbodies	Priority Towns	Final Status	Explanation
			Bethel, Randolph		of community and stewardship focused on the river and its surface waters.
7	Identify target communities for septic social events for the impaired reaches of the First, Second and Third Branches of the White River	First Branch, Second Branch, Third Branch	Royalton, Tunbridge, Chelsea, Bethel, Randolph, Brookfield	Awaiting action	State, federal, and non-profit partners explored some data collection methods for targeting. However, funding and implementing this work never materialized to target towns quantitatively. 'Wastewater Workshops' may still be targeted towards major villages along the impaired river reaches to provide timely education and outreach opportunities on currently available individual and community-level wastewater funding in the state. The 2024 plan carries over this strategy.
8	Employ outreach by the VT Waste Management and Prevention Division to landowners and direct sampling and remediation efforts to Smith Brook	Smith Brook	Randolph	In progress	The landowners have been in contact with DEC and RPC and are considering potential funding sources to explore mitigation alternatives and possibly clean up and re-development opportunities for the old landfill, including through BRELLA or CWSRF. WRP also remains interested in studying alternatives, as they have fielded a growing number of inquiries by concerned community members.
9	Proceed with flow study to determine water quality status and recommendations for flow regulation on Flint Brook	Lower Flint Brook	Roxbury	Completed	The flow study was completed and flow regulation recommendations were provided in 2019 to inform an application for hatchery water withdrawal. Flint Brook is no longer listed on Vermont's Priority Waters Part F list.
10	Develop and present general education and outreach on healthy lake practices and current water quality status of Sunset Lake and Silver Lake	Sunset Lake Silver Lake	Brookfield, Barnard	In progress	LPMPP is presenting to the Silver Lake community in 2024 and is looking to establish relationships with the Sunset Lake community.

Strategy ID	Strategy Description	Priority Waterbodies	Priority Towns	Final Status	Explanation
11	Implement high priority recommendations in the 2015 Silver Lake State Park Lake Wise Evaluation report and VDEC Barnard Stormwater Infrastructure Report	Silver Lake State Park, Silver Lake	Barnard	In progress	A few projects from the Barnard stormwater report and the 2015 Lake Wise Evaluation have been implemented or advanced to final design. LPMPP is considering whether updated assessments are needed and if support exists for implementing remaining designed projects.
12	Develop and initiate “River Wise” outreach and assessment on Stony Brook	Stony Brook	Stockbridge	Completed	WRP and VFWD developed a landowner database for the watershed and began developing an outreach strategy with technical partners. This outreach model was fully developed with LCBP support by FWD and other partners as the regional Streamwise model. Interest and planning of aquatic habitat works continues in Stony Brook, but the StreamWise model may not be the most effective outreach model for this watershed.
13	Continue to monitor swimming areas along the mainstem of the White River to protect public health	White River mainstem mouth to Third Branch	Hartford, Pomfret, Sharon, Royalton, Bethel	Completed	See Strategy 6
14	Complete windshield survey of Breakneck Brook to identify stressors in watershed leading to decline in macroinvertebrate communities	Breakneck Brook	Rochester	Completed	While a windshield survey was not completed by DEC or WRP, 35 hydrologically connected road segments (~3500 ft) were surveyed as part of Rochester and Bethel's Road Erosion Inventory responsibilities, with support from TRORC. Given the highly forested catchment of Breakneck Brook, road impacts would be the first expected stressor on this stream. However, only two road segments were reported as 'Moderate' priorities for MRGP implementation. Moreover, the macroinvertebrate community in Breakneck Brook is listed as 'Good' and the fish community is listed as 'Very Good', and the most recent assessment of DEC data indicates that the visual trend through the three available macroinvertebrate datapoints is not statistically significant. If additional data collection instead show a significant trend and/or if partners or the public identify specific concerns with this

Strategy ID	Strategy Description	Priority Waterbodies	Priority Towns	Final Status	Explanation
					watershed, the need for a more thorough survey of the catchment can be revisited.
15	Review aquatic biota, chemistry, temperature and creel survey data to determine if there is improvement on the White River mainstem from the West Branch to the mouth of the Third Branch	White River mainstem (stressed section)	Multiple towns	Completed	Updated biological (macroinvertebrate) data do not indicate improvement in water quality status in this mainstem segment. The 'stressed' designation is no longer used by DEC; however, the sentinel sampling site in this segment shows a statistically significant negative trend in macroinvertebrate community score. DEC will continue to monitor this sentinel site through the upcoming TBP cycle. Given the mainstem size at this point, water quality improvement here likely requires significant watershed-scale restoration in the White River headwaters, not just local projects, and change may not be likely over a single plan cycle.
16	Conduct road erosion inventory on roads hydrologically connected to Jericho Brook and implement BMPs. Follow up with monitoring and assessment once BMPs are implemented	Jericho Brook from mouth to 0.2 miles upstream	Hartford	Completed	Approximately 30 of 34 hydrologically-connected road segments in the Jericho Brook watershed were inventoried. Only one segment was identified as a 'Moderate' priority for MRGP-related road BMP implementation. Additionally, updated biological data since the last tactical basin plan show biological improvement (macroinvertebrate community = 'Excellent'; fish community = 'Very Good') to the extent that this watershed has now been recommended for monitoring for B(1) reclassification potential by the 2024 plan.
17	Implement high priority projects recommended in the First Branch River Corridor Plan (see Action 2)	First Branch from mouth to Chelsea	Chelsea, Royalton, Tunbridge	In progress	See Strategy 2

