INTRODUCTION

THE WINDHAM REGIONAL COMMISSION

The Windham Regional Commission (WRC) is an association of 27 towns formed in 1965 and subsequently constituted by the State Legislature under the Vermont Municipal and Regional Planning and Development Act (24 V.S.A. Chapter 117). The WRC's mission is to assist member towns to provide effective local government and to work cooperatively with them to address regional issues. Each member town appoints two commissioners to represent that town's interests in regional affairs. Additionally, the WRC has up to ten citizen interest commissioners who represent other regional interests such as agriculture, arts, natural resources, housing, and business and industry. The WRC is supported by an annual appropriation from member towns, an annual appropriation from the Legislature, and by private, state, and federal grants.

The WRC was created following Governor Philip Hoff's 1962 expansion of the state planning program, with four basic goals:

- Promote economic development, increasing jobs and income;
- Preserve the natural beauty of Vermont;
- Obtain and maintain efficiency in government expenditure; and
- Safeguard and extend local autonomy in planning and development decisions.

PURPOSE AND USE OF THE WINDHAM REGIONAL PLAN

The purpose of the Windham Regional Plan (the plan) is to provide guidance for change in the Windham Region. The plan reflects shared values and concerns of the people who live in the 27-towns and it discusses issues facing the region. Based on a set of over-arching regional goals and priorities, the plan sets long-term policies for the region. The plan is a living document that must continually evolve to reflect the dynamic social, economic, and environmental conditions in the region. Statute requires that the regional plan be updated every eight years, but it is the WRC's intent that the review and update process should be an ongoing effort.

WHO USES THE PLAN?

The plan is the basis for the WRC's day-to-day operations and guides regional planning efforts. The WRC commits its staff and resources to work on implementation of the plan's stated priorities, goals, and policies. The WRC's Executive Board, committees, and professional staff implement the plan. For more information on how the WRC uses the plan, refer to the Implementation Section.

Towns with active planning programs also use the Regional Plan as a guideline for local planning efforts, or they may adopt portions of this plan as their own. When applicable, the District Environmental Commission and other state agencies use the plan to review both public and private development proposals. The plan also serves citizens and government agencies as a source of regional information.

LEGAL AUTHORITY AND USE OF THE PLAN

The plan is to be used by the WRC, town planning commissions, selectboards, state agencies, landowners, and citizens in a number of ways:

- To guide basic decisions for planning programs at the WRC;
- To provide guidance for planning and development initiatives at the local level;
- To serve as a basis to evaluate and review development projects proposed under Title 10 V.S.A. Chapter 151: State Land Use and Development Plans (Act 250) and Title 30 V.S.A. § 248 (Public Service); and
- To assist, where needed, in determining compatibility of state and federal agency plans affecting land use with regional and local planning and development priorities.

PLAN ORGANIZATION

With the adoption of the current Windham Regional Plan, the WRC has transitioned to an entirely web-based plan to improve navigation and use of the plan. The plan is organized around the following planning topics: Land Use, Energy, Economic Development, Transportation, Natural Resources, Housing, Education, Cultural and Recreational Resources, and Community Utilities, Facilities, and Services. Each section provides the current reference information, data, and analysis of the planning topics. The Introduction section presents the overarching vision and goals that influence all other elements of the plan.

Each planning topic also includes a set of policies that provide the framework for review and evaluation of projects and issues brought before the Windham Regional Commission. The policies provide direction for the Region. A complete list of the Plan's policies can be found under the Policies Section of the website and each planning topic area also links directly to its relevant policies. Other sections on the website include the Implementation, which provides a discussion on how the plan is put into action, and the Regional Profile, which provides a background on the Region's geography, history, and current population and demographic data.

To take advantage of the web-based format, and to better inform the reader, embedded hyperlinks are found throughout the Plan to direct users to relevant websites and documents. The vision, goals, objectives and policies contained within this plan are not dependent upon access to these additional digital resources. The links are provided for additional reference information only.

MAPS

This plan contains maps that present important background information, and others that present a vision for the region's future. The text and maps should be used together to be properly understood. The maps present information in a generalized format. More detailed information often is available from other maps or data sources, and those are referenced on the Regional Plan maps. Users of this plan and its maps are encouraged to consult those sources when more detailed information is needed regarding the presence, absence, or precise location of a given map feature.

VISION FOR THE WINDHAM REGION

The following statements of long-range desires constitute a shared vision for the future of the Windham Region. They form the basis of this plan and will provide a background for understanding the plan's policies. When readers of the plan are uncertain about the reasons for a policy, returning to the vision statement should help. The vision is:

FOR THE PEOPLE

- A high quality of life, defined as a composite of our economic, social, cultural, and ecological well-being;
- Support for modern infrastructure and telecommunications, while protecting the environment;

- A special place to live and work with a caring attitude for the environment, for each other, and for our communities and their institutions;
- A strong sense of history and culture;
- Stewardship of the region and its resources so that future generations will enjoy a sound economy, a healthy environment, quality education, and effective health services;
- A sense of independence and self-reliance that also recognizes our interdependence and the need for mutual cooperation;

FOR THE PLACE

- A variety in land use that reflects the region's diverse mix of rural lands, small communities and large centers, with the natural environment and working landscape part of our daily lives;
- A region made better as a result of our efforts;

FOR THE COMMUNITIES

- Individual places with their own identity and self destiny, commercial and industrial centers, historic villages and downtowns, residential communities, and recreational centers, all of which both contrast with and complement each other;
- A functional man-made environment, with interest, beauty, and value that complements our natural environment;
- Decision-making that encourages public involvement at every stage, and affirms the legal right and obligation of elected and appointed officials to act. An educated and informed citizenry ready to make effective choices;
- Dialogue within and among the region's towns about where and under what conditions change and growth should occur, and support for a type and pace of change that are appropriate for the region and its communities;

FOR THE FUTURE

- A sustainable future with an identification of—and focus on—critical issues, especially including environmentally and economically sustainable energy sources;
- Development, conservation, and preservation interests working together for the benefit of our communities and the environment;
- A regional commission that recognizes and supports the goals, policies, and issues of member communities as expressed in town plans, and that fosters cooperation among town, state, and federal governments and between public and private interests; and
- Recognition of the rights and responsibilities associated with property ownership.

REGIONAL GOALS

A set of regional goals has withstood the test of time for relevance and importance to the Windham Region. These goals evolved from prior plans and they continue to be the subject of on-going dialogue between the WRC and its member towns. The regional goals which correspond generally to the Vermont Planning Goals are:

- To plan development in order to maintain the region's land use and historic settlement pattern of compact villages and urban centers separated by rural countryside;
- To encourage the availability of a reliable, sufficient, and economical energy supply, to support energy conservation and efficiency, to encourage the development of appropriately scaled and sited energy generation resources, and to facilitate conversations between towns where different interests exist;
- To provide for safe, convenient, economical, and energy efficient transportation systems including options such as public transit and paths for pedestrians and bicyclists, where appropriate;
- To provide a vital and diverse economy with rewarding job opportunities and high environmental standards for the region's citizens;
- To encourage and strengthen agricultural and forest enterprises;
- To maintain and improve the quality of air, water, wildlife, and land resources in the region;
- To identify, protect, and preserve regionally important natural and historic features of the Vermont landscape;

- To provide for thoughtful and efficient use of the region's natural resources, including the prevention of surface water and groundwater pollution, the protection of fragile natural habitats and endangered or threatened species, the avoidance of agricultural and other land-use practices that lead to soil erosion, the management of woodlands on a sustainable basis, and the sensitive treatment of scenic resources. Mineral extraction should have minimal adverse effects on aesthetics, water quality, air quality, and special community resources (such as historic sites, recreation, or scenic areas), and effective site rehabilitation plans should be provided and implemented;
- To plan for, and to educate the public about, natural and other hazards in the region, the prevention and mitigation of these hazards, and for preparedness, response, recovery, and resilience.
- To educate the public about the inherent risk to life and property associated with development within river and stream corridors, including fluvial erosion hazard areas, and to continue to develop actions and policies that prevent and mitigate these risks wherever possible.
- To promote the development of housing suitable to the needs of the region and to ensure the availability of safe and affordable housing for all citizens of the region;
- To broaden access to education and training for all citizens;
- To maintain and enhance recreational opportunities for both residents and visitors in keeping with the carrying capacity of natural resources and public facilities;
- To plan for, finance, and provide an efficient system of public facilities and services (such as schools, water and wastewater facilities, highways and bridges) to meet future local, regional, and state needs; and
- To support affordable access to high-quality health care services for all citizens

REGIONAL PROFILE

GEOGRAPHY

Situated in southeastern Vermont, the Windham Region consists of 23 towns in Windham County, the neighboring towns of Readsboro, Searsburg, and Winhall in Bennington County, and Weston in Windsor County. The region is bordered by Massachusetts to the south and New Hampshire to the east. At over 920 square miles (590,000 acres), the region accounts for roughly 9.6 percent of the State's total land area and roughly 7.5 percent of the State's total population. The Windham Region has several distinct sub-regions, defined by isolating topography and exhibiting similar economic and land use patterns.

The present-day Connecticut River Valley and adjacent Southern Vermont Piedmont is characterized by relatively flat and gently rolling land near the Connecticut River, with hills, small mountains, and narrow valleys in the uplands. Glacial processes left boulders and scrapped and scarred bedrock ledges, leaving behind deposits of clay, sand, and gravel. This process also included the formation of Lake Hitchcock, an extensive and valley-filling water body that contributed to the fertile agricultural soils now present in the region's valleys. In more recent times, the Connecticut River and its tributaries have been instrumental in shaping the valley's settlement pattern of villages and towns separated by fields and forests.

The Green Mountains are the principal element of physical geography in the western part of the region, with Stratton Mountain being the highest point in the region at 3,936 feet. This part of the region generally receives more precipitation and experiences lower temperatures because of its higher elevations. As a result, the main concentration of historic development is in the valleys, some of which are narrow while other high valley areas are surprisingly broad. Outlying areas mainly consist of large woodland areas on higher elevation land. The extensive forests in the Green Mountains along with productive lower elevation woodlands support a small but important forest-based economy throughout the region. The topography in the western part of the region also led to the development of ski areas and tourist resorts.

In addition to the Connecticut River, the other major rivers in the region are the Deerfield, Green, North, Saxtons, West, and Williams, all of which are tributaries of the Connecticut River. There are two major flood control reservoirs on the West River, the Ball Mountain and Townshend Dams. Somerset and Harriman Reservoirs are two major water storage reservoirs for hydropower generation on the Deerfield River.

Several significant transportation routes provide access to and through the Windham Region. There are two active rail lines in the region: the New England Central Railroad runs along the Connecticut River, hosting both freight and Amtrak passenger service, and the freight-only Green Mountain Railroad connects Bellows Falls to Rutland.

Interstate 91 and U.S. Route 5 traverse the Connecticut River Valley north/south. Route 100 runs north/south through the Green Mountain in the western part of the region. Vermont Route 9, part of the National Highway System, provides east/west access from Brattleboro to Bennington, and between New Hampshire and New York. Vermont Route 103, also part of the National Highway System, connects Interstate 91 in Rockingham with Rutland in western Vermont. Finally, Vermont Route 30 runs north and west from Brattleboro through the West River Valley towns of Dummerston, Newfane, Townshend, Jamaica, and Winhall, eventually providing connection to the town of Manchester.

HISTORY

EARLY SETTLEMENT

The Abenaki people lived in present-day Vermont when European settlers arrived and depended on seasonal hunting, fishing, gathering, and agriculture.[1] One of the earliest sites of native agriculture in northern New England is the Skitchewaug site in the Connecticut River Valley near present-day Springfield, Vermont and dates to the year 1100. Agriculture is thought to have become more prevalent by 1300 with the cultivation of corn, beans, and squash in the Connecticut River Valley.[2] The rise of agriculture also led to more permanent settlements. Historians have noted there were several major bands of Abenaki in Vermont, each with larger settlements on tributaries to the Connecticut River. The closest major village to the Windham Region was in present-day Northfield, Massachusetts (Squakheag).[3] It is estimated that between 2,000 – 6,000 Abenaki lived in the upper Connecticut River Valley at the time of European arrival.[4]

EUROPEAN SETTLEMENT

When early European settlers arrived, the region was heavily timbered with abundant wildlife. Initially, there was little interest in establishing permanent settlements and the majority of European activity was related to the fur trade, which peaked in the mid-1650s. However, the British began pushing into southern Connecticut River Valley in the early 18th century and established Fort Dummer near present-day Brattleboro in 1724. A more significant influx of Europeans into Vermont began in the early 1760s. By this time, the Abenaki population had declined severely due to disease, the impacts of the fur trade, and warfare between the French and British over the previous decades.

Early European settlers focused primarily on clearing land for homestead sites and agriculture. Harvested timber was used primarily for building and fuel, with potash, tannin, and other commodities being secondary uses. However,

[1] Historical Society of Windham County

[2] Klyza, Christopher McGrory & Trombulak, Stephan C. (2015). *The Story of Vermont: A Natural and Cultural History*. Chicago: University Press of New England

[3] Kylza &Trombulak

[4] Kylza & Trombulak

by the late 1700s the region had become more connected with the rest of New England and larger commodity markets centered in urban areas. This transformed the timber industry into a cornerstone of the region's economy. An additional effect, combined with land clearing for agricultural activities, was an almost complete transformation of the region from being forest covered to cleared land.

