MORETOWNPLAN

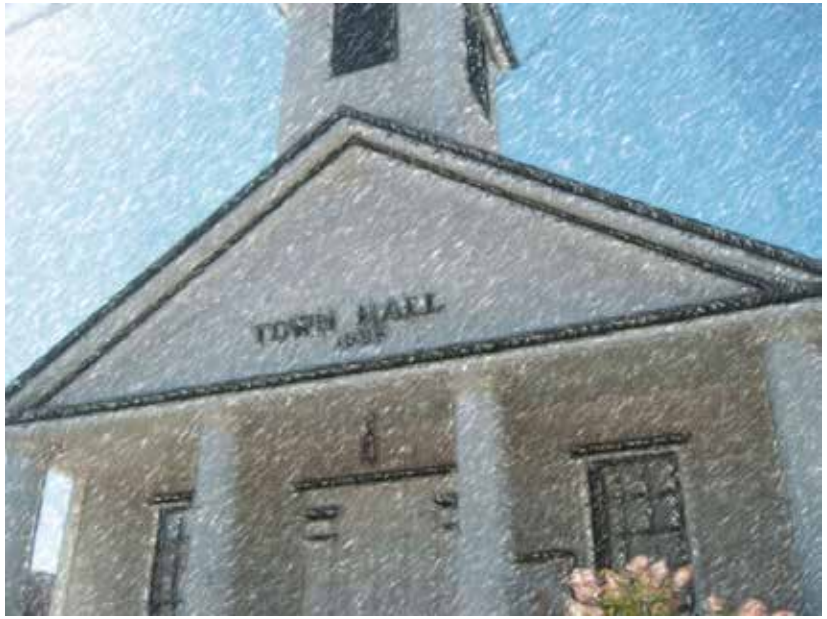
With technical assistance from PlaceSense and supported by a Municipal Planning Grant from the Vermont Department of Housing and Community Development.

PART 1. OUR VISION AND GOALS

CHAPTER 1A. VISION

It is our vision that Moretown will grow...

- To become a more inclusive and connected community whose different areas identify as a cohesive whole.
- More small-scale, clean and homegrown businesses.
- As a vibrant, affordable and family-oriented town with access to quality schools, recreation opportunities, full broadband service, and transportation alternatives.
- Creatively and responsibly in order to preserve and sustain our rural character and culture.



CHAPTER 1B. GOALS

Our goal is for Moretown to be a community that...

Overall. Balances efforts to provide for locally-generated economic and housing development with protection of our natural resources and historic settlement patterns of compact villages surrounded by rural countryside.

Land Use. Plans development to build a cohesive network between our existing settlement areas while preventing rural sprawl.

Housing. Has safe, affordable and energy-efficient housing choices for families and residents of all ages and income levels.

Economic Development. Fosters and supports a vibrant, homegrown economy built primarily on small businesses that:

- Takes advantage of our location, natural resources, scenic beauty, and residents' skills and talents;
- Creates employment, expand the tax base, provide goods and services locally; and
- Maintains high environmental standards and the rural character of our community.

Farming and Forestry. Bases our homegrown economy on farm and forest industries that keeps land in productive use and preserves our rural character. Expands the production and marketing of local food and other farm or forest products.

Resource Extraction. Uses natural resources responsibly and efficiently. Manages resource extraction to avoid, minimize or mitigate adverse impacts on environmental quality, rural and scenic character, and quality of life in our community.

Resource Preservation. Identifies, protects and preserves important natural and historic features of our landscape by:

- Investing in land conservation of special natural and fragile resources, and preservation of historic structures;
- Promoting responsible use and stewardship of our resources; and
- Managing development to avoid, minimize or mitigate adverse impacts on our resources.
- Environmental Quality. Maintains and improves the health and quality of our air, water, wildlife and land resources by:
- Promoting responsible use and stewardship of our land, rivers and natural environment;
- Managing development to avoid or mitigate adverse impacts; and
- Guiding growth away from hazards and locations poorly suited for development.

Recreation. Sustain a high quality of life for residents and attracts visitors to Moretown by:

- Establishing and responsibly using an interconnected network of Class 4 roads, trails and paths.
- Preserving and enhancing access to and enjoyment of our rivers; and
- Supporting and expanding arts and music events.

Transportation. Improves the sustainability, affordability and efficiency of our transportation system by:

- Promoting safe and convenient alternatives to single-occupancy vehicle trips;
- Supporting grant funded construction for pedestrian access; and
- Guiding development towards more compact and mixed-use settlement patterns.

Energy. Uses energy more efficiently. Increases the amount of renewable energy generated in Moretown at a scale that does not compromise the rural and scenic character of our landscape, nor the health and integrity of our natural environment.

Public Facilities and Services. Plans for, finances, develops and maintains an affordable and efficient system of community infrastructure, utilities, facilities and services as needed to support growth and development while maintaining our rural character and culture. Supports efforts of town government to effectively manage that system in a manner that is responsive and transparent to our citizens.

Education. Continues to have a public school system that attracts families to live in Moretown and strengthens our sense of community. Broadens access to affordable, high quality educational and vocational training opportunities by expanding:

- Opportunities for students of all ages to learn from and contribute to the success of local businesses and organizations;
- Regional coordination and sharing of educational resources;
- Access to educational technology and distance learning; and
- Use of local, informal learning and training networks.

Child Care. Is a family-friendly community that has safe, affordable and convenient childcare options for parents.

PART 2. ABOUT OUR TOWN PLAN

CHAPTER 2A. PURPOSE

Simply put, the purpose of the Moretown Plan is to state our vision for the town and recommend strategies for achieving that vision.

The Moretown Plan is a comprehensive, long-range plan for our town's future. This plan:

- Describes the forces that have shaped our history.
- Analyzes our current condition.
- Expresses our shared community values and aspirations.
- Examines the forces that have potential to change our community in the future.
- Establishes goals and policies for guiding and managing change in a manner consistent with our shared values and community aspirations.
- Complies with Vermont's municipal planning laws.

The plan provides a useful reference for local and state officials when making decisions affecting our community, and it may be used to inform anyone interested in Moretown's history, resources, challenges and policies. In particular, this plan establishes a framework within which Act 250, Public Service Board and other state, as well as local, permitting will take place.

CHAPTER 2B. USE

The Moretown Plan serves multiple purposes. A clear understanding of those purposes is necessary to properly interpret the plan.

The plan contains both aspirational and visionary statements, and specific policies that apply in regulatory proceedings. It attempts to broaden our understanding of a wide range of issues affecting Moretown, while also calling for town government and others to take specific actions on some matters.

To properly interpret this plan, it is important to distinguish between aspirations, recommendations, and requirements. The vision and goals expressed in Chapter 1 describe an ideal future Moretown and are stated as what "will be." These are our aspirations. Throughout, the plan recommends various policies, strategies, approaches and actions. The recommendations of other plans and studies are summarized or presented, and best practices are described.

It is only within Parts 4 and 5 that specific policies and actions are stated, some of which are intended to be requirements when applied in a regulatory context. The choice of words indicates whether a stated policy or action is a recommendation or requirement. Words like "should," "may" and "encourage" indicate that the statement is a recommendation; while words like "must," "prohibit" and "require" indicate that the statement is a requirement.

Community Assessment. To effectively guide growth and change in our town, we should be aware of Moretown's strengths and weaknesses and anticipate the factors that may influence the future of our community. Preparing this plan provided us with a structured process for assessing the community's past,

taking stock of current conditions, and predicting future trends and influences. That process of community assessment and discussion regarding Moretown's future was as important as this resulting document.

Part 3 of this plan summarizes our assessment of Moretown's past and present condition. We do not intend for this chapter to be used or applied in a regulatory context. Rather it is the factual, analytical and public opinion foundation for the policies and actions expressed in Parts 4 and 5.

Balance Conflicting Interests and Articulate a Vision. This plan recognizes that residents hold a diversity of opinions and attitudes about the town's future, particularly the policies and actions we should pursue, and that even when we do agree it is still possible for goals to conflict with one another. Therefore, this plan strives to provide an effective framework and process for forging consensus and balancing competing interests, identifying issues in which consensus is not possible, and resolving future conflict.

Part 1 presents a vision statement and broad goals for Moretown expressing in general terms the community values and aspirations for the future of our town that are shared by most residents. The vision statement and broad goals are intended to be a guiding framework within which more specific policies, actions and regulations should be debated, adopted, implemented or interpreted. Given that they are expressed in broad, general language, the vision statement and goals cannot on their own be used or applied in a regulatory context and must be interpreted in conjunction with the more specific policies and actions found in Parts 4 and 5.

Town Land Use Planning and Regulations. One of the primary purposes of this town plan is to describe how we – Moretown residents – want our community to grow and develop over time. By state law, the plan must establish the type, location, form and intensity of future growth and development in town. The land use section in Part 3 serves as our future land use plan. That future land use plan is then implemented through land use (zoning and subdivision) regulations. By state law, land use regulations must be based on and implement the policies of the town plan.

Moretown first adopted zoning regulations to implement a community land use plan in 1977. Those regulations served the town during two decades of rapid growth. In 2000, the regulations were comprehensively reevaluated and revised to correct deficiencies and address development pressure. During the ensuing years, there have been only minor changes to the land use plan and regulations in most of town, with the exception of Moretown village.

As we continue to evaluate and improve our zoning regulations and districts, this plan should serve as the blueprint for possible future changes. Parts 4 and 5 recommend some specific changes to our currently adopted zoning regulations to more effectively implement this plan.

In addition to regulating the future use or development of land, we may have the opportunity to help conserve open space and protect important natural resources for future generations of Moretown residents. The assessment of our natural environment in Part 3, and the policies and actions in Parts 4 and 5 should be used to help establish conservation priorities and identify those properties, features or resources that are most deserving of protection.

Capital Budgeting and Planning. One of the primary functions of town government is to plan for, raise funds for, and efficiently provide public facilities and services. This plan is intended to help guide the town's decisions about raising and spending funds for public improvements, facilities and services.

Moretown maintains a capital budget, which links this plan with the town's annual budgeting process by identifying, prioritizing and scheduling major capital investments over multiple years to prevent budget and tax rate fluctuations. By state law, projects included in the capital budget must implement the policies and recommendations of this plan.

Part 3 identifies the need or desire for various public improvements, facilities and services. Parts 4 and 5 establish policies and actions to guide prioritizing and meeting those needs or desires in a cost effective manner.

State Development Regulations. Many state regulations, most importantly Act 250 (statewide land use review process for large development projects) and Section 248 (statewide review process for electric generation or transmission and other utility projects), are required to consider the policies established in a town plan as part of the review and permitting process. The Selectboard and Planning Commission both have automatic "party status" under Act 250, and are now party status under Section 248, allowing either or both to represent the town's interests in these state regulatory processes.

Act 250's Criterion 10 requires applicants to demonstrate that their project is "in conformance" with the town plan. When deciding whether to issue a Certificate of Public Good under Section 248, the Public Service Board must give "due consideration" to the town's recommendations and any land conservation measures in the town plan.