Strategy ID	Strategy Description	Priority Waterbodies	Priority Towns	Final Status	Explanation
18	Target RAP outreach and implementation and riparian and aquatic area habitat restoration and protection on Kingsbury Brook	Kingsbury Brook (0.5-mile stressed segment)	Randolph	In progress	Since SFY2020, service providers funded by AAFM conducted approximately 274 technical assistance visits to 51 farms in the basin. 11 of these farms (52 visits) were in the lower Second Branch White River watershed (HUC12: 010801050302). The Kingsbury Brook catchment is within this watershed, and this is the lowest level of data tracking of agricultural site visits. Kingsbury Brook remains a monitoring priority to deterimine its attainment of the aquatic life use.
19	Target RAP outreach and implementation on the Third Branch (see Action 4)	Third Branch (11-mile stressed segment)	Bethel, Randolph	In progress	Since SFY2020, service providers funded by AAFM conducted approximately 274 technical assistance visits to 51 farms in the basin. 7 of these farms (36 visits) were in the greater Third Branch watershed.
20	Implement high priority projects recommended in the Third Branch River Corridor Plan (see Action 3)	Third Branch (11-mile stressed segment)	Bethel, Randolph	In progress	See Strategy 3
21	Implement high priority projects recommended in the Stream Geomorphic Assessment identified in the Ayers Brook watershed	Ayers Brook (5.5 miles stressed segment)	Randolph, Braintree, Brookfield	In progress	WRP, TRORC, and WRNRCD conducted landowner outreach in the Ayers Brook watershed and have developed 4 projects to date: 1 river corridor easement and 3 riparian plantings. Project development will continue in the next planning cycle.
22	Conduct road erosion inventory on hydrologically connected road segments for Ayers Brook and implement projects to meet standards (see Actions 30, 31)	Ayers Brook (5.5-mile stressed segment)	Randolph, Braintree, Brookfield	Completed	492 hydrologically connected road segments in the watershed have been assessed (about 9.3 miles in total) and 23 segments still need assessment. 9 segments are very high priorities for remediation, 14 segments are high priorities, and 52 segments are moderate priorities. At the town level, Brookfield is currently meeting their MRGP priority segment implementation targets (2022 and 2024), while Braintree and Randolph are not (as of July 2024). However, more up to date progress on MRGP implementation is available through the MRGP portal. Technical assistance and funding for Municipal Roads General Permit tasks are still identified as a priority by the 2024 plan.

Strategy ID	Strategy Description	Priority Waterbodies	Priority Towns	Final Status	Explanation
23	Implement high priority projects recommended in the Stream Geomorphic Assessment for Hancock Branch	Hancock Branch (4.3-mile stressed segment)	Hancock, Ripton	In progress	WRP and partners have completed one dam removal and floodplain restoration project and two riparian plantings. One potential buyout/river corridor easement identified in the SGA is being developed. This and other efforts stemming from the SGA will continue through the next plan cycle.
24	Investigate protection and restoration opportunities for oligotrophic waterbody, McIntosh Pond	McIntosh Pond	Royalton	Discontinued	LPMPP are not prioritizing this waterbody for protection and restoration project development.
25	Evaluate A(2) classification for Lake Casper and reclassify to appropriate water quality classification for designated uses and explore potential for removal and restoration of dammed tributary	Lake Casper	Royalton	Awaiting action	The 2024 plan carries over this monitoring priority for the Lake Casper catchment and aims to include Lake Casper in a larger basin wide prioritization of dam removal outreach needs.
26	Evaluate A(2) classification for Farnsworth Brook and reclassify to appropriate water quality classification for designated uses	Farnsworth Brook	Braintree	Awaiting action	The 2024 plan carries over this monitoring priority for Farnsworth Brook.
27	Reclassify waters recommended for A(1) and B(1) status to protect high quality fisheries and aquatic biota	Waters identified in Figures 10 and 11 and Table 6	Multiple towns	Awaiting action	No waters have been reclassified in the White River basin, but reclassification remains a priority strategy in the 2024 plan.
28	Provide outreach to towns on B(1) candidate waters	Waters identified in Figures 10	Multiple towns	Awaiting action	No outreach on reclassification candidates has been performed in the White River basin. TRORC looks to ANR to lead reclassification efforts.

Strategy ID	Strategy Description	Priority Waterbodies	Priority Towns	Final Status	Explanation
		and 11 and Table 6			
29	Complete road erosion inventories	Basin-wide	Bethel, Brookfield, Royalton, Tunbridge, Hartford, Barnard, Pomfret, Rochester, Washington	Completed	REIs have been substantially completed for all these towns, though a few are still priorities for additional technical assistance to assess unsurveyed road segments. Technical assistance and funding for Municipal Roads General Permit tasks are still identified as a priority by the 2024 plan.
30	Implement high priority projects identified in road erosion inventories	Ayers Brook, Gilead Brook, Camp Brook, Jericho Brook	Randolph, Bethel, Hartford	In progress	Bethel, Randolph, and Hartford all met their 2022 targets for REI segment improvements, and Bethel and Hartford have met their 2024 targets. Bethel has improved two Very High Priority non-Class 4 (VHP) road segments and needs to improve five more by the end of 2025. Randolph has improved five VHP segments and needs to improve five more by the end of 2025. Hartford has improved 28 VHP segments and needs to improve 28 more by the end of 2025. TA and funding for MRGP work remains a priority in the 2024 plan.
31	Develop stormwater master plans for Randolph, Hartford, Bethel, Royalton and Rochester	Third Branch, Ayers Brook, Lower White, Upper White	Randolph, Hartford, Bethel, Royalton, Rochester	In progress	Stormwater master plans have been completed for Randolph, Bethel, and Rochester. Royalton is beginning a stormwater master planning process in 2024. Hartford is still a priority for a future master planning effort.
32	Implement high priority projects identified in stormwater master plans for Randolph and Rochester	Ayers Brook, Upper White	Randolph, Rochester	In progress	While several projects have been implemented, most proposed projects still require preliminary or final designs prior to implementation. This remains a 2024 TBP priority.