SETTLEMENT PATTERNS

Physical limitations played a dominant role in the region's development pattern. European settlement first occurred in the Connecticut River Valley where water, rich soil, and access to natural transportation routes were available. Settlement and land clearing soon spread throughout much of the region. In the early 19th century, villages evolved in the valleys, such as Wilmington, often attracted by water power for mills and manufacturing.

A linear pattern of development was the natural response to the river and stream valleys as was the establishment of a road system along those same streams, linking village nodes in each major valley. These roads encouraged a land use pattern of mixed residential and commercial uses radiating from villages. The resulting pattern, readily visible today, is one of small villages located in stream valleys with expansion out along connecting roads.

AGRICULTURE

During the first half of the 19th century, agriculture shifted from subsistence farming to market-based production. Difficult soil conditions and increased competition from farmers in the west would eventually result in a decline in agriculture in the region beginning around the Civil War and continuing to 1900.

In the early 1800s, Vermont became a world leader in wool production with prized Merino sheep imported from Spain. The Town of Westminster was one center for wool production in the state and during the height of wool production, many carding, spinning, and weaving mills were established in small towns. The Vermont sheep industry peaked in 1840 and declined dramatically after the Civil War, when demand for wool declined and global competition arrived in the form of wool from Australia and New Zealand. Eventually, dairy farming replaced sheep operations as the dominant agricultural activity in Vermont. Presently, dairy farming is declining, existing farms are diversifying, and many smaller diverse farming operations and specialty food manufacturers are appearing.

POPULATION CHANGES

Beginning in the mid-1800s, Vermonters began to move around. Many hill farms were abandoned by their owners after years of clearing, grazing, and cultivating took their toll on the thin soils and steep slopes so common in the region. Some people moved west to take advantage of more fertile land and encouraged by the opening of the Erie Canal in 1825 and the Homestead Act of 1862. Other farmers moved to larger, nearby towns for jobs in growing industries. Compared to other regions in New England, Vermont experienced relatively little in terms of industrial

development which meant people were more likely to move out of state for jobs. In the smaller villages, businesses that relied on hill farms subsequently failed, and in some cases the villages themselves were abandoned. The Civil War also contributed to Vermont's population decline, as soldiers emigrated after the war to more fertile lands in the Ohio Valley.

While the period of 1790 to 1830 had seen significant population growth in the region, this growth levelled off for more than a hundred years until around 1950. Between 1850 and 1930, 77 percent of the region's towns saw steady declines in population. The only towns to see relatively steady growth during this period were Brattleboro, Rockingham, and Readsboro, which was associated with new industries and corresponding job growth in these communities. In the mid-1900s, many of the region's smaller towns began to see population increases, often fueled by ski area development or the back to the land movement. In the 21st century, these increases have slowed. The population of Brattleboro and Rockingham has seen relatively little change.

MANUFACTURING AND OTHER INDUSTRIES

The prevalence of rivers and streams in the region provided power for woolen mills, paper mills, and other industries, as well as transportation routes. Log drives occurred on the larger rivers until the early 20th century. Roads and railroads utilized river corridors and included routes along the Connecticut, West, and Deerfield Rivers. Railroads played an important role in shaping the region and encouraged the development of Brattleboro and Bellows Falls as regional centers. The railroads carried freight and passengers, bringing more people to the region and facilitating commerce with Boston, New York City, and points south and west.

BRATTLEBORO AND BELLOWS FALLS

Prior to the arrival of the railroads to Vermont in the mid-19th century, commerce largely depended on Vermont's waterway transportation on rivers and canals. Bellows Falls was the site of the first canal in the State to initiate construction. Roads at the time tended to be only marginally passable. Brattleboro and Bellows Falls benefitted significantly as a result of the railroad expansion into Vermont between 1848 and 1870. At the same time, the population of outlying towns was in decline, especially for more remote communities in the hills. Brattleboro hosted a range of industries, including organ manufacturers, an iron foundry, a hospital, print shops, and a cigar factory. Bellows Falls was an industrial center that included paper mills, a farm machinery company, lumber mills, and a marble works. The industries in both towns provided jobs and appealed to many who abandoned farming to work in factories. In the latter part of the 20th century, the development of Interstate 91 as part of the extensive national highway system allowed Brattleboro and Bellows Falls to emerge as warehousing and trucking centers.

TOURISM AND LAND CONSERVATION

In the late 1800s, tourists were attracted to the Windham Region for its heritage, natural beauty, and recreational

activities. The State began taking a more active role in tourism as well – in the 1890s the Board of Agriculture began promoting Vermont as a place for urban residents to rest and recover, and in 1946 the Vermont Development Commission founded *Vermont Life* magazine to promote tourism and the state generally.

Around this same time, conservation became an important movement in Vermont, reflecting trends at the national level. The state established its forest system in 1909 recognizing the important role of forests in providing natural resources, wildlife habitat, scenic landscapes, and recreational opportunities. Today, the Vermont Agency of Natural Resources maintains numerous State Forests, Parks, and Wildlife Management Areas throughout the Windham Region. The Green Mountain National Forest was established in 1932 and today covers land in Readsboro, Searsburg, Wilmington, Somerset, Dover, Wardsboro, Stratton, Jamaica, Winhall, Londonderry, and Weston.

Beginning in the 1950s, the ski industry began to play a significant role as skiing and accommodations brought increasing number of skiers and visitors during winter months. The development of the interstate highway system in the 1960s began a new era characterized by easy and convenient access to the region from large metropolitan areas. This would result in explosive growth in vacation homes and related facilities. In the 1980s and 1990s, the region's ski resorts focused on expansion and development of other winter recreation activities such as snowmobiling, as well as golf and mountain biking to attract year-round visitors.

MODERN VERMONT

The rise in the tourism economy and opening of the interstate highway system in the region contributed to new development pressures unseen since the early 19th century. Between 1850 and 1960, the Region's population remained essentially flat at around 31,000 residents total. Between 1960 and 2000 the population grew from 31,319 to 46,449, an increase of nearly 50 percent. Population growth levelled off after 2000, returning to the slower rates seen prior to 1950.

While the State was actively promoting tourism, there was also a growing recognition during this time that the associated development impacts could be detrimental to the aspects of Vermont that were drawing tourists to the state in the first place—its rural landscapes and historic villages. Governor Deane Davis appointed the Commission on Environmental Control in 1969 to study these development concerns, many of which were concentrated around the growing ski resorts in the Windham Region. A major piece of legislation that came from the Commission's work was Act 250, passed in 1970, which set up a state permitting process for certain types of large development projects. Act 250 remains one of the critical tools in State land use planning today.

Improved transportation infrastructure also allowed for the development of new types of industries, like precision manufacturing and warehousing. These industries have been concentrated in Brattleboro and Bellows Falls, taking advantage of the interstate and rail network. As manufacturing has evolved and become less dependent on raw materials, new businesses have been drawn to the region for its quality of life amenities.

Energy production in the region has also evolved. The early 20th century saw hydropower development on the Deerfield and Connecticut Rivers. The Vermont Yankee nuclear power plant in Vernon was decommissioned in 2014 after more than 40 years of operation. Vermont Yankee accounted for approximately 70 percent of the state's net generation of power in 2010. During this same time, the region has seen an increase in renewable energy production sites, and in particular solar arrays. The largest commercial wind farm in the eastern U.S. went online in Searsburg in 1997, and was expanded in 2017.

Three final important trends in the region during the first two decades of the 21st century have been the local food movement, a recognition of the impacts of climate change, and growing opportunities for remote work. The region has seen an increase in small-scale agricultural producers that have been supported by local farmers markets, community supported agriculture models, and local distribution hubs.

In terms of climate change, the region has experienced warmer temperatures in summer and winter months and an increase in the intensity of rain storms. Two recent events, Tropical Storm Irene in 2011 and the July 2023 flash floods, hit the Windham Region particularly hard in terms of damage to property and infrastructure and are indicative of heavier rain events we can expect in the future.

Finally, with the improvements in telecommunication technology, there has been a growth in the number of remote workers in the region. This includes seasonal home owners that are able to make longer visits to the region with the ability to work remotely, and new residents that have decided to make Vermont their full-time residence for quality of life reasons but can still keep a job located elsewhere.

REGIONAL DATA

The following section provides a summary of population and demographic data for the region. Data on housing characteristics can be found in the Housing Chapter and data on economic characteristics can be found in the Economic Development Chapter. Where appropriate, an analysis of the data and trends has been included to provide a more detailed story behind these numbers.

The information was gathered from the 2020 Census, recent American Community Surveys, and other resources. All data sources are referenced. The most extensive and reliable source for a large portion of the data relevant to the planning process is the U.S. Census Bureau. Complete surveys are completed on a ten-year cycle and collect "point-in-time" data. The Regional Plan is updated on an eight-year cycle.

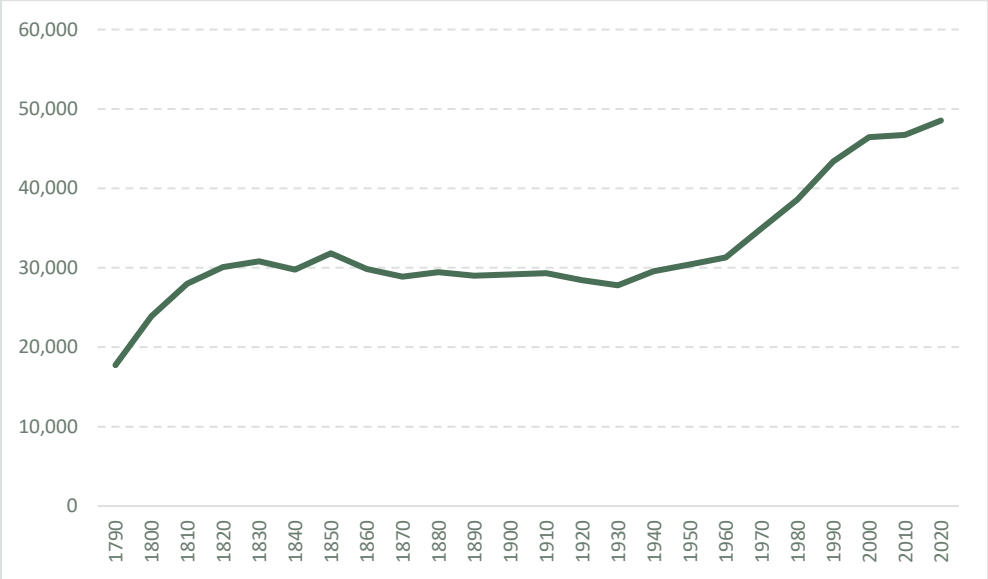
The American Community Survey (ACS) provides five-year **estimates**. Generally, when the ACS was used in this planning process, WRC used the five-year estimates for the years 2016 – 2020 or 2017-2021. As a result, ACS data can only provide a general estimate of the existing conditions and has a relatively large margin of error for smaller geographies, such as the town level. This should be kept in mind when analyzing data and making direct comparisons

between ACS data and Census data. Despite the limitations, the ACS data still provides useful information for the planning process.

POPULATION

The population of the 27 towns that make of the Windham Region totals 48,538, as reported in the 2020 Census. Between 2010 and 2020, the population of the region grew by 1,818, or approximately 3.9 percent. This compares with a population growth of approximately 2.8 percent for Vermont as a whole. The population percentage increase between 2010 and 2020 was noticeably higher than the previous decade (2000 to 2010) when the population grew by only 0.6 percent.

FIGURE 1-1: WINDHAM REGION POPULATION (1790 – 2020)

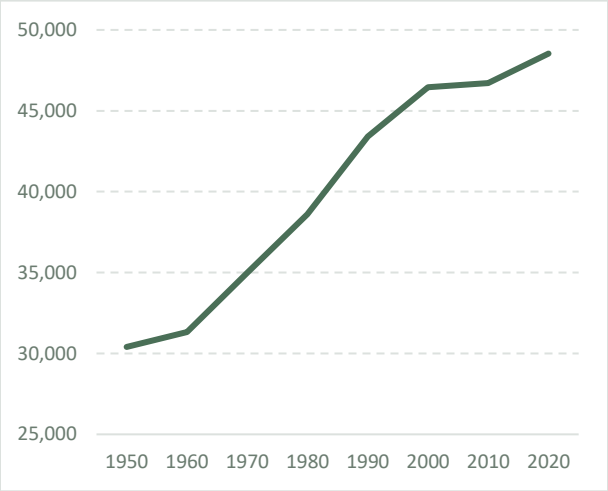


Data Source: U.S. Census (2010, 2020) Vermont Indicators (http://www.vcgi.org/indicators (1790 - 2000)

It should be noted there may be an issue with the population count for the town of Marlboro, which would artificially inflate the region's population for 2020. According to the Census data, Marlboro's population increased by 644 between 2010 and 2020, from 1,078 to 1,722, a growth rate of 60 percent. The ACS 2020 5-year estimates show that Marlboro saw a net decrease in housing units by one during this same time. This discrepancy may have to do with the counting of the student population on the former Marlboro College campus, which closed at the end of 2019-2020 academic year. The additional 644 residents in Marlboro, as reported by the 2020 Census, accounts for roughly one-third of the population growth in the region during the past decade and if it were to be subtracted out, the population growth for the region would be closer to 2.5 percent versus 3.9 percent.