Any determination of conformance with this plan or specific recommendations made on behalf of the town must be based upon the policies and actions expressed in Parts 4 and 5. Those statements of the town's policy or position may refer to more specific language within the zoning regulations, which should then also be considered in any state regulatory process.

Economic Development. This plan also addresses how the town government, private businesses, economic development agencies, and other regional entities can coordinate their efforts to foster a healthy local economy.

Part 3 analyzes our local economy, and identifies needs and opportunities for economic development. Parts 4 and 5 establish policies and actions to support economic development, particularly through the provision of facilities and services and by creating a regulatory climate that encourages business growth and expansion in appropriate locations.

Other Policies and Programs. Development regulations are not the only forum in which it is important for Moretown to have clearly articulated policies and strategies. Other decisions of neighboring town governments, state or federal agencies, or non-profit organizations may affect our community's future (ex. transportation improvements, environmental protection, land conservation, economic development, education, etc.).

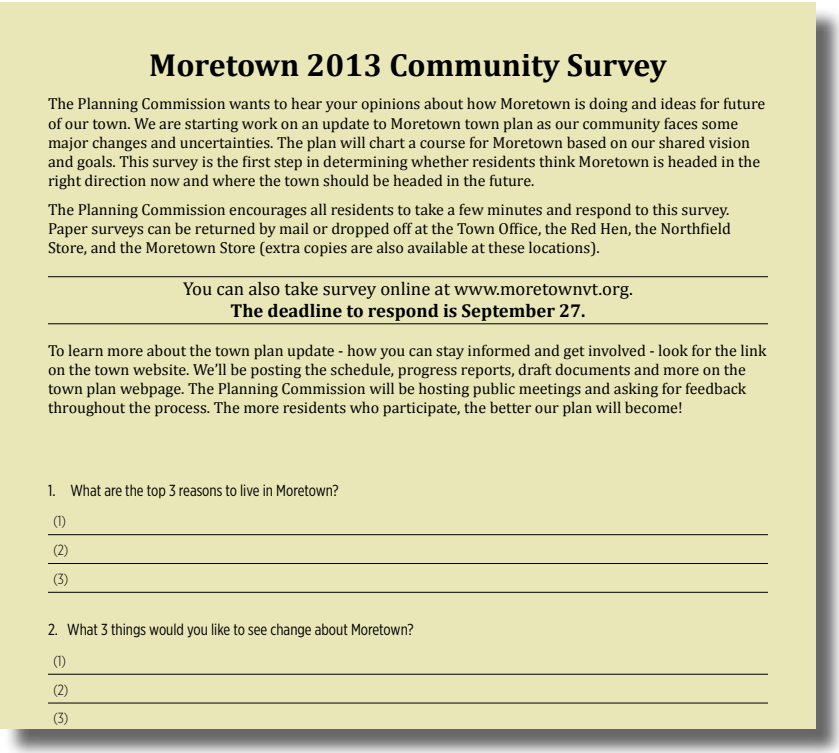
In some instances, public agencies and private organizations may informally seek guidance from town government to ensure that their activities are compatible with the community's values and vision. This is increasingly the case with competitive grant programs where conformance with the town plan is often an important eligibility requirement.

The policies and actions expressed in Parts 4 and 5 should guide any recommendation or position taken by Moretown or other entity representing the town's interests. Parts 4 and 5 also identify potential projects and improvements that the town or other entities may pursue with grants or other outside funding sources to implement our town's goals and policies.

CHAPTER 2C. AUTHORITY

Vermont state law (24 VSA, Chapter 117, The Vermont Municipal and Regional Planning Act) authorizes, but does not require, municipalities to adopt a plan. This plan was prepared by the Moretown Planning Commission and adopted by the Moretown Selectboard in accordance with state law.

As described below, the Planning Commission engaged in an open, comprehensive planning process that invited public participation and has prepared a plan that is consistent with state law. While the plan meets state requirements, it does so in a manner that responds to Moretown's specific conditions and needs, and our unique vision and aspirations for the community's future.



Moretown 2013 Community Survey

The Planning Commission wants to hear your opinions about how Moretown is doing and ideas for future of our town. We are starting work on an update to Moretown town plan as our community faces some major changes and uncertainties. The plan will chart a course for Moretown based on our shared vision and goals. This survey is the first step in determining whether residents think Moretown is headed in the right direction now and where the town should be headed in the future.

The Planning Commission encourages all residents to take a few minutes and respond to this survey. Paper surveys can be returned by mail or dropped off at the Town Office, the Red Hen, the Northfield Store, and the Moretown Store (extra copies are also available at these locations).

You can also take survey online at www.moretownvt.org.
The deadline to respond is September 27.

To learn more about the town plan update - how you can stay informed and get involved - look for the link on the town website. We'll be posting the schedule, progress reports, draft documents and more on the town plan webpage. The Planning Commission will be hosting public meetings and asking for feedback throughout the process. The more residents who participate, the better our plan will become!

1. What are the top 3 reasons to live in Moretown?

(1)
(2)
(3)

2. What 3 things would you like to see change about Moretown?

(1)
(2)
(3)

CHAPTER 2D. PLANNING PROCESS

Moretown residents value their ability to participate in the process of making local decisions. This town plan offers Moretown residents a direct opportunity to guide the policies and actions of town government and to shape how those decisions may affect our community's future. Recognizing this, the Planning Commission worked to involve as many Moretown residents as possible in the process of preparing this plan. Specifically, the Planning Commission:

- Distributed a town wide survey at the start of the planning process to gauge public opinion on the range of topics included in this plan. The purpose of the survey was to assess how residents felt about the current condition of our town, how residents want the town to change or not change over time, and what residents think are the major issues facing the town. The Planning Commission used the survey responses to help guide revisions to the plan, ensuring that this plan reflects what town residents think about our town today and want it to become in the future. The survey results are incorporated throughout Part 3, and the full report of survey results is incorporated into this plan as Appendix B.
- Hosted a community workshop to start work on the vision statement and broad goals expressed in Part 1.
- Hosted a community workshop to discuss the town's fiscal health and economic development opportunities.
- Hosted a community workshop in coordination with the Moretown Energy Group to discuss renewable energy and energy conservation issues.

CHAPTER 2E. COMPATIBILITY AND CONSISTENCY

Due to our geography, dispersed settlement pattern, small population, and limited resources, it has always been and will continue to be necessary for Moretown to work with adjacent communities to efficiently and affordably serve residents. Many of our needs, issues and goals are shared by other Vermont towns – both in our neighborhood and around the state. This plan identifies opportunities for ongoing or further cooperation and coordination to achieve common goals and objectives with neighboring communities, our region and the state as a whole.

It is conceivable that our vision, goals or policies could conflict with those of a neighboring community, the region, or the state. This plan includes an assessment of the compatibility and consistency of this plan with the plans of neighboring municipalities and the region, and the statewide planning goals expressed in the Vermont Municipal and Regional Planning Act.

2E-1. WITH STATE LAW

The Vermont Municipal and Regional Planning Act establishes guidelines for town plans. The plan must be consistent with statewide planning goals and must at a minimum include 12 specific elements.

The broad goals expressed in Part 1 of this plan are modeled on and consistent with Vermont's statewide planning goals. The Moretown Plan includes the following elements required by the Act:

- **Land Use Plan and Map.** See Chapter 3G, 4B and 5B of this plan.
- **Transportation Plan and Map.** See Section 3E-1, and Chapters 4D and 5D of this plan.
- **Utility and Facility Plan and Map.** See Sections 3E-2 and 3E-3, and Chapters 3F, 4D, 4E and 5D of this plan.
- **Resource Preservation Statement.** See Chapters 3A, 3D, 4A and 5A of this plan.
- **Educational Facilities Plan and Map.** See Section 3F-6 and Chapters 4E and 5D of this plan.
- **Implementation Program.** See Part 5 of this plan.
- **Compatibility Statement.** See Chapter 2A of this plan.
- **Relationship to Neighboring Towns and the Region.** See Chapter 2A of this plan.
- **Energy Plan.** See Section 3C-4, and Chapters 4C and 5B.
- **Housing Element.** See Section 3C-2, and Chapters 4B and 5B.
- **Economic Development Plan.** See Section 3C-3, and Chapters 4C and 5B.
- **Flood Resilience Plan.** See Section 3A-6, and Chapters 4C and 5B.

2E-2. WITHIN OUR REGION

Moretown has a long history of coordination with the Central Vermont Regional Planning Commission (CVRPC) and regularly benefits from assistance provided by CVRPC staff. The Planning Commission reviewed and considered the Central Vermont Regional Plan as this plan was drafted.

The Central Vermont Regional Plan, last revised in 2008, states that the regional plan is compatible with the plans of its member municipalities, including Moretown's previous plan. The goals, policies and actions expressed in this plan are not substantively different from the previous plan, which suggests that this plan remains compatible with the Central Vermont Regional Plan.

The regional plan supports many of the same planning concepts and approaches recommended in this plan including:

- Preservation of important historic, natural, cultural and recreational resources.
- Respect for the historic settlement patterns.
- Diversified economic development.
- More energy-efficient transportation patterns.

In 1985 the towns of Warren, Fayston & Waitsfield created a planning partnership called the Mad River Valley Planning District (MRVPD). The purpose of the MRVPD is to carry out a program of planning for the future of the Mad River Valley. The planning programs are directed toward the physical, social, economic, fiscal environmental, cultural and aesthetic well being of the member towns. The current MRVPD Steering Committee encourages Moretown to participate and the Moretown Planning Commission and Selectboard will consider options for participation on an annual basis.

2E-3. WITH NEIGHBORING TOWNS

Compatibility with neighboring towns is particularly important with regard to land use, where incompatible policies could result in conflicting development activities and land uses along town boundaries. The land use plan established in Chapter 3G of this plan emphasizes the relationship between various areas of Moretown and adjoining communities.

- This plan continues to call primarily for low-density residential and forest uses along the Berlin and Northfield town lines, which is similar to what both neighboring communities are planning for on their side of the line.
- This plan speaks to the scenic and agricultural value of the valley land along the Mad River and Route 100B at the Waitsfield town line. This plan encourages continued agricultural use and discourages residential development from locating in flood hazard areas and scenic viewsheds. These policies are similar to those expressed in the Waitsfield Town Plan for their portion of the Mad River Valley.
- This plan recognizes two planning areas along the Duxbury town line. Most of the border area is remote and relatively inaccessible and this plan continues to call for primarily low-density residential and forest uses, which is compatible with the Duxbury plan. Along the Route 100 corridor, both plans support moderate-density residential uses, agriculture and low-intensity rural businesses.
- In North Moretown, this plan continues to call for a greater intensity and mix of uses, including commercial uses along the Route 2 corridor. This is compatible with the existing and planned land use at the Duxbury and Waterbury town lines.
- Middlesex lies across the Winooski River from Moretown. The river, rail line and interstate corridor serve both to separate and link the communities. The plans for both communities emphasize discouraging development within the floodplain and enhancing the character and function of Route 2 as a major regional transportation corridor.