Strategy ID	Strategy Description	Priority Waterbodies	Priority Towns	Final Status	Explanation
33	Determine if high priority projects identified in Stormwater Mapping Report should be carried out singularly or through multi-town Stormwater Master Planning	Basin-wide	Norwich, Sharon, Washington, Barnard, Pittsfield, Tunbridge, Roxbury, Chelsea, Granville, Hancock	Completed	Of the listed towns, only a few had stormwater report-identified projects *within* the White River basin: three in Chelsea, two in Sharon, and one each in Barnard, Tunbridge, and Pittsfield. Unless towns express interest in more comprehensive mapping and planning efforts, this plan recommends implementing the small number of existing identified projects singularly.
34	Provide outreach and education for development of stormwater bylaws	Basin-wide	Killington, Brookfield, Sharon, Tunbridge, Pittsfield, Hartford	In progress	No direct outreach on stormwater bylaws or bylaw development has occurred for these towns. However, in 2024 Two Rivers Ottauquechee Regional Commission is assisting multiple White River towns— Bethel, Granville, Hancock, Hartford, and Royalton— with the development and implementation of stormwater/green stormwater infrastructure plans.
35	Install signage at Bridge Street bridge informing users on "Risk of Creosote Exposure". Develop corrective action plan to prevent "creosote weeping" from entering river corridor and public use area.	White River mainstem	Bridge Street Bridge in Royalton	Completed	WRP and the Town have installed signage and built and maintain a portage trail to bypass the potential hazard; however, some signage may have been removed. This signage should be replaced. WRP assisted the Town in early stages of considering mitigation options, though funding for full bridge replacement over the White River mainstem is extremely limiting. No sheens/concerns have been reported to DEC's Spill Coordinator. The public is encouraged to report any additional issues for evaluation. For now, this strategy is considered complete.
36	Provide outreach on cover cropping and other agricultural BMPs to farms in sub-basins where agricultural cropland is higher than seven percent land use.	First Branch, Second Branch, Third Branch	Randolph, Brookfield, Chelsea, Tunbridge, Royalton, Bethel	Completed	Between 2018-2022, AAFM and the Agricultural Clean Water Initiative Program partners supported 20 education events with 404 attendees in the White River basin. Cover cropping is still under-implemented relative to total cropland in the basin, therefore outreach and technical assistance on cover cropping remains a priority strategy in the 2024 plan.

Strategy ID	Strategy Description	Priority Waterbodies	Priority Towns	Final Status	Explanation
37	Target farm inspections on areas with data that suggests elevated nutrient loading and *E. coli* communities.	Basin-wide	Basin-wide	Discontinued	1 Large Farm Operation in the basin is inspected annually, 4 Medium Farm Operations are each inspected at least every 3 years, and 12 Certified Small Farm Operations are inspected at least every 7 years. Because of this rotational schedule, inspections cannot be targeted at the catchment- or reach-scale. However, this means that all LFOs, MFOs, and CSFOs will be inspected within 7 years of TBP publication such that this prioritization is no longer necessary.
38	Provide educational workshops for farmers on tile drain systems, river management and stream geomorphology, agriculture funding and grant opportunities, and nutrients (e.g. nitrogen) and water quality.	Basin-wide with focus on First and Second Branch	Basin-wide	Completed	Between 2018-2022, AAFM and the Agricultural Clean Water Initative Program partners supported 20 education events with 404 attendees in the White River basin. The Connecticut River Watershed Farmers Alliance, in coordination with WRNRCD, hosts or directs its members to a variety of water quality- and flood-related workshop opportunities. Membership, mailing lists, events, technical and funding assistance opportunities, and other agricultural information can be found on the CRWFA website and the WRNRCD website.
39	Incorporate high priority floodplain encroachments for removal and other floodplain protection and restoration measures into Long-term Hazard Mitigation Plans and Stormwater Master Plans – towns are prioritized by number of structures and percent of all structures in the special flood hazard area.	First Branch, Upper White, Hancock Branch, Stony Brook, Tweed River, Mill Brook, Third Branch, Second Branch, Lower Mainstem	Chelsea, Granville, Hancock, Stockbridge, Pomfret, Randolph, Hartford	In progress	The hazard mitigation plans for the listed towns were updated in 2021, 2019, 2022, 2021, 2024, 2021, and 2021, respectively. Each plan describes updates from the previous plan, including completed actions and new actions identified by the municipality as important for reducing hazards. All plans include flood mitigation strategies including culvert and bridge inventorying and upsizing, floodplain buyouts, elevating or floodproofing critical structures, and floodplain/stream restoration.

Strategy ID	Strategy Description	Priority Waterbodies	Priority Towns	Final Status	Explanation
40	Municipal outreach for adoption of river corridor protection – towns are prioritized based on the value of protection by stream density and upstream protection value	Gilead Brook, Camp Brook, Third Branch, First Branch, White River Mainstem, Tweed River, Stony Brook, West Branch, Fay Brook	Bethel, Stockbridge, Chelsea, Braintree, Rochester, Sharon, Royalton, Tunbridge, Roxbury	In progress	River corridor protections have not been upgraded for any towns since 2018. The passage of Act 121 in 2024 aims to strengthen river corridor protection at the state level.
41	Identify and field verify high priority post-Irene stream alterations for remediation from the *Irene Recovery Report* developed by VFWD	White River mainstem, Alder Meadow Bk, Broad Bk, First Branch, Hancock Branch, Lilliesville Bk, Locust Ck, Stony Bk, Third Branch, Tweed River, West Branch, Marshes Bk, Nason Bk, Clark Bk	Multiple towns	In progress	WRP, VFWD, GMNF, and VLT have implemented two floodplain and in-stream restoration projects and a river corridor easement and riparian planting as an outcome. One project on the West Branch is now the site of a successful GMNF-WRP Freshwater Snorkeling program for hundreds of Vermont school children. Post-Irene site visits and project development remain a priority in the 2024 plan.