FIGURE 1-2: WINDHAM REGION POPULATION (1950 – 2020)

The Windham Region has experienced uninterrupted population growth since 1950. The greatest population growth during a ten-year period occurred from 1980 to 1990, with a 12.5 percent increase in population. The statewide population growth for that same period was 10 percent. From 1950 to 2000, the average ten-year population growth was 7.9 percent. Since 2000, the rate of growth in the region has slowed substantially.



Data Source: U.S. Census (2010, 2020) Vermont Indicators (http://www.vcgi.org/indicators (1790 - 2000)

Time will tell whether the uptick in the rate of population growth between 2010 to 2020 will continue, although there are several factors that may lead to continued growth in the region. The region saw an influx of residents as a result of the COVID-19 Pandemic beginning in early 2020. The in-flow of residents has included second homeowners in the region making the area their permanent residence, and newcomers to the region, many from urban areas seeking a different type of lifestyle.

Southeastern Vermont has also been welcoming new Americans through the Community Asylum Seekers Project and the Ethiopian Community Development Corporation. Finally, WRC anticipates more individuals resettling in the region due to the impacts of climate change making other areas of the country less hospitable. These factors are expected to bring new residents into the region over the upcoming years, but it is unlikely we would experience the same rate of growth as between 1960 to 2000.

The table below shows the town population changes that have occurred from 1990 to 2020. Towns that experienced the highest average percentage change (20 percent or greater) are highlighted in purple. Town that experienced less growth or population decline are highlighted in blue. Communities that experienced the most growth include Dover, Marlboro, Stratton, Windham, and Winhall.

TABLE 1-1: WINDHAM REGION TOWN POPULATIONS (1990 – 2020)

Town	1990	2000	2010	2020	Avg Pct Change 1990-2020	Pct Change 2010 - 2020
ATHENS	313	340	442	380	8.2%	-14%
BRATTLEBORO	12,241	12,005	12,046	12,184	-0.1%	1%
BROOKLINE	403	467	530	540	10.4%	2%
DOVER	994	1,410	1,124	1,798	27.1%	60%
DUMMERSTON	1,863	1,915	1,864	1,865	0.0%	0%
GRAFTON	602	649	679	645	2.4%	-5%
GUILFORD	1,941	2,046	2,121	2,120	3.0%	0%
HALIFAX	588	782	728	771	10.6%	6%
JAMAICA	754	946	1,035	1,005	10.6%	-3%
LONDONDERRY	1,506	1,709	1,769	1,919	8.4%	8%
MARLBORO	924	978	1,078	1,722	25.2%	60%
NEWFANE	1,555	1,680	1,726	1,645	2.0%	-5%
PUTNEY	2,352	2,634	2,702	2,617	3.8%	-3%
READSBORO	762	805	763	702	-2.5%	-8%
ROCKINGHAM	5,484	5,309	5,282	4,832	-4.0%	-9%
SEARSBURG	85	96	109	126	14.0%	16%
SOMERSET	2	5	3	6	70.0%	200%
STRATTON	121	136	216	440	58.3%	104%
TOWNSHEND	1,019	1,149	1,232	1,291	8.2%	5%
VERNON	1,850	2,141	2,206	2,192	6.0%	-1%
WARDSBORO	654	854	900	869	10.8%	-3%
WESTMINSTER	3,026	3,210	3,178	3,016	0.0%	-5%
WESTON	488	630	566	623	9.6%	10%
WHITINGHAM	1,177	1,298	1,357	1,344	4.6%	-1%
WILMINGTON	1,968	2,225	1,876	2,255	5.8%	20%
WINDHAM	251	328	419	449	21.8%	7%
WINHALL	482	702	769	1,182	36.3%	54%

Data Source: U.S. Census (2010, 2020) Vermont Indicators (http://www.vcgi.org/indicators) (1990, 2000)

The towns of Dover, Stratton, Windham, and Winhall are located in the western area of the region and generally either have a ski resort in the community or are in close proximity to a ski area. It should also be noted that the town of Winhall is located adjacent to the town of Manchester, outside of the Windham Region, and its proximity to this commercial and job center could be one reason it has seen population growth. All four of these communities have a high number of second homes as a percentage of their total housing stock: Dover (82%), Stratton (94%), Windham (62%), and Winhall (81%). The population increase in these communities may partially be a result of second homes owners making these their permanent residences.

Most of the communities that experienced slower average growth (less than 3 percent) or population decline during this period are located in or just outside of the Connecticut River Valley: Guilford, Brattleboro, Dummerston, Westminster, Rockingham, and Newfane. The other two towns with slow growth or population decline were Grafton and Readsboro. The towns of Guilford, Dummerston, Putney, Westminster, and Newfane saw significant population growth in the period between 1960 to 2000. This growth began to level off beginning in 2000 and has remained relatively stable since then or decline. The two historically industrial and population centers for the region, Brattleboro and Rockingham, saw their residential populations generally plateau earlier – approximately by 1970 for Brattleboro and by 1960 for Rockingham.

As noted earlier, there is a discrepancy in the population count for the town of Marlboro in the 2020 Census that may be skewing the data for that community. Somerset is unincorporated and its population has been less than 10 people since 1950. Large percent population changes can result from the increase or decrease of only several individuals in Somerset.

The table below shows the population changes that have occurred in the region's incorporated villages and census designated places (CDP) from 1990 to 2020. CDPs are locally recognized communities with a population concentration, but lack legal status. Many of the CDPs in the region were recently added for the 2020 census and historical data is not available for these settlements. Additionally, as noted in the table below, the boundaries for some CDPs have changed between Census counts which accounts for some of the population increase or decrease seen in these areas. Despite efforts to encourage development within the region's village centers and downtowns, all of the villages and CDPs with data going back to 1990 have seen a population decrease over this 30-year period. As of 2020, the total population within village and CDPs was 17,390, approximately 36% of the region's total. This trend has implications for land use and development strategies for the communities in which these villages and CDPs are located.

TABLE 1-2: VILLAGES AND CENSUS DESIGNATED PLACES POPULATIONS (1990 – 2020)

Village/Census Designated Place (CDP)	1990	2000	2010*	2020*	Avg Pct Change 1990-2020	Pct Change 2010 - 2020
Algiers CDP	-	-	-	186	-	-
Bellows Falls village	3,313	3,165	3,148	2,747	-6%	-13%
*Brattleboro CDP**	*8,612*	*8,289*	*7,414*	*7,352*	-5%	-1%
Chimney Hill CDP	-	-	-	263	-	-
Grafton CDP	-	-	-	49	-	-
Harmonyville CDP	-	-	-	92	-	-
Jacksonville village	244	237	223	213	-4%	-4%
Jamaica CDP	-	-	-	174	-	-
Londonderry CDP	-	-	-	180	-	-
Newfane village	164	116	118	-	-14%	-
*North Westminster village/CDP**	*268*	*271*	*247*	*262*	-1%	6%
Putney CDP	-	-	523	571	-	9%
Readsboro CDP	-	-	321	297	-	-7%
Saxtons River village	541	519	565	479	-3%	-15%
South Londonderry CDP	-	-	-	147	-	-
Stratton Mountain CDP	-	-	-	335	-	-
Townshend CDP	-	-	-	199	-	-
Wardsboro CDP	-	-	-	70	-	-
*West Brattleboro CDP**	*3,135*	*3,222*	*2,740*	*2,803*	-3%	2%
West Dummerston CDP	-	-	-	77	-	-
Westminster village	399	276	291	287	-9%	-1%
Weston CDP	-	-	-	77	-	-
Whitingham CDP	-	-	-	91	-	-
*Wilmington CDP**	-	-	*463*	*439*	-	-5%

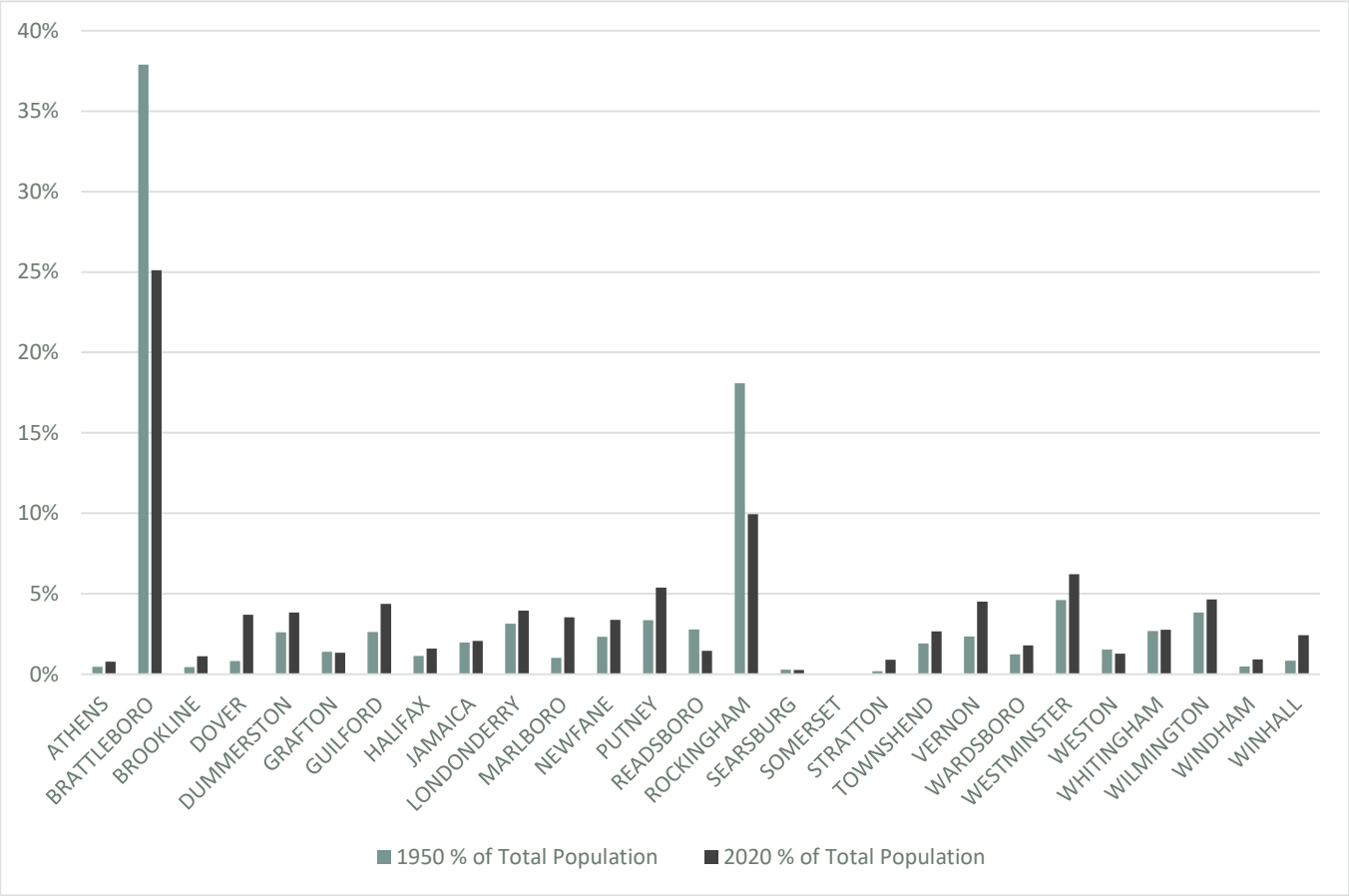
*Some CDP boundaries changed in the 2010 and 2020 Census, which accounts for some of the population increase or loss seen in these areas. For example, the Brattleboro CDP and West Brattleboro CDP boundaries were reduced significantly for the 2010 Census and this contributed to the apparent decrease in population in these areas. The North Westminster village/CDP enlarged in the 2020 Census to include approximately 18 additional housing units. The Wilmington CDP enlarged in 2020 as well, but there was still a population decrease.

Data Source: U.S. Census (2010, 2020) Vermont Indicators (http://www.vcgi.org/indicators) (1990, 2000)

The table below shows how town populations as a percentage of the region's total population has changed from 1950 to 2020. Most significant is the substantial decrease in Brattleboro and Rockingham's population as a percentage of the region's total. In 1950, the combined population of Brattleboro and Rockingham accounted for approximately 56 percent of the region's population. By 2020, this has declined to 35 percent. At the same time, all of the other communities in the region saw an increase in their populations as a percentage of the region's total, except Readsboro, indicating a dispersal of the population's concentration during this period. The communities that

saw the biggest increase in their percentage of the region's population were Dover, Guilford, Marlboro, Putney, Vernon, Westminster, and Winhall.