CHAPTER 3A. NATURAL SETTING

Moretown's natural setting and resources are the foundation for our history, community, economy and way of life.

3A-1. CLIMATE

Moretown shares with communities throughout New England a climate that is highly changeable with wide-ranging temperatures (both daily and annually) and great differences between the same seasons from year-to-year. Relative to other areas of the country, a large number of low-pressure storm systems and fronts pass over or near Vermont – commonly caused by the convergence of dry, cold air from the Canadian arctic and moist, warm air from the Gulf of Mexico. Regionally, the Green Mountains have a strong effect on precipitation. Precipitation, clouds and fog results from cooling air as the prevailing winds from the west are forced up and over the mountains.

July is usually the warmest month in the Mad River Valley with an average high temperature around 85°F and January is usually the coldest with an average low temperature around 0°F. High and low temperatures around town vary noticeably based on elevation. We receive approximately 49 inches of precipitation annually, which is fairly evenly distributed throughout the year with an average of 3 to 5 inches of precipitation per month. The growing season has historically been around 120 days long with the last frost likely during the second or third week of May and the first frost likely during the last two weeks of September – again with variation based on elevation.[1]

In describing the climate, the 1889 Gazetteer of Washington County states "Snow sufficient for sleighing frequently falls in November and remains until April." This description has not been accurate in recent years. An overall warming trend in our average temperature is evident. Spring arrives earlier, summers are hotter, and winters are less snowy.

Globally, 9 out of the 10 warmest years in the modern meteorological record have occurred since 2000. Since 1970, the average annual temperature in the Northeast has increased by 2°F, with winter average temperatures rising by 4°F. Between 1952 and 1982, the average annual temperature recorded at the Berlin airport was 42°F. Between 1982 and 2012, the average annual temperature was 43°F. The average annual temperature in Vermont is projected to increase another 3-4°F by 2050 and anywhere from 5-10°F by the end of this century.[2]

1 30-year averages generated from National Oceanographic and Atmospheric Administration climatological data from 1971 to 2000 for Waitsfield, Vermont.

2 Results of the IPCC-AR4 model projections as presented in *Global Climate Change Impacts in the United States*, U.S. Global Change Research Program and online at www.globalchange.gov/usimpacts.

Changes in winter precipitation are of particular concern in the Mad River Valley, where winter recreation is a major component of the local economy. Climate change is causing snow to become wetter and slushier, and has decreased the number of snow-covered days. Climate change projections suggest that snow season could be cut by one-third to one-half by 2050.[1] Warming is resulting in many other climate-related changes including:

- More days each year with temperatures above 90°F.
- A longer growing season.
- More storms with heavy precipitation.
- Less snow and more rain in the winter.
- Reduced snow pack and ice on lakes and rivers some winters.
- Earlier spring snow melt and break-up of ice.

3A-2. AIR QUALITY

Air quality throughout Vermont is generally very high and most areas of the state are considered "clean air" regions under the federal Clean Air Act. As such, there is limited monitoring of air quality statewide. Given the relative lack of heavy industry in Vermont, the transportation sector is responsible for most of our air quality issues, and locations with heavy traffic and congestion are the most likely to have reduced air quality. Compromised air quality can exacerbate respiration-related health problems like asthma for people in the vicinity of pollution sources.

While overall air quality in Moretown is excellent and unlikely to degrade significantly in the foreseeable future, we do have localized air quality concerns. For example:

- Emissions from vehicles idling or waiting in traffic can reduce air quality in the immediate area. 'No idling' policies, like the one that the Moretown Elementary School adopted, are one way to address this problem. State law prohibiting idling for more than five minutes in a 60-minute period (with exceptions) took effect in 2014.
- Operating heating systems properly, burning only the fuels the system is designed for, maintaining the system as recommended, and replacing old, inefficient models can minimize localized air quality problems.
- Many common activities – farming, trucking, construction, and driving on our gravel roads – can generate considerable dust. Simple measures like good road maintenance, covering loads, watering or using dust inhibitors on haul roads and at construction sites, and following accepted agricultural practices can do much to minimize air quality impacts.

The Moretown Landfill has potential to generate air pollution and affect air quality in the surrounding neighborhood. The landfill has operated under two separate state air quality permits, one for the landfill itself and another for the landfill gas electrical generation facility. Air quality is regularly monitored at and around the landfill.

The decomposition of landfill waste produces a variety of gases. The Moretown Landfill deploys a system of buried pipes that is designed to capture those gases. Methane and carbon dioxide are the major compounds generated by decomposing waste, but there are a number of other gases produced as well. A gas collection system greatly reduces air emissions from the covered portions of landfill, but it is particularly challenging to manage emissions from the open portion of a landfill when waste is being actively deposited.

1 *Climate Change in Vermont*. Vermont Agency of Natural Resources Climate Change Adaption White Paper Series. June 2011. Available online at http://www.anr.state.vt.us/anr/climatechange/Pubs/VTCCAdaptClimateChangeVTBetts.pdf.

3A-3. TERRAIN AND ELEVATION

Moretown is located in the Green Mountains. The Northfield Range crosses our southern town boundary and terminates in the northern part of town in a series of hillsides sloping towards the Winooski River. West of Moretown is the main range of the Green Mountains with a ridgeline defined by recognizable peaks like Camel's Hump. The Winooski River with its broad floodplain cuts through the mountains on its way to Lake Champlain fed by tributaries that flow in narrow valleys down the mountain slopes.

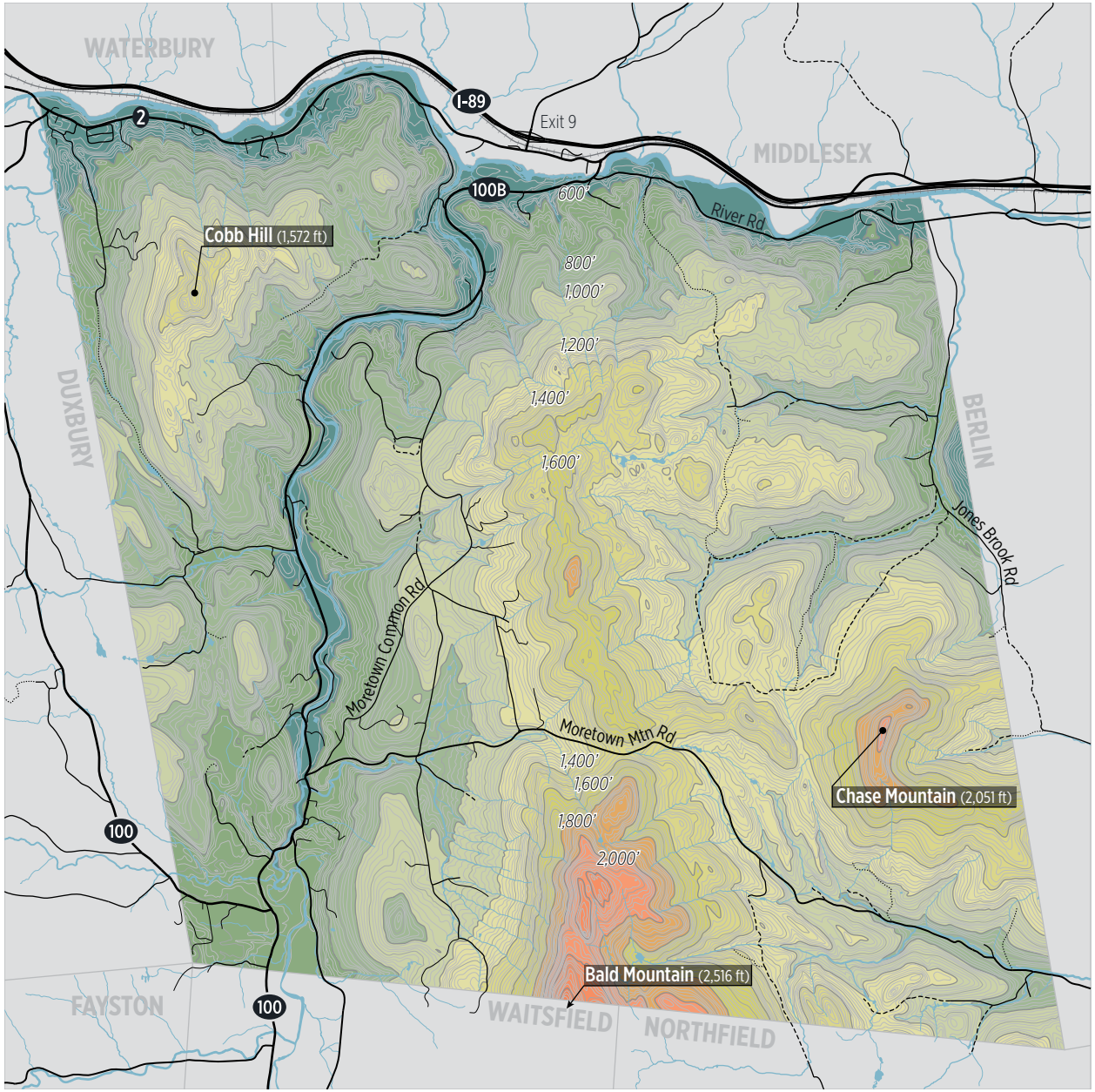
The terrain has directly shaped our town's history and development pattern. Mountains (including the unbroken, natural Northfield and Camel's Hump ridgelines) and river valleys (including the Winooski River, Mad River and Jones Brook valleys) characterize our landscape. Steep slopes and substantial changes in elevation are a common feature in Moretown as shown on the Elevation Map and Slope Map, below. The highest point in town (near the summit of Bald Mountain along the Waitsfield line) is more than 2,000 feet above the lowest point in town (where the Winooski River flows into Waterbury and Duxbury).

The mountainous terrain and steep slopes significantly limit our ability to travel from one area of town to another and restrict where development is feasible or desirable. Despite their rugged appearance, high elevations and steep slopes are fragile environments that are easily damaged by human activities. Clearing natural vegetation, disturbing soil or altering natural grades can result in high rates of erosion and run-off that can reduce water quality and damage property downslope.

The USDA Natural Resource Conservation Service has established slope categories and described the constraints and management requirements associated with each as summarized below:

- Slopes in excess of 25% are generally not suitable for development or widespread clearing for farming and forestry. Any disturbance of these severely steep slopes is discouraged and will require careful attention to erosion control and stormwater management.
- Slopes from 15-25% are generally poorly suited for development. Use of these lands for farming or forestry will require special consideration and best management practices to conserve soil and minimize erosion. Any disturbance of these moderately steep slopes will require specific measures to control erosion and manage stormwater.
- Slopes from 8-15% can generally accommodate development. Disturbance of these slight slopes may still require measures to control erosion and manage stormwater.
- Slopes of less than 8% generally do not pose any particular development constraints due to the slope itself, although level land (<3% slope) may be poorly drained and prone to ponding.