42	Review and evaluate pre-2013 river corridor plan priorities for project development.	Ayers Brook, Tweed River, Upper White, Streams in town of Sharon	Multiple towns	In progress	WRP and partners have reviewed and developed a variety of projects stemming from older plans, including six riparian plantings in the Upper White, a river corridor easement in Sharon, a buyout and river access development in Hancock by VLT, a berm removal, corridor easement, and riparian restoration project in the Tweed, and the projects previously mentioned in Ayers Brook (Strategy 21). Additionally, the 2024 plan recommends these plans are reviewed by VRP and partners to determine if SGA updates should be prioritized for these older plans to identify new project needs.
43	Continue work to prioritize, design, and implement high-priority culvert replacement projects	Upper White, Tweed River	Granville, Hancock, Rochester, Pittsfield, Stockbridge	In progress	See Strategies 2, 3, 21, and 23: WRP has replaced 2 culverts and designed three others since the 2018 plan, and assessment and prioritization has occurred or is underway for > 700 culverts in the upper White, Tweed, and First and Second Branches. The 2024 plan continues to recommend this strategy for remaining structures, especially where towns are interested.
44	Continue work on dam removal prioritization, design and implementation on high priority sites	Basin-wide	Multiple towns	In progress	See Strategies 2, 3, 21, and 23: Four dams have been removed since the 2018 plan and development or design are currently underway for two others. The 2024 plan recommends prioritizing the remaining mapped dams in the basin for removal consideration and project development.
45	Continue work to assess, prioritize, design, and implement high-priority culvert replacement projects	Third Branch, Lower White, First Branch, Second Branch	Multiple Towns	In progress	See Strategy 43
46	Implement high-priority culvert retrofit projects identified by VFWD	Mill Brook, Broad Brook	Pomfret, Sharon	Completed	The Mill Brook retrofit was implemented in 2019 by WRP. Broad Brook was previously completed in 2013.
47	Identify wetlands impacted during and after flooding events	Stream and lake-associated wetlands throughout the basin	Sharon, Hartford, Bethel, Rochester, Stockbridge	Discontinued	The Wetlands Program did not identify this as a priority strategy. WRP have identified several headwater beaver complexes that have been blown out in several flooding events, with at least some subsequently reestablishing. Unregulated removal of beaver dams may exacerbate flooding impacts in some locations (e.g., First Branch); targeted outreach by VFWD beaver biologist may improve human-beaver management conflicts.

48	Review new natural resource mapping and make recommendations for improving wetland mapping in target towns	All wetlands	All towns	In progress	The Wetlands Program has received funding support and technical assistance to update all wetlands mapping statewide. Updated wetlands mapping in the White River basin should be available by 2025.
49	Continue and expand riparian buffer programs. Prioritize buffer plantings based upon recommendations in completed River Corridor Plans and target where previous studies have documented water quality issues.	Basin-wide	Multiple towns	In progress	WRP alone has planted about 30,000 trees across more than 51 sites since the 2018 plan. WRP continues to develop projects, which are variously identified by SGAs, RCPs, other planning documents, or landowner requests for technical assistance.
50	Using Lake Wise assessment model, assess the public Fish & Wildlife access on Rood Pond and upgrade if recommended	Rood Pond	Williamstown	In progress	LPMPP's new Shoreland Restoration Ecologist is aware of potential concern with the Rood Pond launch and will coordinate with Fish and Wildlife staff to determine if assessment is necessary.
51	Establish Lay Monitor on lakes recommended by the Lakes and Ponds Program	Sunset Lake, Rood Pond, Crescent Pond	Brookfield, Williamstown, Sharon	In progress	LPMPP's Lay Monitoring Coordinator is exploring interest in lay monitoring at Sunset Lake, but Rood and Crescent Ponds are not currently monitoring priorities for the 2024 plan update.
52	Continue funding and implementation for portable skidder bridges for logging	Basin-wide	NA	Completed	The DFPR began providing cost-share funding for loggers and foresters to receive temporary portable skidder bridges. Statewide, the DFPR initially distributed 12 free wooden bridges in 2018 and administered 9 cost-share grants for bridges in 2019 and 2020. In addition, the DFPR Watershed Forester administers a rental program for 5 heavy duty steel bridges for crossing larger rivers. In 2023 DFPR re-launched the skidder bridge construction and rental program with support from NRCDs and using Clean Water funding. While the rental program is not active in the White River basin, direct construction support is available.

53	Host portable skidder bridge building workshop at Randolph Technical Career Center	Basin-wide	Randolph	Completed	One skidder bridge workshop was hosted in Shrewsbury, one hour from Randolph but open to statewide participation. 40 practitioners attended. Additionally, since the last basin two AMP trainings collectively hosting 141 participants were held in Randolph and one hosting 11 participants was held in Bethel.
54	Support restoration actions identified in the Robinson Integrated Natural Resource Assessment on USFS land in the White River Basin	USFS Land in the Upper White	Rochester, Pittsfield, Stockbridge, Hancock, Chittenden	In progress	Since 2018 USFS and partners (WRP, TU) have implemented headwater strategic wood addition, mainstem floodplain restoration, and perennial stream culvert upgrades, in addition to many road, trail, and forestry-related water quality BMPs, as prescribed by the Robinson Integrated Natural Resource Assessment. In addition to continuing the work identified in the Robinson assessment, WRP and USFS are collaborating on a project to explore management and restoration potential using Utah State University's Beaver Restoration Assessment Tool, parameterized for the White River headwaters.
55	Continue support for White River Water Trail for public access sites, river corridor protection, and outreach materials and events	White River Mainstem	Granville, Hancock, Rochester, Pittsfield, Stockbridge, Bethel, Royalton, Sharon, Hartford	Completed	The WRP coordinates recreation season stewardship activities at White River Water Trail sites; trained volunteers monitor a specific site monthly, identifying site hazards/access needs and removing trash. The WRP is working to ensure all WRWT sites have 3 basic amenities: informational/wayfinding signage, parking, and safe river access (where applicable). Since the 2018 plan, the WRP and partners have designed and/or implemented about five signage projects, four parking projects, and ten river access projects (including property purchases).
56	Designate the White River mainstem as an ORW	White River Mainstem	Granville, Hancock, Rochester, Pittsfield, Stockbridge, Bethel, Royalton, Sharon, Hartford	Awaiting Action	Funding was secured for outreach and development on ORW designation but ultimately outreach efforts were not pursued. TRORC looks to ANR to take lead on reclassification and designation efforts.