FIGURE 1-4: TOWN POPULATION AS PERCENTAGE OF WINDHAM REGION POPULATION



Data Source: U.S. Census (2020) Vermont Indicators (http://www.vcgi.org/indicators (1950)

RACE AND ETHNICITY

Between 2010 and 2020, the population's racial composition became more diverse. The percent of the population identifying as white decreased from 94.3 to 89.6 percent. The group that saw the largest increase during this period was individuals identifying as being two or more races. This group grew from 1.7 percent of the population in 2010 to 4.8 percent in 2020. The other categories, including Black or African-American, American Indian or Alaska Native, Asian, Native Hawaiian and other Pacific Islander, and Some other Races, remained generally consistent with the 2010 ratios. The percent of individuals of Hispanic or Latino origin increased from 1.8% to 2.8% of the region's population between 2010 and 2020.

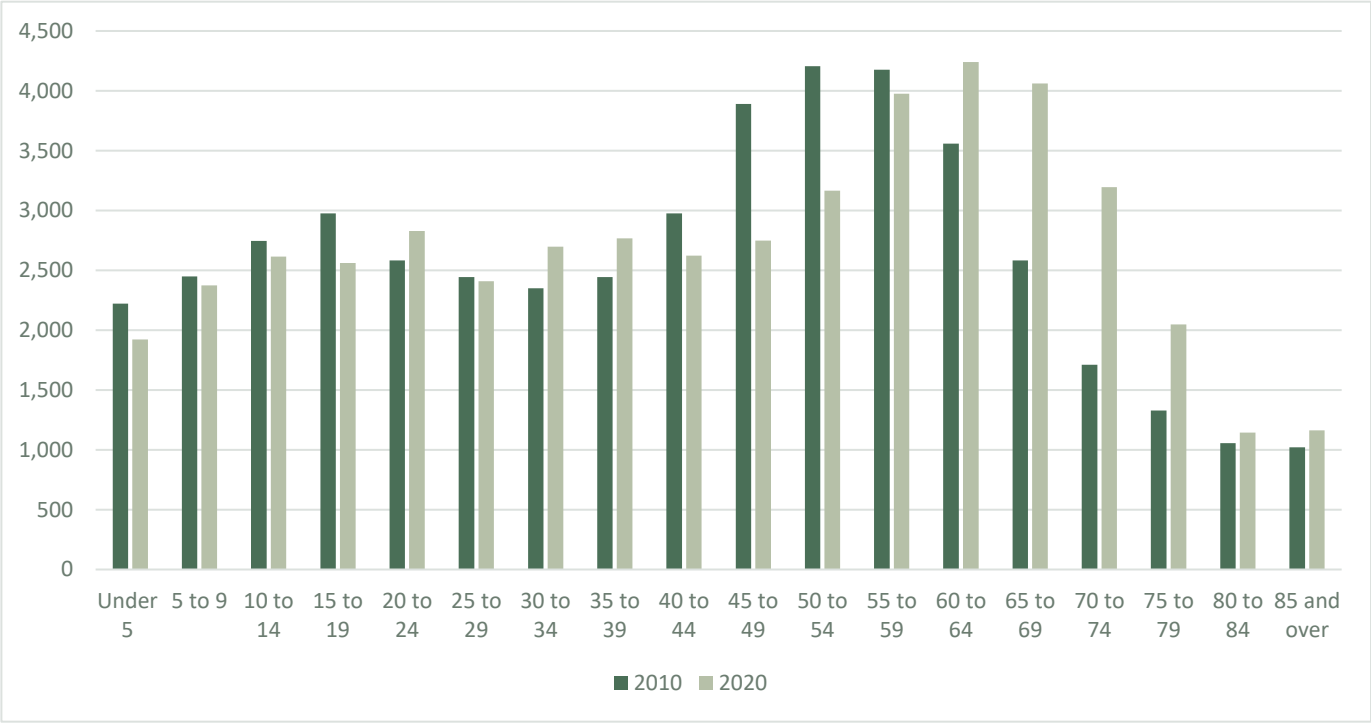
The increase in racial and ethnic diversity between 2010 and 2020 was generally seen in every community in the region and not confined to certain areas. That being said, the communities with the most diversity continue to be the larger towns along the I-91 corridor, including Brattleboro, Rockingham, Westminster, and Putney. This trend of the

region becoming more racially and ethnically diverse is expected to continue, especially in light of the region's support of resettlement efforts, such as the Community Asylum Seekers Project, and an anticipated increase in those relocating due to the impacts of climate change.

AGE

Figure 1-5 below shows the region's population by age in 2010 as compared to 2020. Between 2010 and 2020 the Windham Region grew older, a trend that is playing out across Vermont. The population aged 65 or older grew by 3,913 and in 2020 accounted for 24% of the region's population compared to only 16% in 2010. At the same time, the population aged 19 or younger declined by 925 and decreased from 22% to 20% of the region's population. The aging of the population has numerous implications for how the region supports these residents in terms of housing and services. There is also a pressing need to recruit new workers to the region as older resident begin to retire in more significant numbers.

FIGURE 1-5: WINDHAM REGION POPULATION BY AGE, 2010 - 2020



Data Source: U.S. Census, 2010 and 2020

LAND USE

The focus of the regional land use plan is to encourage and support development that maintains the region's historic settlement pattern of compact villages and town centers separated by rural countryside and forests, consistent with state land use law. The regional land use plan includes a Future Land Use Map and description of designated areas that creates a framework for decisions related to growth, development, and conservation throughout the region. The Land Use Management Techniques section of the plan provides specific tools and strategies for municipalities to consider when implementing regional land use policies at the local level.

BACKGROUND

Looking forward, there are a number of challenges the Windham Region faces as it works to accomplish its land use goals. These include providing necessary public infrastructure to support compact development patterns and creating conditions for housing that is affordable across income levels and different periods of life, responding to the impacts of climate change and increased flood risks, rising public infrastructure costs, protecting limited productive forest and agricultural lands, and changes in demographics, technology, and the local economy.

Vermont's traditional development model and statutory land use planning goal of compact centers surrounded by countryside has allowed for an efficient use of roads and infrastructure, protected working landscapes and critical natural resource areas, and contributed to a greater sense of community. To maintain this land use pattern, most of the region's future growth and development will need to occur within or near existing population centers. However, many of the region's villages have limited or no infrastructure to support this future residential and commercial growth. One of the biggest constraints to growth and higher densities in existing centers is the lack of adequate public water and wastewater systems. This also puts the retention of existing uses at risk as ageing septic systems will be difficult and expensive to replace and expansion of capacity will likely be impossible. Other public infrastructure and amenities, including sidewalks, streetscaping, public spaces, and a mix of commercial and civic uses, are also needed.

Directing growth to our existing centers will help the region become more resilient in the face of climate change. A spread-out development pattern leads to an increased use of vehicles by residents to get to work and access goods and services, increased energy use for heating and cooling buildings, and results in a loss of natural habitats that provide carbon sequestration benefits. In contrast, compact settlements allow for less driving, encourage smaller building footprints with less energy needs, and conserve the region's natural landscapes. As we encourage growth in these areas, we also need to consider how and where it occurs given the flood and fluvial erosion hazards. Many of the region's settlements are located adjacent to streams and rivers and are prone to flooding. The region is

expected to see an increase in extreme rain events as the climate changes and this will increase the risk of structures and critical infrastructure being damaged or destroyed from flooding.

Municipalities are facing increased costs to maintain existing and invest in new infrastructure. Encouraging compact development that takes advantage of our existing social and civic community centers and their infrastructure supports economic resiliency for towns. Low-density development away from existing centers can result in the eventual expansion of costly public infrastructure, which adds to a municipality's long- term capital needs for maintenance and replacement.

Historically, the region's economy was centered around manufacturing and industrial activities in villages and downtowns, and agricultural and forestry industries in rural areas. Over the years, the economy has shifted more towards service-based industries like retail, food services, healthcare, and hospitality. This has implications for how land in the region is being used to support economic activity. With the expanded availability of broadband, the region has seen an increase in the number of remote workers, many whom have chosen to relocate here because of the quality of life it offers. Land use policies will need to be adapted to support existing legacy businesses and entrepreneurial growth, invest in public infrastructure and broadband, and strengthen town centers.

Forest and agricultural lands help define the character and history of the region and provide economic activity while also providing ecosystem services such as habitat, carbon sequestration, and stormwater and flood mitigation. Trends toward forest parcel subdivision and residential and recreational development continue to threaten timber production, hunting and fishing, outdoor recreation, and wildlife habitat and migration corridors. Over the last several decades, there has been a decrease in the number of total acres farmed in the region. However, we have been able to retain and grow a diversity of small-scale agricultural businesses supported by direct market opportunities. For both forest and agricultural industries, it is imperative to maintain an adequate amount of land in these uses to support these activities going forward.

As the composition of the population changes, the region will need to ensure land use policies are responding to the needs of current and future residents. Our population is ageing and it will be critical to provide diverse housing options and services in areas that are affordable and walkable for elderly residents. Local employers are also struggling to maintain and grow their workforce because of a lack of housing for workers. While many new residents are drawn to Vermont because of the rural lifestyle it offers, there are also those that prefer having a smaller footprint home and not having to drive to work or for shopping – opportunities that can be cultivated in our village and town centers. Finally, the region has welcomed refugees and asylum seekers in recent years and we will need to provide welcoming and inclusive communities that offer job opportunities, support services, and childcare that meet the needs of these new residents.

FUTURE LAND USE AREAS

The future land use areas defined below and delineated on the Future Land Use Map create a framework for decisions related to growth, development, and conservation throughout the region. These designations recognize existing settlement patterns, the availability of existing and planned public infrastructure that can support development, and land use policies established in existing town plans. The future land use areas also represent a vision for the region that responds to the background issues described above and complies with state land use goals. There may be cases where existing land uses are inconsistent with the future land use district they fall in, for example a school campus that is located in what is otherwise a rural area. In these instances, the Regional Plan policies that are more aligned with the existing land use will be used.

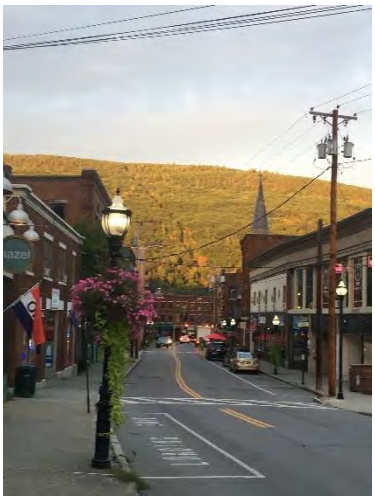
The future land use areas are:

- Regional Centers
- Villages
- Hamlets
- Rural Residential
- Productive Rural Land
- Resource Lands

In addition to the seven land use categories above, the following other land use classifications with special characteristics are shown on the Future Land Use Map and described in the section below:

- Commercial Nodes and Corridors
- Industrial
- Resort Center

REGIONAL CENTERS



DOWNTOWN BRATTLEBORO

Regional Centers are areas that include a core civic and business district as well as surrounding mixed-use neighborhoods. These areas provide services, shopping, housing, and employment opportunities to residents both within the Windham Region and in the surrounding regions and states. Multi-story buildings that mix retail uses with residential and professional offices are typical. They are served by public infrastructure, including public water and wastewater systems and multi-modal transportation systems, which support the highest population densities in the region. The regional land use plan designates Brattleboro and Bellows Falls as Regional Centers.

Appropriate uses and activities in Regional Centers include a mix of uses such as commercial, residential, institutional, civic, light industrial, and public gathering spaces. The highest development densities should occur in the core of the regional downtowns, and transition to more moderate densities in adjacent residential neighborhoods. A variety of different housing types should be available in Regional Centers, with particular attention paid to housing that accommodates the region's aging population, young professionals, families, and low- and moderate-income households.

BELLOWS FALLS, ROCKINGHAM

Public transportation services and pedestrian and bicycle infrastructure are particularly important in Regional Centers. Public realm design and amenities, including sidewalks, street plantings and lighting, and public gathering spaces, are critical to support the vitality of these areas. Buildings should be oriented to the street in order to create a functional and pleasant environment.

VILLAGE

JACKSONVILLE VILLAGE, WHITINGHAM

Most of the Windham Region's towns have village centers that provide for a mix of residential, commercial, service, small industry, and community facilities. This plan recognizes *Villages* as future growth areas. Examples of villages in the region include Putney, Newfane, Weston, Wilmington, Jacksonville, and Saxtons River.

Villages offer many goods and services for local residents, present opportunities for local businesses and employment, and provide rural towns with a sense of place. Many villages are also important historically and culturally. The types of

infrastructure available in villages varies greatly across the region partially based on the size of the community. Most villages provide a modest network of paved roads, and some have invested in wastewater treatment facilities, water systems, sidewalks, and recreational lands. The future provision of water and wastewater services is encouraged, and well-designed and maintained privately owned community water or wastewater systems may provide one avenue for achieving this goal. Villages that are not served by public water or wastewater services must limit densities to what soil conditions allow for on-site septic systems, as well as planning around existing wells and neighboring properties.