The steeper the slope, the larger the area of disturbance has to be to accommodate the development footprint as demonstrated in the figure below. The cost of development generally increases as slope and elevation increases, as does the ongoing cost of providing services to what are often remote areas. It is

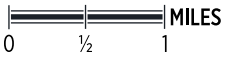


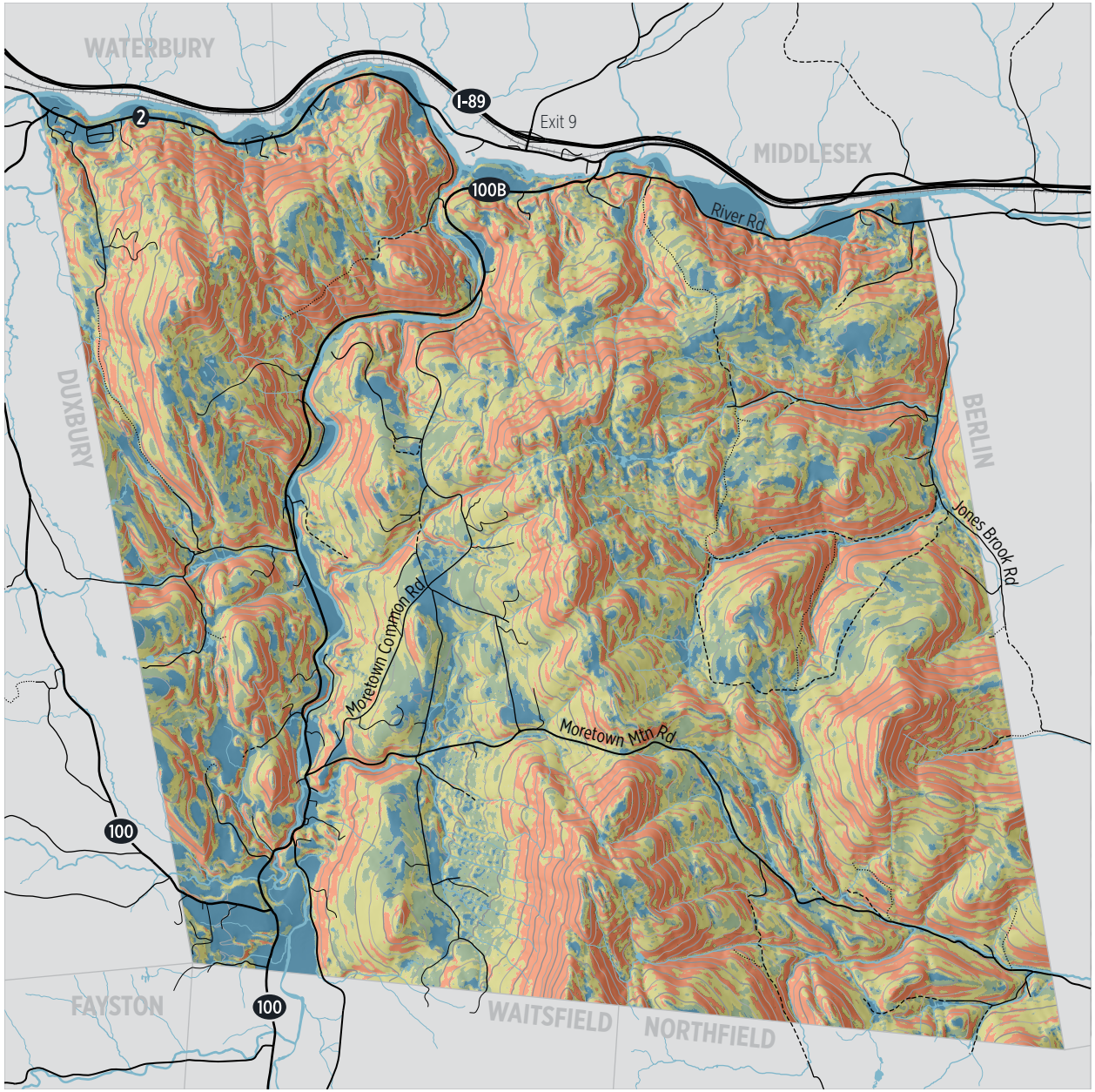
ELEVATION
MORETOWN, VT

- Below 600 ft
- 600-800 ft
- 800-1,000 ft
- 1,000-1,200 ft
- 1,200-1,400 ft
- 1,400-1,600 ft
- 1,600-1,800 ft
- 1,800-2,000 ft
- 2,000-2,200 ft
- 2,200-2,400 ft
- Above 2,400 ft

- 20 ft contours
- 100 ft contours
- 200 ft contours

Source: Contours derived from the USGS 1/3-Arc Second National Elevation Dataset





SLOPE
MORETOWN, VT

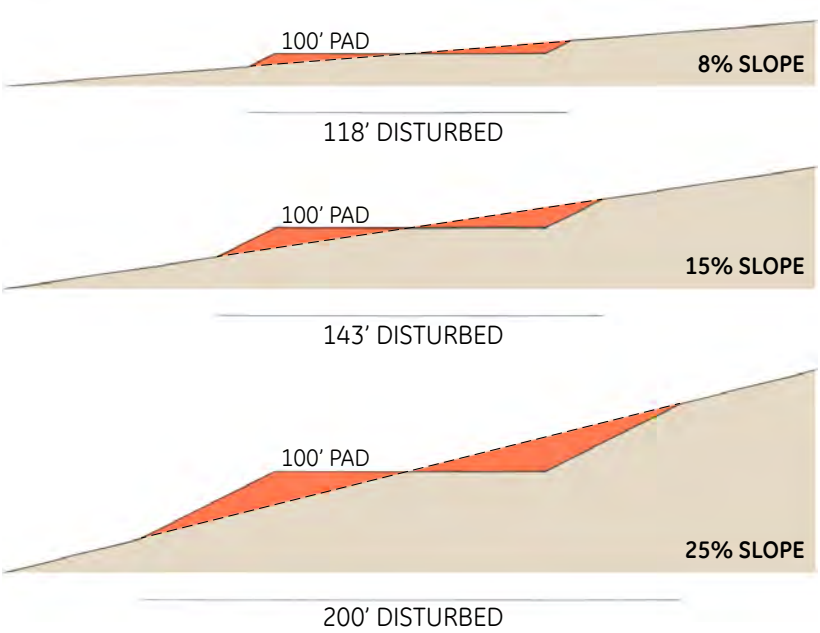
Flat to Gently Sloped (0-8%)
Slightly Steep (8-15%)
Moderately Steep (15-25%)
Severely Steep (>25%)

100 ft contours
200 ft contours

Source: Slope and contours derived from the USGS 1/3-Arc Second National Elevation Dataset

N

0 ½ 1 MILES



challenging to provide adequate access for emergency and service vehicles to development on steep slopes or at high elevations. Additionally, development on higher elevations is typically more visible than downslope development as high elevations and ridgelines are frequently visible from many locations. See Section 3D-4 of this plan for discussion of ridgeline development and scenic resources.

While land above 2,500 feet receives a higher level of protection under state law, Moretown's highest areas are just below that elevation. Approximately 4% of land in town (1,000 acres around Bald Mountain, Chase Mountain and Cobb Mountain) is between 2,000 and 2,500 feet in elevation. Much more of our land is located on steep slopes than is located at high elevation. Approximately 40% of the land in town is moderately steep (15-25% slope) and another 20% is severely steep (>25% slope).

3A-4. GEOLOGY AND SOILS

Bedrock is the most basic component of our environment. The bedrock underlying Moretown (and throughout the northern Green Mountains) consists primarily of metamorphic rocks such as schist, phyllite, gneiss and quartzite. Fragments of calcareous materials (like the talc found in Moretown) that formed under an ancient ocean are common. The Green Mountains formed millions of years ago and have eroded to a fraction of their original height. When highways were constructed through town, numerous rock cuts were needed to accommodate the terrain. Those cuts expose the bedrock that underlies Moretown, providing us with a unique opportunity to see the geological forces that created the Green Mountains.

The landscape we know today was significantly shaped by the advance and retreat of glaciers during the last Ice Age. The ice scraped and rounded the Green Mountains, widening the valleys and carving gaps through the mountains. The advancing glaciers created the iconic steep slope of the south peak of Camel's Hump, for example. The melting glacier left rocks and gravel covering the ground. This layer of glacial till covers our landscape, except for areas of exposed bedrock. The valley floors contain sediments, including sand and gravel, deposited under glacial lakes 10,000 or more years ago.

Because of their importance to our ability to grow crops, develop land, and obtain raw materials, soils are better understood and documented than many other components of our natural environment. The USDA Natural Resource Conservation Service (NRCS) maintains county soil surveys that map and inventory soils. The NRCS reports describe the characteristics of each soil type and its suitability for various uses. Section 3D-1 includes further discussion of soil productivity for farming and forestry, and Section 3D-2 includes a further discussion of mineral resources.

Soil conditions play a critical role in determining the location and intensity of development in Moretown. In addition to their suitability for supporting roads and structures, soils must be suitable for septic systems. There is no municipal sewer service in Moretown and all development relies upon on-site septic systems for waste disposal. The map below shows the general suitability of soils in town for septic systems. Approximately 60% of soils in Moretown are moderately suited to treat wastewater and 20% are marginally suited, which means that most landowners will need to build septic systems that may be more technologically advanced, more expensive, and require more land than a basic conventional in-ground system.

Since 2007, a state wastewater system and potable water supply permit has been required for every new lot and most new construction, and the town is no longer directly involved in regulating wastewater systems. While the state wastewater rules still assert a strong influence over development, the changes to the rules in the 2000s created more opportunity to develop marginal land in Moretown. With expansion in the type of septic systems allowed and other changes, we can no longer rely upon the state wastewater rules as a default means of managing land use and growth.

The state regulations also create incentives for community wastewater systems – private, in-ground septic systems that would serve two or more properties. Community systems can promote more compact development patterns with buildings being clustered in order to share common infrastructure. They also allow owners to more efficiently use smaller pockets of good soils to provide wastewater treatment for multiple properties.