57	Continue outreach and education to prevent new introductions of invasive species introduction (including the rusty crayfish) in to the White River mainstem	White River Mainstem	Bethel, Sharon, Hartford, Royalton, Randolph, Pomfret	Completed	WRP and the Vermont Institute of Natural Sciences coordinated periodic crayfish monitoring events and communicated their findings through social media, YouTube, and other public venues. QAQCed monitoring data were included as a database in the global iNaturalist biodiversity application, coordinated by the Vermont Center for Ecostudies. Continued crayfish monitoring is encouraged in the 2024 plan as a public engagement tool with community science benefits.
58	Initiate regular monitoring and AIS spread prevention through signage or VIP program at Colton Pond, Rood Pond, McIntosh Pond, Sunset Lake and Lake Mitchell.	Colton Pond, Rood Pond, McIntosh Pond, Sunset Lake, Lake Mitchell	Killington, Williamstown, Royalton, Brookfield, Sharon	In progress	AIS signage has been posted Ansel, Colton, McIntosh, and Rood Ponds. Mitchell is not regularly accessed by the public and is not proximate to other waters with AIS presence, and therefore is a lower priority. Two of these ponds have been surveyed since the 2018 plan, and two others are monitoring priorities for the 2024 basin plan.
59	Recruit greeter and initiate AIS Greeter Program at Silver Lake or Silver Lake State Park	Silver Lake	Barnard	In progress	A greeter has not been recruited for Silver Lake State Park but is still a priority in the 2024 plan.
60	Initiate VIP where there is interest in small ponds in priority towns.	Lake Champagne, Randolph Pond, Ansel Pond, Mud Pond, No Name Pond, Hutchinson Pond	Randolph, Bethel, Braintree	Discontinued	There is not currently capacity for coordinating small pond VIP work in this basin and these ponds are not currently considered VIP priorities.

Appendix B. Dams in the White River Basin

Table B1. List of dams in the White River basin. These dams are either in service, partially breached, breached, drained, or removed. The table is completed to the extent possible with information available in the Agency of Natural Resources Vermont Dam Inventory (accessed: 04/28/2024).

State ID	Dam Name	Stream	Town	Dam Status	Purposes	Hazard Potential
184.03	Crescent Lake	Quation Brook-TR	Sharon	In Service	Recreation	High
11.01	Silver Lake	Pond Brook	Barnard	In Service	Recreation	High
47.02	Keyser	Bicknell Brook	Chelsea	In Service	Recreation	High
32.05	Holdens Pond	Sunset Brook-TR	Brookfield	In Service	Recreation	Significant
171.08	Lake Casper	White River-TR	Royalton	In Service	Water Supply	Significant
171.09	Lake John	White River-TR	Royalton	In Service	Water Supply	Significant
188.03	Colton Pond	South Branch Tweed River	Killington	In Service	Recreation	Significant
184.05	Johnson Real Estate	Mitchell Brook-TR	Sharon	In Service	Recreation	Significant
171.02	McIntosh Pond	White River-TR	Royalton	In Service	Recreation	Significant
32.04	Sunset Lake	Sunset Brook	Brookfield	In Service	Recreation	Significant
200.09	Day-Bruorton	Fay Brook-TR	Strafford	Drained	Recreation	Significant
92.01	Camp Killooleet	Hancock Branch-TR	Hancock	In Service	Recreation	Significant
200.02	Kratky	Fay Brook	Strafford	In Service	Recreation	Significant
184.04	Lake Mitchell	Mitchell Brook	Sharon	In Service	Recreation	Low
21.02	Ansel Pond	White River-TR	Bethel	In Service		Low
157.04	Johnson	Mill Brook	Pomfret	In Service	Recreation	Low
211.01	Tunbridge Trout Pond	First Branch White River-TR	Tunbridge	In Service	Recreation	Low
162.03	Lake Champagne	Penny Brook	Randolph	In Service		Low
244.06	Rood Pond	Second Branch White River-TR	Williamstown	In Service	Recreation	Low
184.01	Standing Pond	Fay Brook-TR	Sharon	In Service	Recreation	Low
157.01	Freeman	Mill Brook-TR	Pomfret	In Service	Recreation	Low
21.01	Bethel Mills	Third Branch White River	Bethel	In Service	Hydroelectric	Low
244.04	Goyette	Second Branch White River	Williamstown	In Service	Recreation	Low
157.03	McCord	Mill Brook-TR	Pomfret	In Service	Recreation	Low
184.06	Baribeau	Quation Brook-TR	Sharon	In Service		Low
168.03	Kings Pond	West Branch-TR	Rochester	In Service	Recreation	Low
171.07	Clark	Cleveland Brook-OS	Royalton	In Service	Recreation	Low
225.05	Washington-5	First Branch White River-TR	Washington	In Service		Minimal
47.05	Reed Mill	First Branch White River	Chelsea	Breached (Partial)		Minimal
162.02	Gulf Road	Second Branch White River	Randolph	In Service		Minimal

State ID	Dam Name	Stream	Town	Dam Status	Purposes	Hazard Potential
11.08	Barnard-2	Pond Brook - OS	Barnard	In Service	Recreation	Minimal
188.02	Sherburne-2	South Branch Tweed -TR	Killington	In Service		Minimal
47.04	Lyons Mill	Jail Brook	Chelsea	Breached (Partial)		Minimal
94.1	Podunk Brook	Podunk Brook -TR	Hartford	In Service		Minimal
168.02	Eller	Howe Brook	Rochester	In Service	Recreation	Minimal
211.02	Haywood and Noble	First Branch	Tunbridge	In Service		Minimal
25.06	Rose	Flint Brook	Braintree	In Service	Recreation	Minimal
21.07	Kellog	Third Branch -TR	Bethel	Drained		Minimal
211.06	Farnham Bros.	First Branch	Tunbridge	Breached (Partial)		Minimal
211.08	Lafogg	Dickerman Brook	Tunbridge	In Service		Minimal
188.01	Sherburne-1	South Branch Tweed -TR	Killington	In Service		Minimal
25.04	Delaney	Riford Brook-TR	Braintree	In Service		Minimal
25.05	Braintree-5	Ayers Brook-TR	Braintree	In Service		Minimal
32.07	Brookfield-7	Second Branch -TR	Brookfield	In Service		Minimal
32.1	Brookfield-10	Sunset Brook - TR	Brookfield	In Service		Minimal
162.01	Harvey	Adams Brook-TR	Randolph	In Service		Minimal
168.04	McIntyre	White River -TR	Rochester	In Service	Recreation	Minimal
171.1	Walsh	Whitewater Brook – OS	Royalton	In Service	Recreation	Minimal
198.02	Stockbridge - 1	White River-TR	Stockbridge	In Service		Minimal
25.03	Wain	Riford Brook-TR	Braintree	In Service		Minimal
25.02	Bass	Spear Brook	Braintree	In Service		NA
11.07	Barnard-1	Pond Brook	Barnard	Breached	Other	
32.02	North Pond (Upper)	Sunset Brook-TR	Brookfield	Breached		
32.03	North Pond (Lower)	Sunset Brook-TR	Brookfield	Breached		
32.08	Chase	Sunset Brook-TR	Brookfield	Breached		
32.09	Sunset Brook	Sunset Brook	Brookfield	Breached	Other	
32.11	Buxtonssaes Mill	Sunset Brook	Brookfield	Breached		
47.03	Whitney	First Branch	Chelsea	Breached		
47.06	Jones Pond	First Branch -TR	Chelsea	Breached		
92.02	Camp Killooleet Diversion	Hancock Branch	Hancock	Breached		
94.09	Hartford Woolen Co.	White River	Hartford	Breached		
162.08	Playground	Third Branch	Randolph	Breached		
171.01	Bethel	White River	Royalton	Breached		
184.07	Day Farm Pond Upper	Quation Brook-TR	Sharon	Breached		
184.08	Sharon Power Co.	White River	Sharon	Breached		