SAXTONS RIVER VILLAGE, ROCKINGHAM

Development in villages should include concentrated areas of moderate-density residential uses mixed with neighborhood commercial, institutional, and civic uses, such as general stores, restaurants, places of worship, professional offices, medical and care-giving facilities, recreational facilities, primary and secondary schools, and higher learning institutions. Safe and convenient modes of transportation to and within the villages need to be provided, including pedestrian, bicycle, transit, and automobile travel. Towns can better accommodate these different modes of travel and address potential conflicts through implementation of Complete Streets design principles and working with state partners.

In many villages, there are limited opportunities for growth within historic settlement areas given already existing development, small lot sizes, and other constraints. Towns should regularly assess the growth potential of villages, determine whether suitable areas for development or expansion can be found in and around existing village districts, and evaluate the appropriateness and feasibility of developing or expanding the capacity or extent of public water, sewer, and road systems.

HAMLET

HAMLET IN MARLBORO

Though sometimes referred to as villages, *Hamlets* are a distinct land use that is primarily residential. A hamlet is either an existing historic cluster of residential development within a rural area or an area proposed to allow for the development of a small concentrated settlement within a rural area. Examples of hamlets in the Windham Region are Stratton, Marlboro, Windham, Cambridgeport, Brookline, and Dummerston Center.

A hamlet allows for a mixture of land uses that are consistent with the traditional settlement pattern and densities,

and that do not unnecessarily duplicate services offered in the village or other commercial areas. Appropriate land uses include civic, educational, small-scale retail and service businesses, and home-based businesses mixed with the residential land uses. However, the principal land use for hamlet areas should be residential. In order to achieve traditional hamlet densities, it may be necessary to have shared water supply or sewage disposal systems.

Some towns may want to consider establishing a new village area in addition to, or as an alternative to, further development of existing villages. For example, the town of Vernon is exploring the creation of a new village center in the vicinity of its town office and school. In some situations, it may be appropriate to encourage additional growth around existing hamlets. Prior to promoting village-type development in a rural area, towns should carefully consider factors such as proximity to existing neighborhoods, the adequacy of roadways in the vicinity, soil conditions, and water supply potential. In general, this plan prioritizes most of the region's growth and development within Regional Centers and Villages and not in Hamlets.

RURAL RESIDENTIAL

RURAL RESIDENTIAL HOMES IN WILMINGTON

Rural Residential areas include lands committed to residential development in town land use plans, or that are in proximity to already developed lands. They generally do not have access to municipal sewer and water infrastructure, and are easily accessible by the existing road network. Despite more limited access and topography constraints, many rural areas have attracted increasing residential development. Much of the peak residential growth experienced in the region between 1960 – 2000 occurred in Rural Residential areas.

These lands do not contain significant amounts of high value natural resources, and may accommodate moderate density mixed use development that is compatible with existing land uses and sensitive to the limitations of the land. As much as possible, new development should be encouraged in close proximity to regional and village centers and existing residential subdivisions. Areas with steep slopes, wetlands, adjacent to waterways, or with other environmental constraints should be avoided.

Residential development is an appropriate use at low to moderate densities, but this type of development will encourage rural sprawl if it continues to be the dominant settlement pattern. Low density development consumes significantly more land per residential unit than higher density development. As such, growth must be planned to avoid diminishing the region's rural character, degrading environmental quality, and creating excessive costs for municipalities in terms of long-term infrastructure costs. There is an opportunity to increase density in these areas incrementally by encouraging accessory dwelling units, two-family dwelling units, and small-scale multi-family dwellings where appropriate. Limited commercial uses that provide goods and services for nearby residents, such

as small general stores and service stations, may be appropriate in Rural Residential areas.

PRODUCTIVE RURAL LAND

SUGARHOUSE

Productive Rural Lands are low density and very low-density residential areas that also contain most of the region's land-based resources, including forestland, active agricultural lands, sand/gravel/mineral deposits, and high-value forest and agricultural soils. Productive Rural Lands contribute significantly to rural areas by providing open space and lands suitable for rural occupations and lifestyles. These lands are the traditional rural working landscape of the region, and for this reason require a high level of stewardship.

Low density residential and mixed-use development can be appropriate in productive rural land areas, but it must be compatible with working land uses, in scale with its surroundings, and sensitive to the limitations of the land. Certain small-scale industries, especially those related to agricultural and forest activities (e.g., dairy production, small-scale food processing, saw mills), may be compatible with, and most appropriate in, outlying rural areas. These types of industries are often essential for supporting the viability of agricultural and forestry businesses.

This plan also recognizes that productive rural lands may provide an opportunity for utility-scale renewable energy facilities where there is the raw potential for energy production, availability of adequate utility lines and facilities, and no environmental constraints, as further defined in the Energy Chapter of this plan. Renewable energy facilities in Productive Rural Lands must be designed to allow for the productive use of land for agricultural and forestry to the greatest extent possible.

RESOURCE LANDS

Resource Lands require special protection or consideration due to their uniqueness, irreplaceable or fragile nature, or important ecological function. Generally, these areas have not been impacted by any significant development other than very low-density residential uses or forestry activities and have limited access to local road networks. Resource lands include areas that meet at least one of the following criteria:

- Over 2,500 feet in elevation
- Identified bear travel corridor
- Area hosting significant plants, animals and ecological communities as designated by Vermont's Nongame and Natural Heritage Program
- Area hosting federally identified endangered and threatened species or unique and fragile natural areas

JAMAICA STATE PARK

- Riparian areas and their buffers
- Wetlands, floodplains, shore lands
- High Priority Forest Block or Habitat Connectivity Block as designated by the Vermont Agency of Natural Resources
- Steep slopes over 25 percent
- Scenic corridors or vistas as identified in town plans.

Resource lands must be preserved and protected to the greatest extent possible. Any development or land use in these areas should be designed to have a minimal impact on natural resources and should include effective mitigation measures that will protect natural resource values. The most appropriate uses for Resource lands are conservation and management of natural resources and limited, low impact, very low-density rural uses.

COMMERCIAL NODES AND CORRIDORS

The *Commercial Nodes and Corridors* land use classification includes locations outside of traditional downtown and village centers that have been developed primarily for commercial and service industries, such as gas stations and retail operations, to support local residential populations. In the Windham Region, this type of development is largely found along segments of US 5, VT 9, VT 30, and VT 100. Much of this development has occurred since 1960 and coincides with the increases in population in more rural areas and the development of ski resorts. Some of the issues associated with this type of strip development include poor access

COMMERCIAL BUSINESSES ON VT 100 IN WEST DOVER

management, lack of pedestrian infrastructure, excessive signage, lower quality buildings, and a lack of building frontage along the road.

While Commercial Nodes and Corridors are inconsistent with the goal of maintaining compact settlements separated by rural countryside, this plan recognizes that these areas provide important services for rural communities that can complement commercial areas in village and regional centers. By utilizing proper land use planning and growth management techniques, including site plan review regulations and transportation corridor planning, the negative impacts of strip development can be mitigated. The goal is to over time transform these areas into higher-density, compact, mixed use areas through infill and redevelopment while ensuring that any growth does not detract from the vitality of village and regional centers.

INDUSTRIAL

The *Industrial* land use designation is primarily concerned with large-scale industrial and commercial development and activities that are either complementary or coexist without significant land use conflicts. These areas typically have access to transportation infrastructure, rail, water and wastewater facilities, three-phase power, and broadband and communications technology. Thoughtful planning for growth in these areas should be encouraged in order to provide jobs for residents, help retain existing businesses, and increase municipal tax bases. Examples of appropriate uses include manufacturing facilities, large-scale distribution centers, multi-tenant buildings, and business campuses that employ a high number of individuals.

This plan recognizes that large-scale industrial development has a high potential for conflict with surrounding land uses and it is appropriate to direct these businesses to the identified Industrial areas and provide mitigation for off-site impacts such as noise, traffic, and light/glare when appropriate. Landscaping or other visual and auditory screening should be provided between industrial uses and abutting incompatible land uses and major roadways. Environmental impacts of developments within this designation need to be thoroughly reviewed and adequately addressed in the early stages of project development.

Industrial activities will also take place in other parts of the region as directed by town plans, which can address the town's needs with more specificity. Industrial uses have evolved away from higher impact heavy manufacturing uses to high-tech manufacturing and small-scale operations. These types of uses tend to have lower off-site impacts and can often be accommodated within existing village and town centers.

RESORT CENTER

CARINTHIA BASE LODGE, MOUNT SNOW

The Regional Plan recognizes the resort development concentrated around ski area base facilities as *Resort Centers*. This plan recognizes four Resort Centers: Mount Snow, Stratton Mountain, Magic Mountain, and The Hermitage Club at Haystack Mountain. Development in these areas includes seasonal homes, lodging, restaurants, retail businesses, and recreational equipment rentals. Resort centers have also increasingly focused on providing year-round recreational activities for residents and visitors. Some secondary development around resorts has occurred in areas that have waste water systems and are located along major roads, and as a result have been able to support higher intensity uses. However, other development is located greater distances from resort centers with lower residential densities. Over time it is possible that properties currently used for temporary lodging may become primary residences as remote work has become more common and high speed internet becomes more available and reliable.

All four resort centers are located in or adjacent to designated Resource Land areas where soils are often shallow and slopes are steep. Many streams and rivers originate from these lands, and some are productive forests and have valuable wildlife habitat. Because of these fragile natural conditions, any expansion or redevelopment must be conducted in a planned and orderly manner, take into consideration the cumulative impact of development, follow careful environmental management practices, and improve stormwater management, water quality and quantity. Expansion of commercial, retail, and residential areas must be contained, and infill development should occur as an alternative wherever possible.

Given the remote locations of the resorts and the need for an extensive seasonal workforce, provision of affordable workforce housing is critical. High-value resort and second-home properties increase surrounding property values, reducing the availability of affordable housing. To that end, there must be a balance of housing options to enhance the overall viability of a resort community. The responsibility of providing affordable workforce housing cannot fall solely on the towns and region, but instead must be a joint responsibility with resort owners and companies. Similarly, public facilities and services must not be overburdened as a result of resort development.

LAND USE MANAGEMENT TECHNIQUES

The regional land use plan is implemented primarily through town plans, local land use regulations, investment in public infrastructure, and private development. In developing this plan, WRC incorporated current local land use planning goals and also considered regional goals and the compatibility of proposed land uses between towns. This

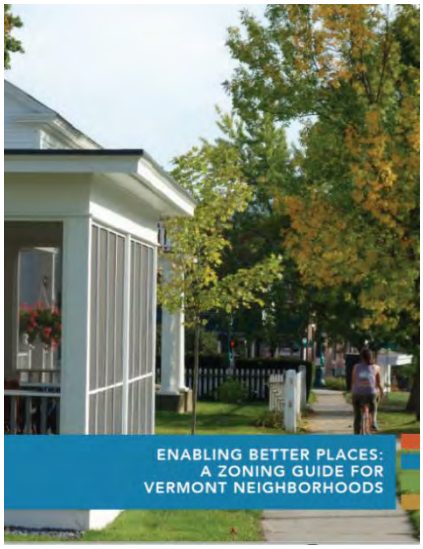
section provides an overview of different approaches that municipalities can consider when implementing their town plans or making local policy decisions. WRC can support towns in deciding which strategies are the most appropriate for their communities. This section also addresses regional planning efforts WRC has identified as beneficial for the region and member towns, and community reinvestment programs available to towns.

LOCAL REGULATORY APPROACHES

Because regional plan policy only has regulatory bearing in Act 250 proceedings, it is up to towns to direct growth to appropriate areas within their borders. Effective zoning and zoning administration are the tools that can be used for this purpose. The proposed land use categories in this plan can be considered in local level planning efforts. Towns are encouraged to use these designations and definitions as a way to improve consistency and coordination among municipal plans, and to manage the region's lands more effectively so that local and regional goals may be achieved.

Much of the vibrancy of our Regional Centers and Villages is due to the variety of residential, commercial, and civic uses that are found in close proximity to one another. Zoning bylaws should be written to support this mix of uses and, in village centers, to discourage large footprint retail or commercial establishments that may conflict with existing land use patterns. It is also important to support a variety of residential uses including single-family, two-family, and small multi-family buildings, which are already present in our regional and village centers. This can be accomplished by allowing more types of multi-family residential uses as permitted uses in zoning bylaws rather than a conditional use, which require additional town approvals.

Land use regulations are sometimes not in line with how villages have developed historically, even though this is the type of development pattern that residents often want to see replicated in their towns. In Regional Centers and Villages, towns should consider zoning bylaws that establish minimum lot size and building setback requirements more consistent with existing settlement patterns, such as smaller lot sizes and buildings situated towards the street, and recognize that wastewater and water infrastructure will be necessary to achieve this consistency. For towns with municipal water and sewer, it is common for lots to be as small as 4,000 square feet. In areas with public wastewater, higher residential densities should also be encouraged through increasing density limits or removing maximums.



ENABLING BETTER PLACES

The Vermont Agency of Commerce & Community Development (ACCD) partnered with Congress for New Urbanism to develop the Enabling Better Places zoning guide for Vermont neighborhoods in 2020. The guide focuses on incremental, small changes that communities can make to their zoning bylaws which have the biggest impact on creating vibrant and livable places. ACCD has offered funding through the Bylaw Modernization Grant program for towns to implement these recommendations. In the Windham Region, Brattleboro, Wilmington, Rockingham, and Newfane have received funding through this program.