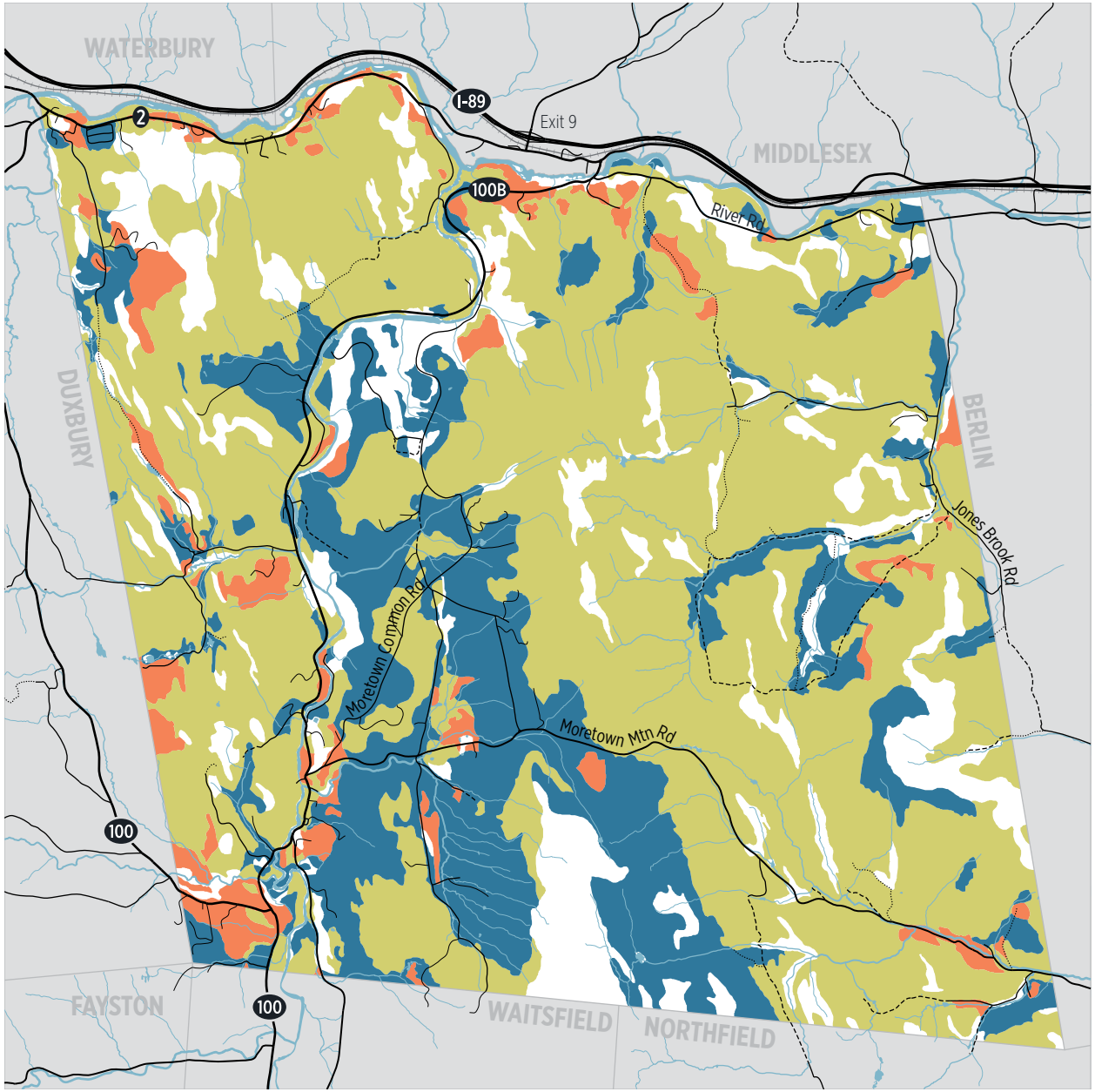
3A-5. WATER RESOURCES

Watershed

Moretown is within the Winooski River watershed, which is part of the larger Lake Champlain watershed. Most of the town drains to either the Mad River or the Dog River (two of the Winooski's seven major tributaries). A small amount of land drains directly to the Winooski River. The 1,080 square mile Winooski River watershed includes all of Washington County and portions of Chittenden, Lamoille and Orange counties – approximately 10% of Vermont's land area.

Winooski River

The Winooski River forms Moretown's northern boundary. We have more than 7 miles of frontage on the river, and Route 2 and Route 100B travel along the river. The river originates in Cabot and flows westward to Lake Champlain. Our portion of the river valley has a very gentle slope – the change in elevation from one end of town to the other is only 80 feet, an average grade of approximately 0.2%.

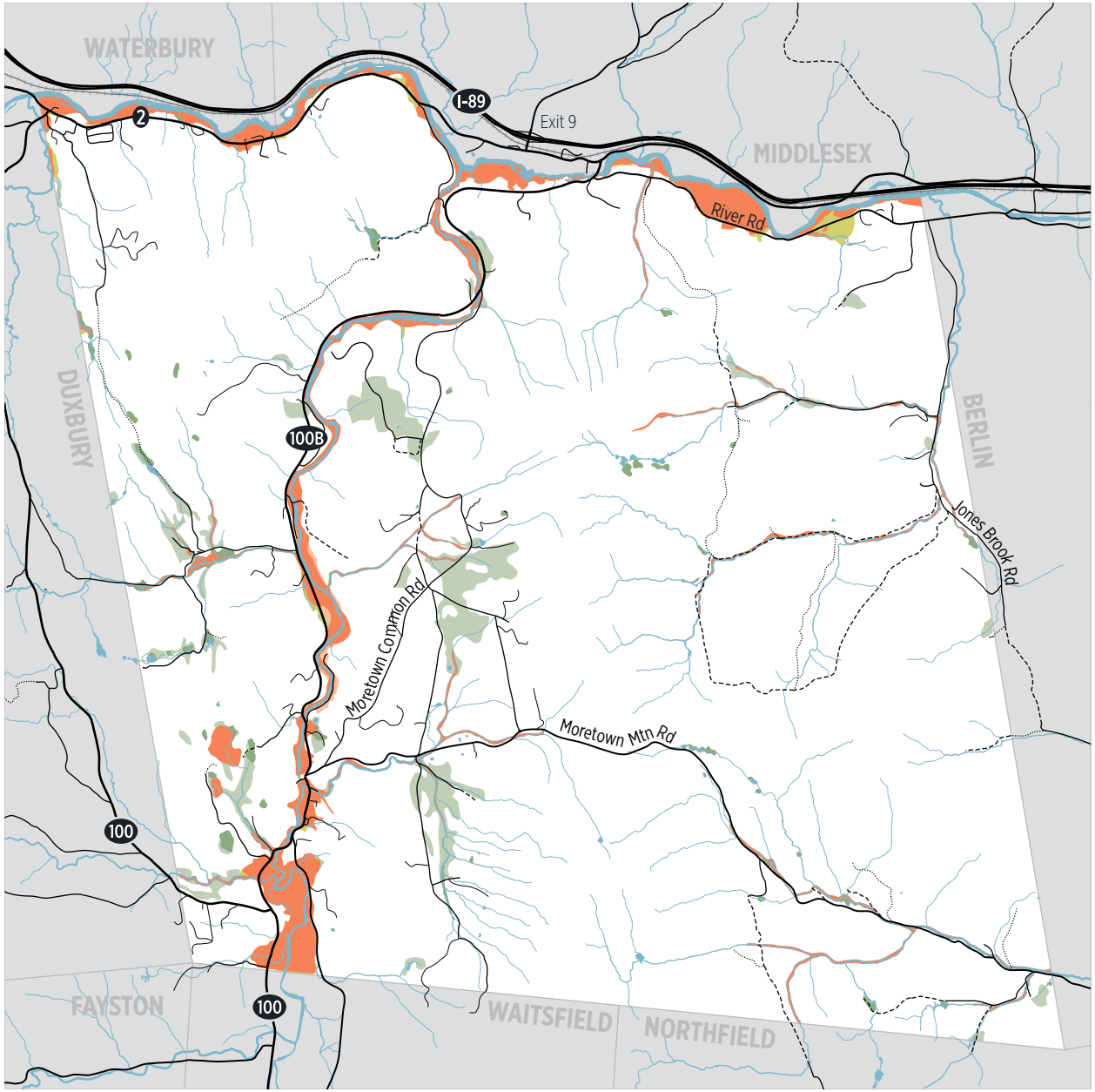


SEPTIC SUITABILITY
MORETOWN, VT

- Class I - Well suited
- Class II - Moderately suited
- Class III - Marginally suited
- Class IV - Not suited
- Class V - Not rated

Source: Natural Resource Conservation Soil Survey for Washington County, Vt. On-site sewage disposal ratings based on the 2002 Vermont Environmental Protection Rules.

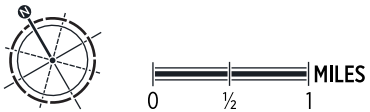
0 ½ 1 MILES



WATER RESOURCES
MORETOWN, VT

- Flood Hazard Area
- Erosion Hazard Area
- Frequently Flooded Soils
- Wetlands
- Hydric Soils

Source: Frequently flooded and hydric soils from the Natural Resource Conservation Soil Survey for Washington County, Vt. Flood hazard area from the Federal Emergency Management Agency's Flood Insurance Rate Maps. Fluvial erosion hazard area provided by Centeral Vermont Regional Planning Commission. Wetlands from the Vermont Significant Wetlands Inventory prepared by the Vermont Agency of Natural Resources. Surface waters from the Vermont Hydrography dataset.



The Winooski River valley is a vital east-west transportation corridor through the Green Mountains. Route 2, Interstate 89 and a rail line all share the relatively narrow valley floor with the river. To accommodate this transportation infrastructure and other development, the river channel has been straightened, the banks armored and berms built in an attempt control the river. There are also dams on the Winooski River that are used to regulate the river's flow and generate electricity.

All of these efforts have not changed the underlying fact that the river is designed by nature to meander around the valley floor, depositing sediment in one location while eroding it in another – and periodically surging out of its banks to cut a new channel. It is increasingly evident that we cannot engineer away these natural processes and forces. Neither can we afford to relocate major infrastructure and development further from the river. Instead, we must find a new approach to balance the needs of our natural and built environments.

The 2007 Phase I Geomorphic Assessment for the Winooski River found that land use and floodplain modifications are contributing to the river's instability. Most sections of the river are undergoing a process of geomorphic adjustment that will likely to continue to cause erosion along the banks. The assessment recommends restoration of a natural riparian corridor along the river wherever possible.

Mad River

The main stem of the Mad River enters Moretown from Waitsfield and flows 7.5 miles before emptying into the Winooski River. The Mad River is a unifying feature in Moretown's landscape, which is otherwise fragmented by the terrain. The river flows in a northerly direction and the village grew up alongside it. Much of the town's historic development was focused around the Mad River, and along the Winooski River to a lesser degree, because

the river provided both power and transportation. Route 100B travels along the Mad River creating many opportunities to enjoy the river's scenic qualities. The federal Highway Administration recognized Route 100B as a Scenic Byway in 2007. Residents and visitors alike enjoy recreating on and along the river.

The Mad River has been the focus of comprehensive, broad-based, citizen-initiated watershed planning and protection efforts. The Friends of the Mad River has been actively working to protect the river and its water quality for more than 20 years.

Dog River

While the main stem of the Dog River does not pass through Moretown, one of its major tributaries – Cox Brook – flows down the eastern side of the Northfield Range into Berlin where it enters the Dog River. The state has classified the Dog River and all of its tributaries as "wild trout waters." As productive trout

streams, the river and its tributaries are popular with anglers. There is strong interest in protecting and restoring riparian buffers along the Dog River and its tributaries to provide a suitable environment for trout, along with expanding fishing access. The benefits of riparian buffers are discussed below.