State ID	Dam Name	Stream	Town	Dam Status	Purposes	Hazard Potential
184.13	Day Farm Pond Middle	Quation Brook-TR	Sharon	Breached		
184.14	Day Farm Pond Lower	Quation Brook-TR	Sharon	Breached		
188.12	Sherburne-12	West Branch Tweed	Killington	Breached		
198.03	Stockbridge - 2	White River -TR	Stockbridge	Breached		
211.03	Grants Mill	First Branch	Tunbridge	Breached		
244.05	Staples Pond	Second Branch	Williamstown	Breached		
47.01	Chelsea Mill	First Branch	Chelsea	Removed		NA
47.07	Bobbin Mill	First Branch	Chelsea	Removed		NA
162.05	Sargent, Osgood and Roundy	Third Branch	Randolph	Removed		NA
171.05	Royalton-5	Second Branch	Royalton	Removed		NA
184.1	Wright	Fay Brook	Sharon	Removed		NA
211.04	South Tunbridge	First Branch	Tunbridge	Removed		NA
21.03	Hyde Mill	Second Branch	Bethel	Removed		Low
171.03	Eaton (Upper)	First Branch	Royalton	Removed		Low
171.04	Eaton (Lower)	First Branch	Royalton	Removed		Low

Appendix C. White River Basin Municipal Protectiveness Table

Table C1. Surface-water related protections adopted by municipalities predominantly in the White River basin.

	National Flood Insurance Program	Road and Bridge Standards	Local Emergency Management Plan	Local Hazard Mitigation Plan	River Corridor Protection[1]	ERAF Rate	E911 Structures in Special Flood Hazard Area (SHFA)	SFHA Structures Insured	Critical or Public Structures in SFHA	Percent of All Town Structures in SFHA	Steep Slope Protection
	Enrolled?	Adopted?	Completed?	Adopted?	None, CRS, By-Law, or Interim	Percent	Count	Percent	Count	Percent	In by-laws, ordinances, town plan, or zoning?
Barnard	Yes	Yes	Yes	Yes	Interim	17.5	35	3	0	5	Yes
Bethel	Yes	Yes	Yes	Yes	None	12.5	36	17	1	3	Yes
Braintree	Yes	Yes	Yes	Yes	Interim	17.5	10	20	0	1	Yes
Brookfield	Yes	Yes	Yes	Yes	None	12.5	19	11	0	3	Yes
Chelsea	Yes	Yes	Yes	Yes	None	12.5	70	10	1	10	No
Chittenden	Yes	Yes	Yes	Yes	None	12.5	20	5	0	3	No
Granville	Yes	Yes	Yes	Yes	Interim	17.5	42	2	2	15	No
Hancock	Yes	Yes	Yes	Yes	None	12.5	31	39	2	13	No
Hartford	Yes	Yes	Yes	Yes	None	12.5	70	19	2	1	Yes
Norwich	Yes	Yes	Yes	Yes	None	12.5	56	16	0	4	Yes
Pittsfield	Yes	Yes	Yes	Yes	Interim	17.5	22	5	0	5	Yes
Pomfret	Yes	Yes	Yes	Yes	None	12.5	45	?	1	8	Yes
Randolph	Yes	Yes	Yes	Yes	None	12.5	37	22	0	2	Yes
Rochester	Yes	Yes	Yes	Yes	None	12.5	26	8	1	3	Yes
Roxbury	Yes	Yes	Yes	Exp.	Interim	7.5	6	?	1	1	No
Royalton	Yes	Yes	Yes	Yes	None	12.5	27	7	0	2	Yes
Sharon	Yes	Yes	Yes	Yes	Interim	17.5	22	5	1	3	Yes
Stockbridge	Yes	Yes	Yes	Yes	None	12.5	48	6	0	8	Yes
Strafford	Yes	Yes	Yes	Yes	None	12.5	30	17	1	5	Yes
Tunbridge	Yes	Yes	Yes	Yes	None	12.5	21	5	0	3	Yes
Washington	Yes	Yes	Yes	Yes	None	12.5	25	?	2	4	No
Williamstown	Yes	Yes	Yes	Yes	None	12.5	81	4	1	6	No

[1]The River corridor protection eligibility criteria for a 17.5% Emergency Relief and Assistance Fund (ERAF) rate can be met through Community Rating System participation (CRS), River Corridor by-law adoption (By-law), or temporarily through early adopter status for communities that adopted some river corridor protections before October 2014 (interim).