The form of existing neighborhoods can be encouraged by adopting site plan review or design review regulations as part of zoning bylaws. These regulations can address things like the location of parking, access control, landscaping, screening, and exterior lighting, and can also include requirements on architectural design for buildings. Site plan and design review regulations can help a community mitigate potential impacts associated with development and provide property owners and developers a clear understanding of what is expected. In addition to Regional Centers and Villages, site plan review regulations should be considered in Industrial and Commercial Node and Corridor areas.

VISUALIZING DENSITY

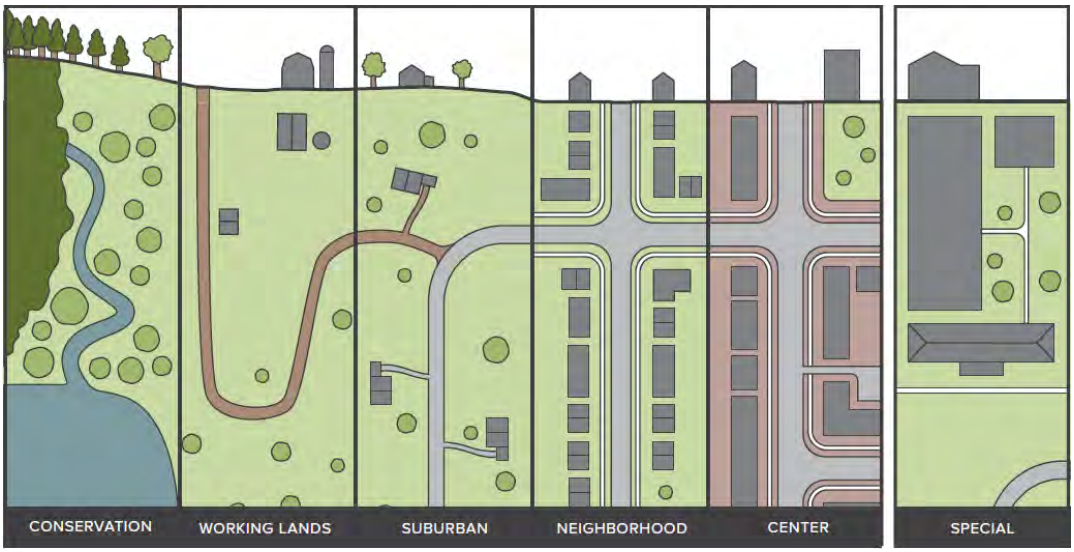
VISUALIZING DENSITY PROJECT PUTNEY

The Windham Regional Commission has assisted towns with density visualization projects to address concerns about the impact of development on infrastructure and the existing character of the community. For the Putney Visualizing Density Project completed in 2005, three sites were chosen that represented different types of development potential in the town's village.

During a community charette, participants were asked to consider how to accommodate growth at these sites consistent with the existing small-scale rural village character of Putney. The image on the left is an excerpt from the report showing a design for a vacant site adjacent to the Putney Food Co-op that accommodates a mix of commercial, residential, and public activities. These projects can help towns develop zoning bylaws that require new development to be done consistent with the community's vision.

Residential subdivisions in Rural Residential and Productive Rural areas should incorporate design characteristics such as walkable layouts, community identity, public open spaces, and preservation of important resources, such as agricultural soils and wildlife habitat. Many of these objectives can be achieved by clustering lots to create a hamlet-type character around homes, while setting a significant percentage of the project area aside as open space reserved for agriculture, forestry, or public recreation. This development approach is commonly referred to as conservation subdivision and it is economically efficient because road and other infrastructure requirements are less extensive and costly to construct and maintain.

Towns can also consider developing more than one zoning district for areas identified as Rural Residential and Productive Rural to distinguish between different levels of development the community envisions for these areas. For example, it may be appropriate to have a district immediately adjacent to a village center that allows for moderate density of development and acts as a transition between the village center and more rural areas. In some cases, these areas of town may be on paved roads, supporting higher levels of traffic than dirt roads, in easy walking distance to a village center, and have access to municipal water and wastewater systems. This is commonly referred to as a "transect" approach to land use planning that encourages development on a continuum from a town center to rural settings.



TRANSECT CATEGORIES
Source: Vermont Agency of Commerce & Community Development

Zoning bylaws and subdivision regulations can be used to help protect forest and agricultural lands in Productive Rural and Resource Land areas. To discourage the fragmentation of large forest blocks and protect natural resources, towns can adopt large minimum lot size requirements. Local regulations can also include specific requirements on the siting of new dwellings and driveways to minimize impacts and restrict development in areas with steep slopes,

high elevations, or natural resources, such as wetlands, significant natural communities, and rare, threatened, and endangered species. Overlay zoning districts are also a useful tool to protect the most critical natural resources areas or productive agricultural lands. An overlay zoning district includes more specific regulations that are in addition to the underlying zoning district. Examples of overlay districts in the Windham Region include the sensitive wildlife resource overlay district adopted by the town of Dover and the prime agricultural soils overlay district adopted by the town of Westminster.

REGIONAL PLANNING

The Windham Regional Commission has a role in implementing the goals of the land use plan when it comes to addressing issues that cross municipal boundaries. WRC has identified regional planning projects that would be beneficial for the region and its member towns and it will seek to complete these projects as funding and staff availability allow.

LAND CONSERVATION PLANNING

This plan recognizes that land conservation planning can be more effective at the regional level with a focus on linking together parcels of land that span town boundaries and that form contiguous forest blocks and provide wildlife travel corridors. WRC will continue the work initiated under the Windham Connectivity Collaborative to map priority conservation areas in the region, meet with stakeholder groups and local partners, and assist towns with strategies for implementation at the local level.

VILLAGE WATER AND WASTEWATER ASSESSMENT

The cost of building and maintaining centralized water and wastewater systems can be high, but infrastructure planning is an integral part of encouraging infill development and compact settlement patterns. This plan recognizes that gaining a better understanding of existing infrastructure capacity and potential areas for new systems is critical to answering if, where, and how growth will occur in the region's existing village and town centers. WRC will seek to complete a regional assessment of existing public water and wastewater systems that looks at capacity, condition, and operational issues and challenges. This study would asses the feasibility of new public wastewater systems in villages in the region where there is town interest in pursuing this infrastructure.

COMMUNITY REVITALIZATION

Reinvestment in regional centers, villages, and neighborhoods can promote compact settlement and add to the vibrancy of communities. Revitalization can happen through investment in infrastructure and public improvements, retaining local business and public services, and redeveloping brownfields and other underutilized properties.

VERMONT COMMUNITY REVITALIZATION DESIGNATION PROGRAM

The Vermont Department of Housing and Community Development manages the state designation program, which provides incentives and offers towns assistances for encouraging new development and redevelopment in compact settlement areas. The following is a summary of the designation programs towns are eligible to apply for:

- **Downtowns**: This program provides resources to assist with downtown revitalization, including priority funding for state grant programs, downtown transportation, capital improvement funds, income tax credit for rehabilitation of certified historic buildings, and expedited review for certain Act 250 permit applications. There are three designated downtowns in the Windham Region: Brattleboro, Bellows Falls, and Wilmington.

- **Village Centers**: Villages that receive this designation become eligible for a number of benefits, including tax credits for building rehabilitation and improvements as well as priority consideration for state programs. Currently, the region has 27 state designated village centers: Algiers Village, East Dover, Grafton, Guilford Center, Jacksonville, Jamaica, Londonderry, Marlboro, Newfane, North Westminster, Putney, Readsboro, Saxtons River, South Londonderry, South Newfane, Townshend, Vernon, Wardsboro, West Brattleboro, West Dover, West Townshend, Westminster, Westminster Station, Westminster West, Weston, Williamsville, and Whitingham.

- **Neighborhood Development Areas**: Areas eligible for this designation include those within walking distance of a designated downtown, village center, new town center, or within a designated growth center. This program offers special permit and tax incentives to encourage mixed-income housing. Currently, Brattleboro and Putney are the only communities in the region with neighborhood development areas.

Towns can also apply for Growth Center and New Town Center designation. The Growth Center program designates areas that are planned for new development in keeping with historic development patterns. The New Town Center program supports the creation of an area that functions as a new downtown. No towns in the Windham Region currently have either of these designations.

BROWNFIELD REDEVELOPMENT

BRATTLEBORO HOUSING AUTHORITY
RED CLOVER APARTMENTS

Brownfield redevelopment is another important revitalization tool. Historically, the region hosted a range of industries, including organ manufacturers, print shops, paper mills, lumber mills and marble works, that left sites with contamination. Even properties with small businesses like gas stations or dry cleaners can require extensive cleanup. As a result, many of these sites, which tend to be located in village centers and downtowns, have been left vacant or underutilized.

The WRC established the Windham Region Brownfields Reuse Initiative (WRBRI), funded through the EPA, to help communities redevelop these challenging sites. The program conducts site assessments, cleanups, and related activities at brownfield sites. The WRBRI also provides landowners with a better understanding of the funding sources, benefits, and tax incentives available to redevelop such sites. WRC has been able to assist with numerous brownfield redevelopment projects using this program. One example shown above is the Brattleboro Housing Authority Red Clover Commons housing development in Brattleboro.

CREATIVE PLACEMAKING

POP UP ART EVENT, BRATTLEBORO

Creative placemaking refers to a wide range of arts, cultural, and, design activities meant to strengthen communities. Examples of creative placemaking including using vacant buildings for community events or art shows, testing out potential small-scale public infrastructure projects, and creating pop-up pocket parks and public gathering spaces. The overarching goal of these activities is to bring new energy and attention to village centers and downtown areas, connect people and communities, and envision ideas to build better communities. Ultimately these projects can help improve the economy and quality of life in village and regional centers and support growth in these areas.

LAND USE POLICIES

1. Direct new growth, including housing, commerce, public infrastructure, industry, and community facilities, into appropriate land use designation areas, such as Regional Centers, Villages, Industrial areas, Commercial Nodes and Corridors, and Resort Centers.

2. New growth, in-fill development, and redevelopment in Regional Centers, Villages, and Hamlets shall give attention to the type and scale of the existing development forms and patterns in these areas in order to keep these centers culturally, socially, and economically viable.

3. Increase the energy efficiency of new and existing development from a regional land use perspective, including projected transportation, heating/cooling, and electricity needs.

4. In order to support climate resilient communities, new development and redevelopment in identified flood hazard, fluvial erosion, and river corridor protection areas should be avoided. If new development or redevelopment occurs in these areas, it shall not exacerbate flooding and fluvial erosion.

5. Efforts to conserve lands for the purpose of stormwater and floodwater attenuation, as well as for aquifer

recharge, shall be supported by the Commission.

6. Preserve the historic and architectural character of the region through the reuse and repurposing of viable existing structures and retaining historic development patterns, densities, and characteristics.

7. Maintain and grow an adequate housing stock that satisfies a diversity of needs and income levels for all residents throughout their life stages and situations. Encourage the siting of housing in Regional Centers and Villages, or within areas in close proximity along major roads and transit routes.

8. Support the transformation of existing Commercial Nodes and Corridors into areas that provide a greater mix of uses, increased density (when wastewater infrastructure is available), improved traffic circulation and pedestrian safety, and improved architectural and site design.

9. Concentrate multi-year or phased development growth to minimize the trend toward dispersed and sprawl development. All ski resort development shall be reviewed as part of a development master plan that has received positive findings on critical natural resource and other cumulative growth issues before any individual development projects are approved in order to assess and address cumulative impacts of the development.

10. Develop, maintain, and expand public infrastructure, including water and sewer systems and pedestrian and bicycle facilities, to promote and enable greater densities in development centers, including Regional Centers, Villages, Resort Centers, Industrial sites, and growth areas as identified by town plans. Support the development of new village centers where appropriate.

11. Develop and expand Hamlets in a form that maintains traditional density and residential settlement patterns.

12. Ensure the continued viability of industrial and commercial enterprises by supporting growth and expansion in Industrial areas while reducing and mitigating potential land use conflicts and external impacts of industrial activities.

13. Development in Rural Residential and Productive Rural areas shall be sited and designed to minimize conversion and fragmentation of forest and agricultural lands and protect the existing rural character. Proposed subdivisions adjacent to Villages and Regional Centers shall extend traditional neighborhood development patterns to the greatest extent feasible.

14. Strongly discourage all development in Resource Lands for purposes other than forestry and agriculture. Any land development in Resource Land shall be sited and designed to minimize the fragmentation of Priority Forest Blocks and Habitat Connectors, and minimize adverse impacts on the natural resources and

ecological services they provide, including wetlands, flood plains, river corridors, rare, threatened, and endangered species, significant natural communities, elevations above 2,500 feet, and slopes steeper than 25 percent.

15. Require that the benefits of any mitigation associated with projects in the Windham Region and being reviewed under Act 250, be directed to the Windham Region.

16. All development shall conform with the land use designation within which it falls as shown on the Future Land Use Map and described in the narrative section of this plan. Permit applications, including Acts 250 and 248, shall demonstrate conformity with the regional land use designation.