Smaller Streams and Brooks

Smaller tributaries draining portions of Moretown include Jones Brook (including its tributaries, Herring Brook and Kelley Brook), which flows directly into the Winooski River, and the upper reaches of Crossett Brook, which drains into the Winooski River in Duxbury.

Wetlands

Moretown does not have any large wetland areas, another result of our hilly terrain. Smaller wetland areas are found throughout town, as identified in the Vermont Significant Wetlands Inventory and shown on the Water Resources Map above. These are generally associated with brooks or streams. Altogether, we have less than 160 acres of mapped wetlands and the largest wetland area in Moretown is approximately 15 acres (the average size is 2½ acres).

The state Agency of Natural Resources (ANR) considers all of the mapped wetlands in Moretown to be Class 2 Wetlands. ANR updated the Vermont Significant Wetlands Inventory in 2010, which resulted in some minor changes to the extents and boundaries of wetlands in Moretown. It is possible that there are additional wetlands in Moretown that have not yet been identified and mapped. Available soil data shows areas in Moretown with hydric soils, which indicates potential wetland conditions in those locations.

Science has shown that wetlands are a necessary and valuable element of our landscape. Wetlands can filter run-off and allow water to infiltrate into the ground, recharging groundwater supplies. They can absorb and store floodwaters, reducing flood-related hazards to people and property. Wetlands are home to a variety of wildlife, aquatic and plant species, and are essential for the survival of some of these species.

Wetlands are not well suited for development due to their poor drainage and high water table. Historically, people filled in wetlands to create suitable development sites and as a result, ANR estimates that nearly 50% of wetlands statewide have been lost.[1] Filling in wetlands is no longer an accepted practice. State and federal regulations limit disturbance and development in wetland areas in order to preserve their ecological functions. Generally, all development within wetland areas will require a state permit and some projects may require a federal permit (from the U.S. Army Corps of Engineers) as well.

Groundwater

Groundwater is one of our most essential resources. Almost all residents rely on groundwater as our drinking water source. There is no municipal water service in Moretown. Homes and businesses have individual wells. Most properties have drilled wells, but there is likely still a small number that get water from dug wells or springs.

Despite our reliance on this resource, we know relatively little about the quality and quantity of groundwater available in town. Groundwater mapping has not been completed statewide and is not available for Moretown. While groundwater mapping is underway in Vermont, a relatively small area is mapped each year and it is not known when maps will be produced for Moretown.

1 *Conserving Vermont's Natural Heritage: A Guide to Community-Based Planning for the Conservation of Vermont's Fish, Wildlife, and Biological Diversity.* Vermont Fish and Wildlife Department and Agency of Natural Resources. 2004.

There is no requirement that the wells serving individual homes be regularly tested in Vermont to assess water quality. Groundwater is susceptible to contamination from the discharge of waste, chemicals and other contaminants within recharge areas. Potential contamination sources include: agricultural run-off, road salt or similar materials, fuel and petroleum products, and failed septic systems. Failed septic systems are a particular concern in higher-density areas like Moretown village. See further discussion of this issue below.

Moretown Landfill. Based on a petition from Moretown Landfill, the Vermont Agency of Natural Resources reclassified the groundwater underneath the landfill and downslope towards the Winooski River from Class III (potable) to Class IV (non-potable) in 2012.

This decision was based on the presence of elevated levels of arsenic, iron and manganese in the water from monitoring wells near the landfill. However, the groundwater uphill of the landfill also has high levels of arsenic and manganese, which suggests they are also naturally occurring elements in the area. There is also no evidence that reductions in groundwater quality downslope of the landfill are impacting surface water quality in the Winooski River.

The reclassification of groundwater under and downslope from the landfill prohibits the development of any potable water supplies within the delineated area.[1]

Public Water Supplies. The Vermont Agency of Natural Resources' Drinking Water and Groundwater Protection Division regulates and requires regular testing of public water supplies (water sources serving 15 or more service connections or 25 or more individuals at least 60 days a year, but not necessarily publicly owned). There are five public water supplies in Moretown (Moretown Elementary School, Harwood Union High School, the General Store, the Commons subdivision, and the Riverside mobile home park).

Each of these public water systems has a source water protection plan and a mapped source water protection area to avoid contamination of the water supply, as required by state and federal law. Moretown's zoning regulations currently do not apply additional restrictions on development within the mapped source water protection areas. None of the public water systems in Moretown reported any water quality violations in 2012.

Water Quality

Clean water is a basic necessity – essential for our health and the overall health of the natural environment. Federal and state laws have been enacted to improve and maintain water quality so that our rivers, streams, lakes and ponds are "fishable and swimmable." The Vermont Agency of Natural Resources (ANR) has classified all the surface waters in Moretown as Class B. When water quality falls below the standards for Class B surface waters, the state lists the water body or portion of the water body on the 303(d) List of Impaired Surface Waters as required by the federal Clean Water Act.

1 *Findings of Fact and Reclassification Order: Groundwater Reclassification at the Moretown Landfill*. Vermont Agency of Natural Resources and the Vermont Groundwater Coordinating Committee, 2012.

Respondents to the 2013 community survey indicated only a moderate level of satisfaction with water quality in our rivers and streams. While 34% thought that the overall quality of the natural environment in Moretown was excellent, only 15% thought water quality was excellent.

Impaired Waters. Currently, a 6-mile segment of the Mad River from its mouth to Moretown village is on the impaired list due to high E.coli levels. E.coli is fecal coliform bacteria, which comes from human and animal waste. The most likely sources of the E.coli present in the Mad River are failed septic systems and agricultural run-off throughout the watershed. While only the final segment of the Mad River is considered impaired, pollutants accumulate from the tributaries and main stem of the river as they combine and flow into Moretown – making the high E.coli levels a watershed-wide problem.

The state's current water quality standard for E.coli is not to exceed a geometric mean of 126 organisms/100 ml obtained over a representative period of 60 days, and no more than 10 percent of samples above 235 organisms/100ml. This is more conservative than the national standard recommended by the EPA, which is 235 organisms/100ml in a single sample and an average of 126 organisms/100ml from multiple samples. Historic and current E.coli data is available from the Friends of the Mad River, which has been monitoring water quality in the Mad River and several of its tributaries since 1986.[1]

ANR prepared a Total Maximum Daily Load (TMDL) Plan for E.coli in the Mad River in 2011. It recommends additional testing to better identify the sources of E.coli contamination. To reduce E.coli levels in the Mad River, the TMDL recommends action throughout the watershed in four areas:

- **Septic Systems.** Development should be discouraged on steep slopes and on soils not suited for septic systems. New septic systems should be properly designed and constructed. Existing septic systems should be properly operated and maintained. There should be programs to educate property owners about septic system function and identifying a failed system, and to assist property owners who need to replace or upgrade a failed septic system.
- **Agriculture.** Land adjacent to streams and rivers should be removed from production and returned to a naturally vegetated riparian buffer. Livestock should not be allowed to enter streams, rivers or riparian buffers. Farmers should be encouraged to participate in programs like the Conservation Reserve Enhancement Program (CREP) that provide incentives and assistance for actions that can improve water quality.
- **Conservation.** Efforts to conserve priority lands within the watershed should continue and be expanded. Priority lands include contiguous forestland, wetlands, and floodplains.
- **River and Riparian Corridors.** Regulations should limit further development within floodplains and river corridors. New development should retain naturally vegetated riparian buffers along streams and rivers. Property owners should be encouraged to re-establish naturally vegetated buffers where they have been removed.

Sedimentation and Erosion Control. While E.coli poses a specific hazard to human health, sedimentation reduces water quality and affects our aquatic ecosystems more broadly. Excess sediment can smother or suffocate aquatic plants and animals. It can block the sunlight aquatic plants need to thrive. Sediment can also carry other pollutants like petroleum products, metals, chemicals and fertilizers into our streams and rivers. Sedimentation also contributes to and is exacerbated by flooding.

The movement of sediment downstream is a natural process, but various human activities that change land cover and disturb

1 More information is available online at http://www.friendsofthemadriver.org.

soil (construction, agriculture, logging, road maintenance, etc.) can result in excessive erosion and sedimentation. The rate of erosion in areas with bare soil is 100 times greater than in areas that are forested. The potential for excessive erosion is greater at high elevations, in areas with shallow or poor soils, and on steep slopes. Development in these fragile areas poses direct threats to water quality, and the extension of roads and utilities to serve such development further exacerbates erosion, sedimentation and habitat loss.

Excess erosion and sedimentation can be controlled by relatively simple practices during road construction and maintenance, on construction or industrial sites, in agricultural fields, and while harvesting timber including:[1]

- Limit the area of disturbance and preserve existing vegetation. Mark boundaries and fence off areas near water bodies or wetlands.
- Limit the amount of soil exposed at any one time. As soon as work is completed in an area, stabilize the exposed soil with seed and mulch or erosion control matting.
- Provide a stabilized entrance for vehicles and equipment.
- Install silt fences on the downslope side of disturbed areas, and between disturbed areas and any water bodies, wetland, ditches or swales.
- Use berms and ditches to divert upland run-off from flowing across the disturbed area.
- Slow down channelized run-off by installing check dams in drainage channels.
- Stabilize disturbed areas before winter. Precipitation and snow melt flowing over frozen or saturated ground greatly increases the potential for erosion.
- Regularly inspect sediment and erosion control measures to ensure they are functioning properly.

As discussed below, the Vermont Department of Environmental Conservation Stormwater Program issues permits for erosion control on some construction sites (generally if an acre or more of land will be disturbed). The erosion prevention and sedimentation control measures listed above are also applicable to smaller-scale disturbances.

In Moretown, many construction projects or other activities that disturb soil fall below the threshold for a state permit. Currently, Moretown's zoning regulations do not require erosion prevention or sedimentation controls for most development (extraction and quarrying operations are required to have and follow an approved erosion control plan). Our current regulations authorize the Development Review Board to require erosion control as a condition of approval, but there are no specific standards provided within the zoning regulations.

Riparian Buffers. The word "riparian" simply means the area alongside a river, stream, pond, lake or wetland. Riparian buffers are naturally vegetated upland areas adjacent to surface waters and wetlands. Throughout Moretown, the "natural" vegetation alongside our rivers and streams would be primarily woody vegetation – trees and shrubs – except for some wetland areas that would naturally be wet meadows with primarily herbaceous vegetation.

Maintaining or restoring riparian buffers along all our streams and rivers would have multiple beneficial effects. Riparian buffers protect water quality, provide wildlife habitat, filter run-off, absorb floodwater, shade surface water (keeping it cooler), contribute to scenic character, and reduce the likelihood of human disturbance. Woody vegetation in riparian buffers intercepts rainfall, slows run-off and promotes infiltration.

1 *The Low Risk Site Handbook for Erosion Prevention and Sediment Control.* Vermont Department of Environmental Conservation. 2006.