Appendix D. Responsiveness Summary

Vermont Department of Environmental Conservation

Agency of Natural Resources

Responsiveness Summary to Public Comments Regarding:

White River (Basin 9) Tactical Basin Plan

On October 1st, 2024, the Vermont Department of Environmental Conservation (DEC) of the Agency of Natural Resources (ANR) released a final draft of the White River (Basin 9) Tactical Basin Plan for a public comment period. Press releases were sent out to regional publications by DEC, the White River Partnership, the White River Natural Resources Conservation District, and Two Rivers Ottauquechee Regional Commission informing the public of the public comment opportunity. The public comment period, which ended on October 31st, 2024, included two public meetings on October 17th and 24th, 2024. Comments were received either during the formal public comment meetings or written comments were submitted via email or mail.

2024 meetings for public comment include:

- October 17 – 6:00 PM – Royalton Academy Building, 4182 VT Route 14, Royalton, VT 05068 – Hybrid Meeting & Presentation (6 Attendees)
- October 24 – 6:00 PM – Bethel Town Hall, 318 Main Street, Bethel, VT 05032 – Hybrid Meeting & Presentation (5 Attendees)

The DEC prepared this responsiveness summary to address specific comments and questions and to indicate how the plans have been modified in response to public comment. Comments may have been paraphrased or quoted in part, and similarly comments are grouped and answered collectively when appropriate. The full text of the comments provided for each plan is available for review by contacting the Water Investment Division.

Comments & Responses

Comment 1: Monitoring on pages 21-22: Monitoring data is shown in a good condensed graphic. The plan states on page 22, "If a stream has macroinvertebrate and fish communities consistently at or near a reference level condition, it is a candidate (our emphasis) for increased protection through upward reclassification." Our position is that upward classification is required at that point, and even should it not be required by law it is in the public interest to do so. The plan notes on page 22 that twelve streams were found to be in 'Excellent' condition for macroinvertebrates, and twenty-six were in 'Very Good' or better condition. The plan then notes, "Streams in Very Good or better condition exceed the VWQS criteria for B(2) classification and are priorities for additional assessment and protection." ANR has failed for over twenty years to make this a priority. Additional assessment is not needed. Additional

protection through a B1 classification is needed. Similarly on page 22, "Of the 34 sites where fish communities could be assessed, 21 (62%) had fish communities in Excellent or Very Good condition, indicating the fish communities at these sites exceed the VWQS for class B(2) streams." Yet, there is somehow no movement by ANR on a reclassification to B1.

Response 1: Pursuant to 10 V.S.A. § 1253, the Agency of Natural Resources Secretary determines whether to initiate rulemaking to reclassify a surface water when it is in the public interest, based on a technical evaluation and public comments received. DEC has historically relied primarily on external petitions and supporting information to consider surface waters for reclassification. We look forward to working with TRORC on efforts to protect Vermont's highest quality waters and agree that reclassification is one of several protection tools. For additional information regarding the reclassification process and example petition(s), please visit Vermont's Stream Reclassification webpage.

Comment 2: Classification on pages 34-38: TRORC has done considerable work in the past analyzing ANR data and suggested many waterbodies suitable for A1 and B1 classification for some uses. In general, ANR has taken a data-heavy approach on what is needed to support designation and we have stressed that is not required in some cases. For example, waters above 2,500 feet that flow down through remote forests have little change when that pass that mark, and certainly it is hard to argue that values such as aesthetics or habitat vary crossing that line. Fourteen years ago, we reviewed every stream in the basin based on aerial photography of land use, land cover and roads and identified the likely break point where there might be a conservative reason to remain at B2 instead of moving them to A1. We also looked at DEC biotic data and suggested many waters that have some kind of development near them as B1, as there was data that showed they are worthy of B1 for aquatic biota. The plan itself notes on page 38 just ten additional waters attaining quality above B2. There remains no legal basis for ANR to not use reasonable assumptions for classification proposals or the data it possesses.

Response 2: The Vermont Water Quality Standards establish a data driven approach in assessing surface water candidates for reclassification (see Appendix G - Application of biocriteria for fish and macroinvertebrate communities in Vermont wadeable streams and rivers). Water quality can be degraded by poor land use practices, even in predominately forested watersheds. For example, not following Vermont's Acceptable Management Practices for Maintaining Water Quality on Logging Jobs can degrade water quality. While the Department utilizes land cover/land use analyses to help prioritize water quality monitoring sites, ambient water quality data is necessary for assessment. The Vermont Water Quality Standards establish designated uses, management objectives, and minimum water quality criteria that all surface waters must meet. Surface waters are classified independently for each designated use. The Vermont Water Quality Standards and the Assessment and Listing Methodology describe the methods used for assessing lakes and streams relative to the minimum water quality criteria.

Comment 3: Petitioning on page 35: The draft is inaccurate by only saying that the public may petition to reclassify streams or designate ORWs. 10 VSA 1253 clearly states that ANR "on its

own motion" may do so. This fact should at least be included in the plan. Why ANR has not chosen to use this power remains a shameful mystery, since it is the agency charged with protecting these waters. However, that it can do so is beyond a doubt.

Response 3: The public may petition the Agency to reclassify surface waters or consider designation of Outstanding Resource Waters through rulemaking, but the Agency may initiate reclassification of its own motion through rulemaking for the Vermont Water Quality Standards when reclassification is in the public interest.

Comment 4: B1 criteria for fishing on page 39-40: The plan notes that "34 streams meet the B1 criteria for recreational fishing." These are listed in Table 6. However, the plan does not say ANR will seek to classify them as B1, which it should.

Response 4: DEC recognizes that fishing activities in streams and rivers are widespread and too numerous to thoroughly document for the White River Basin. In the case of streams too small to support significant fishing activity, the VANR recognizes these as potential spawning and nursery areas, which contribute fish stocks downstream where fishing may occur. These small streams support the use of fishing and therefore are protected at a level commensurate with downstream areas.

Comment 5: Existing uses, page 42: the plan notes that "ANR stipulates (our emphasis) that all lakes and ponds in the state have existing uses of swimming, boating, and fishing. The ANR recognizes (our emphasis) that fishing activities in streams and rivers are widespread and too numerous to thoroughly document for the basin." The unwary reader may think these are the same, but they are not. ANR in fact has very few waters where it acknowledges that fishing is an "existing use", an important term of art. TRORC has maintained and continues to maintain that if you could toss a hook in and catch a fish at some time since 1975, that is an existing use for fishing. ANR should stipulate that as well for at least all second order streams in the basin. The existing use table at https://dec.vermont.gov/sites/dec/files/wsm/mapp/docs/pl_WhiteRiverUsesFishing.pdf is woefully inadequate to cover fishing.