NATURAL RESOURCES

BACKGROUND

Natural resources are elements such as forests, mineral deposits, or fresh water, which are necessary or useful to humans. A natural resource's value is derived through either an economic use or through its conservation for continued future access and public benefit. Beneficial use and conservation of natural resources begins with an understanding of the complex balance of energy, ecosystems, and all living organisms. This interconnected web of life-support systems makes the sustainability of natural resources both a global and a local issue. Rapid consumption, misuse, or degradation can deplete and destroy both renewable and non-renewable natural resources.

The Windham Region is fortunate to have a wealth of valuable natural resources. Extensive forested lands, prime agricultural soils, river valleys, upland streams, and wetlands create a diversity of ecosystems in the region that sustain numerous plant and animal communities in addition to supporting human habitation. These interconnected ecosystems, consisting of humans, animals, plants, earth, air, and water, can be sustained through careful resource use and conservation.

The Windham Regional Commission continues to assist Towns in planning efforts to protect these resources, collaborates with regional and state-wide organizations who are working in our region, and focuses on education as a means of promoting natural resource knowledge and protection.

FOREST RESOURCES

REGIONAL OVERVIEW

Vermont's forests have recovered from a time when agriculture dominated a largely treeless landscape, followed by heavy logging of the young forests that first colonized the unused farmlands. These habitat changes have altered the relative abundance of various plant and animal species. With the maturing of today's forest, a mosaic of fields, pastures and woodlots in rural portions of the region has been shifting to a forested landscape punctuated by residential and recreational development, roadways, and powerline corridors. By contrast, in and around villages and other settled areas, an expansion of suburban development onto former farms and farm woodlots is reducing forest acres and lowering their productivity. Forested areas dominate the region at 82.8% of the

landcover. [1]

A MULTI-VALUED RESOURCE

Forests play a major role in the ecological, economic, and social health of the region. As a major component of our landscape, forests are a mix of rich ecological habitats for wildlife that support flora and fauna, contribute to water and air quality, make a significant contribution to reducing climate change effects though carbon sequestration, and form the environmental setting for human activity. Forest land provides employment to foresters, loggers, truckers, artisans, and forest-product manufacturers, and also supports a thriving recreation and tourism industry. In an increasingly populous and urban world, the region's forests offer reminders of Vermont's heritage and a traditional, rural lifestyle that appeal to residents and visitors alike.

These multiple and inter-related values create the potential for conflict and a need for thoughtful planning and management that embodies sound silvicultural practices while permitting multiple, compatible uses and for some fraction set aside as permanently protected natural areas. While it is clear that economic pressures can threaten many forested lands with conversion to non-forest uses, it is important to acknowledge that forest resource values are also threatened or degraded if these lands cannot be maintained in large, interconnected blocks. Fragmentation of large wood lots into smaller parcels with multiple owners decreases the practicality of commercial timber harvest, and diminishes the ability to use sound sustainable forest management practices.

FOREST ECONOMICS

With 82.8% of the region being forested, the region's forestry industry is one of the state's leading producers, especially of high-quality northern hardwoods and white pine. Eighty eight percent of the region's forests are in private, non-industrial ownership, with industrial firms and Federal, State and local governments sharing the rest. The headwaters of the region's major streams and rivers are heavily buffered by forestland, preserving soils, and water purity at the source. Nevertheless, steady population growth, dispersed settlement patterns, and second-home development have increased development pressure in forested areas.

Forests make a significant contribution to the economy of the Windham Region, leading the State in Sawlog and Veneer log harvest.[2] In past years, the forest products industries as a group had been a leader in the regional manufacturing sector in number of establishments and number of employees; however, recent trends have shown that the number of establishments has decreased as other sectors have risen. The forest industry has also slipped

[1] 2021 national Cover Dataset. Assumption made that forested wetlands is counted as wetlands and developed open land is counted as open.

[2] Vermont Department of Forests, Parks & Recreation, Vermont Harvest Report 2022, https://fpr.vermont.gov/sites/fpr/files/documents/Harvest_Report_2022.pdf

behind other types of manufacturing in the region in terms of payroll and average wage.[3] Recent economic hardship, caused by a slowing economy, resulted in some forest owners cutting timber intensively without regard for good forest management practices, leading to forest land that will not produce high quality timber for many years to come. Other forestland in the region has been sold for development. Research suggests, however, that the private owners of the great majority of the region's forests are not motivated by economic pressures alone, but highly value the non-economic resource attributes of their land. The top three reasons for forest ownership has been reported as 1) to enjoy scenery and beauty, 2) to protect or improve wildlife habitat and 3) to protect nature of biological diversity.[4] Nevertheless, the typical forestland owner is of mature age, and the potential for permanent conversion to non-forest uses looms large when ownership passes to the next generation, who may or may not have similar views in forest ownership. Two strategies have proven effective over time in keeping forestland intact, the Use-Value Appraisal Program in the short-term and the purchase of conservation easements in the long-term. Each of these programs should be supported and used in appropriate situations to help maintain the forest economy in Windham Region.

THE FOREST'S SOCIAL VALUE

The region's forests offer a rich selection of recreational options. Skiing and snowboarding, snowmobiling, mountain biking, hiking, hunting and fishing, wildlife observation and photography, and foliage appreciation all are popular in their seasons. Many view forestlands as valuable as a precious natural environment and a source of solitude, as well as a host for recreation and forest-based employment. The resource accommodates and satisfies this wide range of values, although some competing uses may at times be in conflict. State and Federal public lands offer opportunities for a backcountry wilderness experience that individual private lands in smaller block sizes cannot match, and they also support the most concentrated commercial recreation in the form of ski resorts. In spite of this, private lands dominate the forested landscape, and their contribution to recreation and aesthetics is essential. The management of forest resources needs to happen at a larger scale than most individual parcels have available. As such, it is important to work in cooperation with landowners and through public planning processes help preserve the value of larger forested blocks in the region.

[3] Vermont Department of Labor Economic & Labor Market Information, Covered Employment and Wages, Windham County 2022, http://www.vtlmi.info/indareanaics.cfm

[4] The Efficacy of Wildlife Conservation Assistance Programs for Vermont Family Forest Owners (2020) by Meg Harrington and Brett Butler

ISSUES FACING THE REGION'S FORESTS

FRAGMENTATION

Fragmentation of the forested landscape can be caused by any number of development activities. Subdivision of land and construction of new homes and businesses, and their attendant infrastructure, create smaller, separated, even isolated parcels that are too small or inaccessible to be managed or harvested efficiently. Sales by long-term industrial owners may add to this trend. Even if these lots are not developed, there is often a change in attitude of the landowners and a decrease in the land base available for management. This can affect the movement of wildlife across the landscape, the sharing of genetic information between different populations of plants and animals, people employed in the forest products industry and decrease opportunities for recreational activities.

Fragmentation is especially harmful to wildlife as habitats and habitat elements are eliminated or separated. With multiple owners and smaller woodlots the consistency of management practices that favor wildlife, and the connectivity among tracts of land is lost, with a result that can be detrimental to wildlife diversity and species vitality. Fragmentation also relates to climate change impacts influencing how animals will move and adapt as temperatures warm and forest tree species composition changes.

Act 171 was signed into law in June of 2016, amending Vermont's planning statutes to allow regions and municipalities to plan for management of forest and wildlife resources. Statute provides the following definitions for forest blocks and habitat connectors:

- **Forest block:** a contiguous area of forest in any stage of succession and not currently developed for non-forest use. A forest block may include recreational trails, wetlands, or other natural features that do not themselves possess tree cover, and uses exempt from regulation under subsection 4413(d) of this title.
- **Habitat connector:** land or water, or both, that links patches of wildlife habitat within a landscape, allowing the movement, migration, and dispersal of animals and plants and the functioning of ecological processes. A habitat connector may include recreational trails and uses exempt from regulation under subsection 4413(d) of this title. In a plan or other document issued pursuant to this chapter, a municipality or regional plan commission may use the phrase "wildlife corridor" in lieu of "habitat connector."

A look at the larger forested landscape pattern shows our forests are being fragmented by rural sprawl. It occurs incrementally, beginning with cleared swaths or pockets of non-forest within an otherwise unbroken expanse of tree cover. Over time, non-forest pockets tend to multiply and expand. Eventually the forest is fragmented and reduced to scattered, disconnected forest islands. These remnant forest islands are surrounded by land uses that threaten the health, function, and value of them for animal and plant habitat, and for human use. As forest

fragments become smaller, practicing forestry can become operationally impractical, economically nonviable, and culturally unacceptable. In turn, we lose the corresponding and significant contributions that forestry makes to our economy and culture.

Forest pattern addresses the configuration of forest blocks and habitat connectors. The pattern is the degree to which forest blocks and habitat connectors connect across the landscape or within a particular town. A healthy forest pattern is one where a town's largest forest blocks connect to one another via smaller forest blocks and riparian areas. These large blocks also connect to large forest blocks beyond the town boundaries. This healthy forest pattern is a network of contiguous streams and forest blocks that extends across town, interrupted only by a few roads or non-forest land cover (see Forest Blocks Map).

The degree of ecological functionality and connectivity varies with landscape condition. Conservation of only narrow threads of vegetative cover within a developing landscape will not maintain an area's ecological values, biological diversity, or plant and animal habitat needs. However, vegetative corridors can serve as habitat connectors. Conservation of vegetative corridors in conjunction with the maintenance of forest blocks with diverse habitat conditions will assist in supporting ecosystem functions and related public benefits.

An ecologically functional landscape is especially important in the context of climate change. Populations of species are already adjusting their home ranges to adapt to new conditions. Northward migration is occurring in response to warming temperatures, as well as in response to more complex changes in soil moisture and micro-climates. Movement resulting from climate change may also occur in more than one direction. Therefore, the overall network of connected lands and waters made up of forest blocks and habitat connectors in Vermont and throughout the northeast region is instrumental in allowing for migration of both plants and animals as our climate changes.

Forest uses directly serving economic ends must be reconciled with the need for large, undeveloped and relatively undisturbed, and interconnected blocks of forest that can meet the habitat needs of wide-ranging wildlife while minimizing human-wildlife conflicts. Forested sites of special natural value need identification and may require protection. Education aimed at improving understanding and appreciation by landowners and by the general public of the natural communities within the forest is essential to striking the right balance between natural, economic, and social uses of those resources. Conservation of forested helps ensure that large tracts of forested land will remain off limits to development and ensure the multiple productive, wildlife and scenic values of this resource.

DIMINISHED ECOLOGICAL DIVERSITY

Forested lands contribute to ecological diversity that will allow a healthy mix of plant and animal communities to thrive. Reduced plant diversity and change in forest structure (elimination of the mid-story and expansion of

ferns) negatively affects wildlife diversity. There are a few different reasons why there may be diminished ecological diversity in the future. One factor working against such diversity is the impact of deer herd browsing on saplings. The state of Vermont has been keeping a close watch on deer heard numbers and base yearly hunting regulations on deer health and population.

Another factor is the increasing numbers of invasive plant and animal pest species that displace native plants and animals. There is a correlation between invasive plant species taking hold in our region's forests and reduced densities of tree seedlings. Invasive pests, such as the Emerald Ash Borer, will likely change the nature of the region's forests as the amount of living Ash trees decreases.

With the need to manage for ecological diversity in a changing climate, there is an important role for planning in facilitating private landowner cooperation at the regional, town or neighborhood level.

CHANGING DEMOGRAPHICS

The changing demographics of the Windham Region, particularly in woodland ownership, are beginning to have an effect on forest management practices, as well as on public perceptions, attitudes and influence on regional forestry policies. Some research indicates that new woodland owners in the Windham Region, and in Vermont in general, are younger and less traditionally "land-connected" than historic owners, and that these younger owners are more likely to sell or subdivide their woodlands.

MAINTAINING THE REGION'S WOODLAND LEGACY

Approximately two-thirds of the land area in the Windham Region remains in parcels larger than 50 acres in size. Stronger local policies can be enacted to promote the viability of forestland, especially on intact parcels between 50 and 100 acres. Some forest resource protection tools available to towns include;[5]

- Designating a forest zoning district (24 V.S.A. § 4414, (1)(B)(ii))
- Requiring new developments to have smaller road setbacks, small lot sizes, clustered development, and land in conservation helps minimize forest fragmentation
- Encouraging development in existing growth centers to help prevent further fragmentation of natural resources
- Enacting overlay districts to restrict development in buffer areas near lakes, ponds, streams, rivers or steep

[5] The Conway School Student Project, *Woodlands of the Windham Region: Our Working Landscape*, 2013.

slopes

- Developing subdivision bylaws that require development be kept away from sensitive areas as a requirement for obtaining subdivision approval. It is important to note that "sensitive areas" should be identified and defined prior to enactment of the subdivision bylaws.

There are numerous resources for town officials and woodland owners to learn about forest management options, Acceptable Management Practices (AMP's) for maintaining water quality on logging jobs, and climate resiliency in our changing forests. Many organizations, such as Vermont Woodlands and Vermont Coverts provide training and peer to peer connections statewide. In the Windham Region, the Windham Regional Woodlands Association promotes education, conservation science, and recommended forestry practices. Professional programs for loggers and other forest workers (for example, the Vermont Logger Education, Training and Certification program and the Game of Logging program) have increased safety levels and improved forestry practices. Recreational use of forestland is enhanced by a variety of educational programs, such as those offered by the Bonnyvale Environmental Education Center of Brattleboro and the Nature Museum of Grafton.