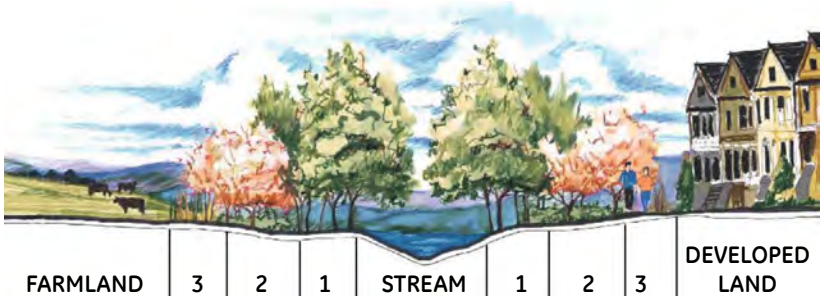
Streams and rivers with naturally vegetated buffers experience more gradual changes in water level, which minimizes downstream flooding potential. Riparian buffers along small tributaries higher up in the watershed are more effective at attenuating downstream flooding and limiting sedimentation than buffers along major rivers.

The effectiveness of a naturally vegetated riparian buffer to protect water quality depends on several factors: soil type, slope, amount of water flowing through the buffer, time of year, type of vegetation, and buffer width. Of these, we can most easily control buffer width. Nearly all the benefits of riparian buffers are enhanced as the buffer width increases. There has been considerable scientific research on the relationship between buffer width, water quality protection and habitat protection as summarized below:[1]

- **50-Foot Buffer.** The effectiveness of a 50-foot naturally vegetated riparian buffer at pollutant removal will be heavily dependent on local conditions (soil type, slope, etc.). It will provide the shade necessary to control the temperature of small streams and will provide some protection for aquatic plants and animals. It will not provide adequate habitat for most non-aquatic animal species.
- **100-Foot Buffer.** A 100-foot naturally vegetated riparian buffer generally will remove at least 60% of pollutants from run-off (even where the soil and slope conditions are less than optimum). It also protects plant and animal species that are aquatic or stay very close to the water's edge. It likely will not provide adequate floodwater abatement.
- **300-Foot Buffer.** A 300-foot naturally vegetated riparian buffer will provide wildlife habitat for a broad array of species that are dependent on both water and uplands, as well as a travel corridor for both small and large animals. It will generally remove at least 90% of pollutants from run-off and will provide greater floodwater abatement.

1 *Buffers for Wetlands and Surface Waters: A Guidebook for New Hampshire Municipalities*. Audubon Society of New Hampshire et al. 1995

RIPARIAN BUFFER



1. UNDISTURBED NATURAL VEGETATION (TRIMMING OR DEBRIS REMOVAL DISCOURAGED)
2. MANAGED WOODY VEGETATION (MAY BE LANDSCAPED & PERIODICALLY MAINTAINED)
3. LOW-MAINTENANCE GRASSES & HERBACEOUS PLANTS (MAY INCLUDE PATHS)

Currently, Moretown's zoning regulations require a minimum setback of 25 feet from all streams and rivers. No disturbance or development is allowed within the 25-foot buffer and vegetation is to be left in a natural condition. Our regulations allow for clearing and site development within the 25-foot buffer as necessary to accommodate: road, driveway and utility crossings; stream bank stabilization and restoration projects; unpaved paths and trails; residential landscaping; and public recreation facilities and water access. The regulations also require a minimum of a 50-foot naturally vegetated buffer around all Class 2 wetlands. No development or disturbance is allowed within the wetland buffer unless it is permitted by the state Wetland Rules.

Respondents to the 2013 community survey expressed strong support for requiring development to be set back from streams and for retaining or establishing natural buffers along streams.

Stormwater Management. Managing water flowing off developed land is essential to protecting and improving water quality. The first step in stormwater management is to reduce the amount of run-off a site will generate by minimizing:

- The amount of impervious surface, which directly reduces the amount of stormwater to be managed.
- The area of development or disturbance, which offers multiple environmental, energy and financial benefits.
- Soil compaction, which reduces the ability of water to infiltrate into the ground.
- Disruption of natural drainage patterns.
- Clearing of natural vegetation.

The Vermont Department of Environmental Conservation Stormwater Program issues stormwater permits for run-off from impervious surfaces, construction sites and industrial facilities. The state's stormwater permitting system generally only covers projects that result in at least one acre of impervious surface on a property or disturbs at least one acre of land. Most of the development that occurs in Moretown falls below those thresholds.

Even for smaller projects and sites, stormwater management is important. Low impact development (LID) is an approach to land planning and site design that the state is encouraging municipalities and property owners use to prevent and minimize environmental degradation. Most LID techniques relate to stormwater management because of the environmental and water quality impacts associated with run-off from developed land – often referred to as nonpoint source pollution. Simple LID practices and tools appropriate to residential properties and small-scale development projects include:

- Maximizing sheet flow and infiltration to slow and disperse the energy in the flow of stormwater and allowing it to soak into the ground by disconnecting roof drains and collecting water in rain barrels or cisterns, or directing water to rain gardens, vegetated swales or infiltration trenches.
- Minimizing lawn and garden watering by using drip irrigation, soaker hoses or micro-spray systems, and avoiding directing water onto paved surfaces or drainage ways.
- Minimizing or reducing the amount of mowed lawn by retaining or re-establishing native woody vegetation, particularly in riparian areas, or by planting gardens or using low-growing native sedges. Native plants and grasses are typically more drought tolerant and pest residents, requiring less watering and pesticide use.
- Preventing and eliminating pollutants from run-off by: avoiding and minimizing the use of fertilizers, pesticides and other chemicals on lawns and landscaped areas; properly cleaning up pet waste; properly disposing of household cleaners and chemicals; directing water used to wash vehicles into an area where it can infiltrate into the ground and using more environmentally friendly cleaning products; properly cleaning up any oils or fuels that leak or are spilled; and composting leaves, grass clippings and tree trimmings on-site.

Currently, Moretown's zoning regulations include a general requirement that conditional uses (which would include most nonresidential development and would exclude most single-family homes) appropriately manage their stormwater. The regulations authorize the Development Review Board to require a stormwater management plan as a condition of approval, but there are no standards or guidance for stormwater management provided within the regulations.

3A-6. FLOODPLAINS AND RIVER CORRIDORS

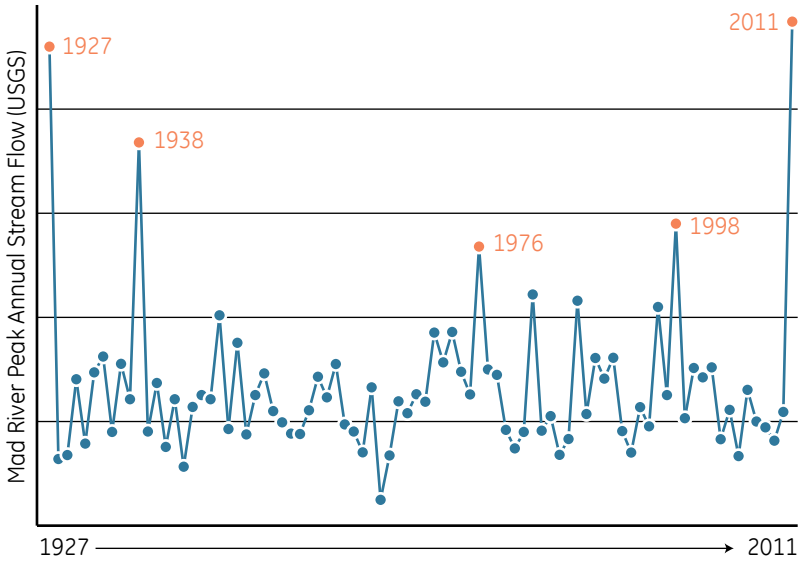
Flooding

Major floods occur periodically in Moretown. One of the earliest written accounts of flooding in Moretown was included in the 1889 Gazetteer of Washington County, attributed to a D.P. Thompson of Montpelier, describing a severe storm that occurred in the 1830s.

> "The most remarkable instance of a sudden and great fall of water, which was ever known in this region, occurred about thirty years ago, round the sources of Jones's brook, a small mill stream that rises in Moretown Mountains and empties into Winooski river three miles below Montpelier... The inhabitants of the basin, when the storm burst upon them so suddenly and unexpectedly, were struck with astonishment and alarm at the unwonted quantity of water that descended upon them, from the seemingly flooded heavens... The rain, after a brief duration of less than half an hour, ceased as suddenly as it came, and the inhabitants ran out of their drenched houses just in time to behold the numerous uniting streams, that had come pouring down the encircling mountain, gathering into a mighty river that swept away shanties, fences, old trees, logs, lumber, and everything in its path..."

That description sounds eerily familiar to those of us who experienced Moretown's most recent major flood – Tropical Storm Irene in 2011 – as it would have to town residents who lived through flooding in 1927, 1938, 1976 or 1998. The worst recorded flood in Moretown occurred in 1927. We believe that the 1927 flood levels were two to three feet higher than they were during Tropical Storm Irene when up to seven feet of flooding occurred in the village. Tropical Storm Irene caused $1.8 million in damage to public infrastructure and flooded 52 homes in Moretown.

Minor flooding is a regular occurrence in Moretown, while more significant floods occur periodically. Flooding generally results



in one foot of floodwater in low-lying areas every two to three years. Localized flooding also occurs regularly as a result of ice jams that develop during the spring thaw. Smaller flash floods caused by a short but intense storm are also common and often result in road washouts, which may be exacerbated by blocked or undersized culverts.

Floodplains

Floodplains are the lands adjacent to bodies of water that flood during storms or periods of high water. Floodplains are vital to the health of rivers and streams and the safety of the community. They serve as a "safety-valve" by retaining runoff during periods of heavy rain and spring thaw, and reducing the velocity of rivers and streams. Floodplains also improve water quality by filtering stormwater before it reaches streams and rivers. Floodplains tend to be flat with gravelly, nutrient-rich soils – characteristics of high quality farmland.

Floodplains are poorly suited for development due to the hazards associated with periodic flooding. Harmful effects on channel capacity and downstream properties often result from filling, and there is risk of groundwater contamination from septic systems associated with typically high water tables.

The Federal Emergency Management Agency (FEMA) has mapped floodplains along major water bodies based on the likelihood of flooding. If land has a 1% chance of flooding in any given year, it is described as being within the 100-year floodplain. If it has a 0.2% chance of flooding, it is within the 500-year floodplain. FEMA has further classified a portion of the 100-year floodplain as a floodway. The floodway is the area required to carry the 100-year flood without causing an increase in flood elevation downstream of more than one foot.

The floodway and floodplains in Moretown are shown on the Water Resources Map.[1] FEMA updated and modernized the floodplain maps for Washington County in 2013. The maps are now available in digital format and can be viewed online through the Vermont Natural Resource Atlas or the FEMA Map Service Center. The recent revision did result in some changes to the floodplain boundaries in Moretown. A more detailed floodplain study could still be done, particularly within the village, to more accurately delineate the floodplain. This is an action that our Hazard Mitigation Plan recommends that the town pursue with the state Agency of Natural Resource and FEMA.