Response 5: Pursuant to the Vermont Water Quality Standards, an Existing Use means a use that has actually occurred on or after November 28, 1975, in or on waters, regardless of whether or not the use is presently occurring or included in these rules. For Existing Uses of waters, the level of water quality necessary to protect those existing uses shall be maintained and protected regardless of the water's classification. Further, because fishing is protected as a Designated Use by the Standards, an assignment of fishing as an Existing Use to any water already classified as Class B2 or higher is redundant and therefore not necessary.

Comment 6: Thank you for including in the final draft that ANR has enforcement powers and the important role that enforcement has in ensuring compliance.

Response 6: Duly noted.

Comment 8: Road and Bridge Standards, page 66: Vermont towns have gotten very good at having road and bridge standards. They are less good at actually paying attention to them. ANR or VTrans should do more to audit towns compliance with their standards.

Response 8: Projects that receive VTrans-administered grant funding are reviewed for compliance with Road and Bridge or MRGP Standards as part of the application and reimbursement processes. This ensures projects receiving state or federal funds are designed and then constructed in accordance with the applicable standards. VTrans Districts do not have the additional capacity to monitor municipal transportation projects that do not use state or federal funds.

Comment 9: Septic systems on page 71: Vermont has a myriad of legacy septic systems that have no design, and are even a mystery to their owners. This is especially problematic along streams and lakes. This should at least be mentioned in the plan. Better yet would be a proposal for ways to assess these, perhaps by requiring a dye test prior to any property transfer for properties within a certain distance of surface water.

Response 9: While it is outside the scope of the basin planning process to recommend additional regulations, we recognize the potential for all failed or inadequate septic systems, including 'legacy' systems of unknown design/location, to potentially impact adjacent surface water quality. Dye testing is generally not recommended because dye testing rarely provides conclusive results due to inherent dilution and time of travel issues. However, municipalities currently may adopt ordinances or bylaws to require time of property sale inspections (per section 1-103(b)(7) of the State of Vermont's Wastewater System and Potable Water Supply Rules).

Once identified, failed systems must be addressed through the Vermont Wastewater System and Potable Water Supply Permit process to meet current standards. Failed septic systems may be identified through reports to and inspections by the local Town Health Officer and in part through DEC's Illicit Discharge Detection and Elimination studies noted on Page 62 of the TBP. The suitability of on-site septic systems may also be evaluated after certain triggering events, such as a seasonal dwelling's change to year-round use or increase in wastewater system design flow, such as by adding one or more bedrooms.

Tactical Basin Plans generally focus on community outreach to address potential septic system concerns adjacent to surface waters. The plan encourages Wastewater Workshops – community events for landowners to learn about septic system function, maintenance, and potential technical and financial resources to support maintenance and upgrades – in any basin community where there may be interest, especially along impaired rivers or ponds or those with trending water quality concerns (see Strategy #11).

Comment 10: Woody debris on page 78: The Process-based Restoration section should include work ANR does through the stream alteration permitting to regulate clearing of woody debris.

Response 10: The following language was added to the basin plan (Page 78) to capture the role of stream alteration permits to regulate woody debris clearing:

> "Wood addition and wood removal from stream channels is regulated by ANR via the Stream Alteration Rule. The re-introduction of wood to wood-starved channels is a restoration focus in the basin, through the use of strategic wood addition and process-based wood addition restoration. Strategic wood and process-based wood addition restoration projects are generally located in small streams, under 20 ft wide, and are away from developed areas and transportation infrastructure. These projects provide important areas in headwater streams to help trap sediment and other wood along the length of the stream system; helping reduce what is transported to the larger downstream rivers. Recent wood and other debris removal done after historic flooding in 2023 and 2024 is only necessary in limited instances to protect life or property from fluvial erosion hazards. The Stream Alteration Rule ensures that excessive woody debris removal does not significantly impact the dynamic equilibrium of local stream processes. Wood addition and wood removal projects are reviewed for level of permitting requirements based on their complexity, location, risks to other infrastructure, channel stability, flood response, goal of the project, and other relevant data for the site and project."

Comment 11: Aquatic passage on page 79: There does not appear to be a mention of culverts and bridges that carry water needing stream alteration permits for upsizing, and such upsizing should be noted as both an aquatic passage and flood prevention strategy. Additionally, the work done by private individuals to repair and replace undersized bridges and culverts needs more diligence from the agency in terms of permitting as these often are not required to meet standards when they are substantially damaged in floods.

Response 11: The following language was added to the basin plan (Page 80, end of first AOP Working Group Paragraph) to capture the role of stream alteration permits in flood resilience and aquatic organism passage:

> "Vermont's Stream Alteration Rule and permit ensures that any new or replaced structures are required to meet these sizing standards that generate water quality, flood resilience, and aquatic habitat benefits."

Regarding private structures, the Agency of Natural Resources has adopted the Stream Alteration Rule pursuant to 10 V.S.A. § 1027 and 10 V.S.A. Chapter 165. This Rule applies to all stream alterations, including by private individuals, in both emergency and non-emergency circumstances. All crossings deemed not to be repairable after a flood event (i.e., damages are >50% the cost of structure replacement) shall be removed following applicable law or replaced with a permanent structure that meets the standards set in the Stream Alteration Rule. Violations of this Rule are subject to enforcement under applicable Vermont law, including 10 V.S.A. Chapter 41 and 10 V.S.A. Chapters 201 and 211. Violations of this rule can be reported to The

VT Department of Environment Conservation's Environmental Enforcement Office (EEO). Information on how to report an environmental violation can be found on their Violation Reporting site.

Comment 12: Lastly, the above comments should be translated into actions in the table on pages 96-104.

Response 12: As noted in the responses above, many comments are outside the scope of revision for a single basin plan. However, we have noted where B9-specific strategies are relevant, or where we have changed language within this TBP because of the comments received above.