Approximately 430 properties or 1,055 acres in Moretown are located within the 100-year floodplain. 505 of the 1,055 acres within the 100-year floodplain are within the floodway. Another 170 acres in Moretown are within the 500-year floodplain.

1 The official Flood Insurance Rate Maps (FIRMs) must be referred to for any regulatory purpose. The FIRMs are available at the town office.

A number of our civic buildings are located within the floodplain including: the former town office, the Catholic Church, and the Moretown fire station. Whether to rebuild or reinvest in public buildings within the floodplain is an issue where our goals and policies may conflict. As reflected in the 2013 survey, residents strongly support maintaining the village as the center of our community – where public buildings should be located. Residents also clearly expressed support in the survey for prohibiting development in floodplains. Many existing buildings may be retrofitted to make them flood proof and reduce the likelihood of flood damage in the future, as has been demonstrated around the country.

Floodplain Regulations

Moretown adopted floodplain regulations as part of the zoning bylaw in 1978 and we have updated them several times since. The town needs to have these regulations, which must meet federal requirements, so that landowners within the floodplain will be eligible to participate in the National Flood Insurance Program. The regulations are intended to protect life and property, and to allow property owners to obtain flood insurance and mortgages. Our current floodplain regulations apply to land within the 100-year flood zones depicted on the FIRMs. Within the 100-year floodplain, building design standards are imposed to minimize property damage during flood events. Within the designated floodway, building and filling is prohibited.

Standard property and casualty insurance does not cover damages from flooding. Since 1968, the federal government has operated the National Flood Insurance Program. Property owners are required by their lender (who is in turn required by federal law) to purchase flood insurance on structures within the 100-year floodplain. In 2013, the federal government revised the residential flood insurance program, which is deeply in debt due to a series of massive storms around the country during the past decade. The result is that many property owners within the floodplain will see the cost of their flood insurance increase. The premiums will now reflect the real actuarial risks and the deductibles will be higher. These changes will be fully phased in by the end of 2014.

River Corridors

The federal flood maps and regulations are designed primarily to address inundation flooding, but property in Moretown is at greater risk of damage due to erosion than to inundation. Erosion that occurs along flood-swollen rivers and streams is referred to as fluvial erosion. Buildings and infrastructure within river corridors, but outside floodplains, can be vulnerable to erosion

hazards and can exacerbate erosion and flooding problems downstream.

As our understanding of river science and dynamics has improved, it is becoming evident that the majority of rivers and streams throughout Vermont are unstable as a result of the changes we have made to the river channels and the adjacent corridors. Rivers and streams have been contained and re-directed. They have been cut-off from their natural floodplains. The state is now recommending that municipalities consider the "river corridor" as an area of special concern and planning. The river corridor includes the floodplains, but also includes other adjacent lands needed for a river or stream to adjust laterally over time and maintain a natural, stable form.

Mapping of river corridors has begun in Moretown, but is not complete. To date, a full geomorphic assessment and delineation of a fluvial erosion hazard area has been completed only for a segment of the Mad River in the vicinity of the village. We anticipate that the state and local watershed organizations will complete river corridor mapping throughout Moretown within a couple of years.

The portion of the corridor that has been mapped along the Mad River is not significantly wider than the 100-year floodplain. We expect that the width of the river corridors will vary considerably throughout town. Unlike the areas in danger of inundation, which are based on elevation, the areas vulnerable to erosion are based on multiple factors – soil type, slope, characteristics of the river channel, and adjacent development and infrastructure. In some areas of town, it is possible that the fluvial erosion hazard area will be considerably larger than the flood hazard area. When the river corridor mapping is complete, we will need to decide whether to adopt stricter standards for development within the erosion hazard area similar to those in place for the floodplains.

Flood and Erosion Hazard Mitigation

Moretown has taken a number of actions to address flood mitigation since Tropical Storm Irene in 2011 – in fact, we were working on many of these efforts before the storm, recognizing our vulnerability to flooding. Residents who responded to the 2013 community survey indicated that they felt Moretown has done very well at responding to emergencies and disasters.

We completed a culvert and bridge inventory in 2011. Following Irene, we have adopted new road and culvert standards. We working to upsize culverts and are having hydraulic studies performed on culverts that have been repeatedly flooded. Moretown participated in an erosion hazard study sponsored by the Friends of the Mad River in 2011 and 2012, which assessed and prioritized areas of erosion along town Class 3 and Class 4 roads.[1] That study produced design plans to mitigate erosion at five sites in Moretown.

We updated our Hazard Mitigation Plan (HMP) in 2012 with the assistance of the Central Vermont Regional Planning Commission. That plan is adopted by reference into this Town Plan. The purpose of the HMP is to identify the hazards we face and identify strategies to reduce the risks they pose to life and property. The HMP found that Moretown is most vulnerable to flooding and severe storms.

We participated in an assessment of our previous town plan, hazard mitigation plan, and zoning regulations in 2012 that resulted in a series of recommended policies, strategies and regulations that we could adopt to improve flood resilience in Moretown. The recommendations fall into four categories:[2]

1 *Mad River Valley Erosion Study Final Report*. Watershed Consulting Associates, 2012.

2 *Disaster Recovery and Long-Term Resilience Planning in Vermont: Policy Memo for the Mad River Valley*. U.S. EPA Smart Growth Implementation Assistance Project. 2013.

- Conserve land and avoid additional development in river corridors, which includes the river channel, floodplains and adjacent lands needed for the river to adjust laterally over time and maintain a natural, stable form.
- Reduce future flooding risk and protect people, building and infrastructure where development already exists in vulnerable areas.
- Plan for and encourage new development to locate in areas that are less vulnerable to future flooding.
- Implement stormwater management techniques town-wide to keep the rain where it falls, and slow, spread and sink floodwater.

The Hazard Mitigation Plan also includes a number of specific recommendations. Many of the mitigation-related recommendations from these and other plans and studies have been incorporated into the policy and action sections of this plan (See Parts 4 and 5).

3A-7. WILDLIFE AND FISHERIES

Respondents to the 2013 community survey indicated a high level of satisfaction with the ability to enjoy wildlife in town. They also expressed strong support for protecting wildlife habitat and travel corridors.

No comprehensive inventory of species or their habitat needs has been undertaken in Moretown. We know that a variety of game and non-game wildlife species reside in town, including white-tail deer, black bear, moose, coyote, mink, otter, fisher, bobcat, turkey, ruffed grouse and numerous species of raptors and migratory songbirds. The wildlife species that are most abundant in Moretown are those better adapted to survive in close proximity to humans. There also remain areas of remote, contiguous forest habitat in town that are home to wildlife species that require large areas or undisturbed areas to survive.

Specific elements of our landscape that are critical to the survival of a wide range of species include:

- Large tracts of undeveloped forest.
- Wetlands.
- Riparian corridors, especially those connecting large tracts of forest.
- Travel corridors, including sheltered road crossings.
- Vernal pools (isolated, temporary water holes that water does not enter nor leave via a stream).
- Open meadows and associated forest edge.
- Habitat for specific species, such as rare and endangered species and deer wintering areas.

The Vermont Department of Fish and Wildlife maintains some information about wildlife habitat and travel corridors. In addition, private organizations, such as the Friends of the Mad River, sponsor the Keeping Track® volunteer-based wildlife monitoring program in portions of Moretown. Despite the lack of a comprehensive habitat inventory, the specific needs of several species have been identified in Moretown to varying levels of detail, as discussed below.

Deer Habitat

Deer are Vermont's most popular game species. Despite their relative abundance and adaptability to human activity, deer have specific habitat needs. Most important are adequate wintering areas (deeryards) to ensure survival during severe winter conditions. Areas of coniferous forest on predominately south or west facing slopes, typically below elevations of 2,000 feet are best suited to provide suitable habitat for deer in winter. The state has mapped more than 5,000 acres of deer wintering areas in Moretown.

In addition to their benefits for deer, these areas also provide winter food supplies and shelter for other species including porcupine, snowshoe hare, fox, fisher, coyote, bobcat, crow, raven, and crossbill among others. The Vermont Fish and Wildlife Department offers specific management recommendations for these areas in its publication, Management Guide for Deer Wintering Areas in Vermont.

In 2007, the Selectboard and School Board placed a conservation easement on 81 acres within the Town Forest to provide deer wintering habitat in perpetuity. The Vermont Land Trust holds the easement, and the Vermont Agency of Natural Resources supported the action. The town's decision to grant the easement was connected to the state's requirement that Moretown Landfill Inc. mitigate an anticipated loss of deer wintering habitat if the landfill expanded into Cell 4. There is a Town Forest Land Management Plan, which establishes specific goals and policies related to the management of the Town Forest for recreation, wildlife habitat protection (deeryard specifically), education, hunting, and timber production.

Bear Habitat

Maintaining a viable population of black bears requires a large land area of contiguous forest, in addition to some specific types of habitat. Given the broad habitat needs of the black bear, they are considered an "umbrella species" for many other wildlife species in Vermont. If we protect habitat for black bear, we are protecting habitat for many other species as well.

Black bears rely on beechnuts and acorns produced by beech and oak trees as a significant part of their diet. These nut-producing trees are referred to as "hard mast" and groups of such trees are called "mast stands." The Vermont Department of Fish and Wildlife consider mast stands as necessary wildlife habitat as defined by Act 250. The state has identified one mast stand on the eastern slope of the Northfield Range and approximately 3,500 acres of bear habitat in Moretown.

The bear habitat in Moretown is connected to significantly larger tracts in Duxbury and Fayston. Wildlife corridors connecting these areas with the Northfield Range are important so that black bears can travel between habitat areas to access food sources and to prevent populations from becoming isolated. Frequent bear sightings – and bear/vehicle collisions – have occurred on Route 100 in the vicinity of the Moretown-Duxbury town line, and on Moretown Mountain. This suggests that the bears are moving between core habitat in the Green Mountain Range and the wetland areas located between Route 100 and Route 100B, south of Cobb Hill.

Rare, Threatened or Endangered Species

The rate of species loss is a barometer of the overall health of our natural environment. Various state and federal laws define and protect rare, threatened and endangered species. The Vermont Endangered Species Law protects approximately 200 species of plants and animals and a smaller number are federally recognized under the Federal Endangered Species Act. Species may be rare, threatened or endangered because they are on the edge of their native range, they are separated from the main population of their species by a large distance, or they occur only in a unique or rare natural habitat or community. The state has identified two locations of rare, threatened or endangered plant species in Moretown.

Fisheries

Moretown's streams and rivers support moderately healthy fish populations. Native brook trout populations are found in many upper watersheds, including Jones, Crossett and Cox brooks. Limited stocking of rainbow and brown trout occurs in the Mad River and several small tributaries near the Winooski River. As discussed above, improving water quality would improve the health of our fisheries.