At the State level, legislative intervention in forest-management practices and changes in forestland taxation under the Use Value Appraisal (Current Use) Program have affected both industrial and private ownership. In particular, private owners have created or inherited long-term management plans that are professionally monitored. At this time there are approximately 140,000 forested acres, or 27.6% percent of forests in the Windham Region, enrolled in the Use Value Appraisal Program, which is nearly 50% of the land that is eligible.

The Use Value Appraisal program offers a moderate amount of protection for forestland; however, owners can always withdraw from the program by paying a penalty fee, and then are free to develop their land. Permanent protection of forest land is best achieved through increased funding to support conservation easements. Land Trusts and non-profit land conservation groups are very effective in permanently conserving land and have been steadily adding more forest to the Windham Region's inventory of lands protected through conservation easements.

WORKING LANDS ENTERPRISE INITIATIVE

The Working Lands Enterprise Initiative mission is to strengthen and grow the economies, culture and communities of Vermont's working landscape. The Working Lands Enterprise Fund invests in the working lands economy by: giving grants to small and start-up working lands businesses; supporting working lands service providers that are starting up or in a growth phase; and investing in infrastructure to supporting working lands.

SURFACE WATERS

Surface waters are prominent landscape features that have often determined both the location and form of regional settlement. Surface waters include lakes and ponds (both natural and impounded), rivers and streams (permanent and intermittent), vernal pools, and wetlands (see Water Resources Map). The region's abundant surface waters are critical for sustaining ecological systems and provide numerous valuable resources. The region's landscape is 4.7% covered by water and wetlands.[6]

RIVER BASINS AND WATERSHEDS

The majority of the Windham Region is located within the Connecticut River Basin with small portions located in the Hudson River and Lake Champlain Basins. These basins contain many rivers and tributaries, each with their own unique watersheds. Table 5-1 shows the Windham Region's major watersheds and their respective acreage. A map of the major river basins is available in the map section, Basins and Watersheds Map.

TABLE 5-1: WINDHAM REGION WATERSHEDS

Watershed	State Watershed Basin Number	Acreage in Region	Percent of Region
Connecticut River Basin		582,598	99.0%
West, Williams and Saxtons Rivers	11	306,150	52.0%
Deerfield River	12	172,221	29.0%
Lower Connecticut River	Now incorporated into Basins 11 and 12	104,237	18.0%
Lake Champlain Basin		660	0.1%
Otter Creek	3	660	0.1%
Hudson River Basin		6,630	1.0%
Batten Kill	1	6,630	1.0%
Total		589,888	100.0%

Source: Windham Regional Commission GIS Department

[6] 2021 National Cover Dataset. Forested wetlands were counted as wetlands for a breakdown of landcover for the region.

LAKES AND PONDS

Within the watersheds of the Windham Region, there are 33 lakes and ponds over 20 acres in area. These water bodies provide their own special habitats and recreational opportunities, as well as conservation and water quality issues. Some of the issues particularly pertinent to lakes and ponds are exotic invasive species such as Eurasian watermilfoil, competing recreational uses, dam management, and extraction of water for snowmaking and other commercial uses.

The Vermont Watershed Management Division's Lakes and Ponds Section developed the Lake Score Card to provide a method for conveying the large amount of data gathered through their monitoring efforts. The Score Card rates Vermont lakes in terms of water quality, aquatic invasive species, atmospheric pollution, and shoreland and lake habitat. Most of the lakes within the Windham Region are in good condition for water quality and invasive species parameters. The region has many lakes who score in fair condition for mercury pollution, which comes from atmospheric deposition.

RIVERS AND STREAMS

Rivers and streams are dynamic systems that are constantly shifting in response to streamflow and ecological conditions making them complicated to understand. As a result, thorough study is required to understand how different sections of a stream relate to each other. Rivers and streams are critical waterways that provide vital breeding, resting, and feeding areas for fish, birds, and other wildlife species as well as critical habitat for plants, including rare, threatened, and endangered species. Rivers and streams provide water for drinking and domestic use, for generating electricity, for powering machinery, for irrigating crops, and for transporting goods. They enhance the beauty of the landscape and the quality of scenic and recreational experiences in the region. Healthy rivers and streams also provide vital ecological services such as helping to purify water, transport water and nutrients through the region, and moderate floods and droughts.

Undeveloped and undisturbed land along rivers and streams (riparian buffers) and along the shores of lakes and ponds (lacustrine buffers) are important for a number of reasons. They provide water quality values in terms of shade (temperature), pollutant filtration, and bank stability. They also provide habitat values both in the water, including direct sources of food and shelter for fish, and on shore, including viable habitat for plants and feeding, foraging, and travel corridors for wildlife. Finally, undeveloped waters shorelines provide a direct benefit to society in terms of scenery, recreation, and in many cases, buffering of flood waters.

FLOODPLAINS

Floodplains are lowlands along rivers, streams, and lakes that periodically become inundated with water during periods of high rainfall or spring runoff. They are important to the healthy functioning of river systems for retaining and infiltrating waters that might cause damage or destruction downstream. Floodplains are often the

best agricultural lands because of their thick glacial deposits, minimum slope and proximity to surface water. Floodways are stream channels and adjacent floodplain areas that carry the bulk and force of the river's flow, and must be kept free of encroachment.

Nearly three-quarters of Vermont streams have become disconnected from their historic floodplains through human impacted changes to the landscape. A stream's lack of access to its floodplain, including many wetland areas, creates an unstable condition in which the stream no longer has its "release valve" or ability to dissipate energy out of the stream channel and onto the surrounding landscape. Excessive streambank erosion, depositing of sediments, fast moving floodwaters, and increased damage to infrastructure and vulnerable development are all potential outcomes of a stream or river that has lost connection with its floodplain.[7]

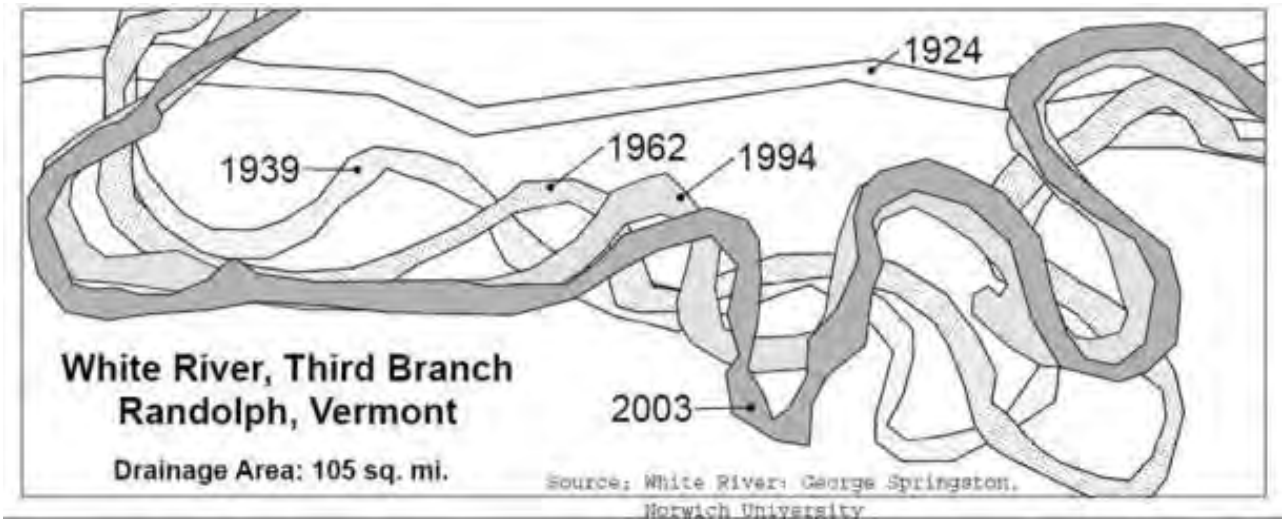
RIVER CORRIDORS

Fluvial (or river-related) erosion refers to major streambed and stream bank erosion associated with the often-catastrophic physical adjustment of stream channel dimensions (width and depth) and location that can occur during flooding. Fluvial erosion becomes a hazard when the stream channel that is undergoing adjustment due to its instability, threatens public infrastructure, houses, businesses, and other private investments. The mapped area subject to fluvial erosion risk is called the river corridor.

Rivers and streams are not static in the landscape. The shape of a river channel, including its width, depth, pattern, and slope, changes over time due to the action of water, sediment, and debris from the surrounding watershed as shown in the example (Figure 5-5). Rivers in "dynamic equilibrium" carry water, sediment, and debris, even during high water, without changes occurring in the depth, width, length, or slope of the channel. The channel may move and shift position within the landscape, but these other factors remain relatively constant. Human development, especially within river corridors, that significantly alters the runoff pattern of water and sediment can disrupt the equilibrium of a river system. When development changes the relationship of the river with its floodplain or constrains the river from maintaining or re-establishing equilibrium conditions, the result is often costly losses due to erosion. This erosion can also contribute to increased sediment and nutrients that can compromise water quality and aquatic habitat.

[7] Friends of the Winooski River, *Living in Harmony with Streams: A Citizen's Handbook to How Streams Work*, *http://www.vtwaterquality.org/rivers/docs/rv_streamguide.pdf.*

FIGURE 5-1: WHITE RIVER CHANNEL OVER TIME



Source: Agency of Natural Resources DEC Watershed Management Division

The degree of adjustment that streams will go through to establish and maintain equilibrium (having a dimension, pattern, and profile where erosion is minimized) is significant and a changing landscape makes finding that equilibrium more difficult. It is not safe or environmentally sound to encroach within a river corridor, as these areas are naturally unpredictable and are changing to seek equilibrium. Consideration of stream geomorphology and long-term river dynamics in land-use decision-making can protect and restore water quality and habitats, and mitigate damages and economic losses incurred as a result of floods and fluvial erosion.

FLOOD RESILIENCY

The Windham Region is vulnerable to the destructive impacts of the region's surface waters as we are reminded on an increasingly frequent basis. Although flooding is common in the Region, the severity of both Tropical Storm Irene in 2011 and the flooding of July 2023 raised considerable public awareness and community discussions about the need to address flood resiliency. Resiliency is the ability of a community to respond and adapt to natural and human-caused disasters. Potential flood damage in this region is exacerbated by a combination of frequent intense storm events and traditional settlement patterns which historically placed road networks, villages, and other development along river and stream corridors, often within the floodplain and river corridor.

Flooding is a natural ecological process. While river and stream channels serve to convey water downstream, floodplains and wetlands are critical for the infiltration and temporary storage of water during large storm events, thereby reducing peak flows and mitigating flooding downstream. Each of these ecosystems fulfills critical functions that have significant downstream benefits and thus should be preserved to the greatest extent possible. Experience has repeatedly demonstrated that development in floodplains and river corridors, and especially in floodways, is inherently dangerous, due both to the immediate hazards associated with flood water inundation and

to the increased flooding that may occur downstream when developed floodplains are no longer capable of retaining flood waters. Such development can also interfere with the function and quality of waterways, floodplains, and wetlands. While engineering techniques may help to mitigate the consequences of flooding on development within floodplains and river corridors, the fact that development *can* take place in these areas does not mean that development *should* occur in these areas. Development in river and stream corridors fundamentally places life and property at risk, and may exacerbate problems downstream. Towns are encouraged to develop policies and regulatory and non-regulatory local strategies to protect floodplains and river corridors.

There are many tools available to the region and towns for assessing their waterways and for promoting development that will allow existing waterways and future development to co-exist in a manner respectful of each other's needs. These tools include Stream Geomorphic Assessments, River Corridor Plans, Stormwater Master Plans, and Bridge and Culvert assessments. The Vermont Watershed Management Division has multiple guidance documents and reports available to towns and groups interested in pursuing this type of assessment.

NATIONAL FLOOD INSURANCE PROGRAM

Under the National Flood Insurance Program (NFIP), the Federal Emergency Management Agency makes insurance available to property owners in communities that implement and enforce zoning bylaws that meet standards to reduce future flood risk to new development and improvements to existing development. A major purpose of the NFIP is to alert communities to the danger of flooding and to reduce flood related property damage. The only option for property owners seeking flood insurance in a community that does not participate in the NFIP is to purchase it through the private insurance market, which can be more costly.

Special Flood Hazard Areas (SFHAs) are officially designated on Federal Insurance Rate Maps (FIRMs), prepared and published by the Federal Emergency Management Agency. The current FIRMs in Vermont are dated and map updates are a digitization of old data; therefore, in many instances SFHAs do not reflect the realistic extent of flood prone areas. For this reason, and to more accurately and adequately regulate the risk, communities should regulate both the SFHA and the river corridor. Communities can also adopt more stringent standards than the minimum measures acceptable for NFIP participation as a way to lessen the gap between the older map data and the true risk. As well, property owners that have built structures that may be subject to flooding or fluvial erosion are able to purchase flood insurance regardless if they are located in a mapped flood hazard area or not.

VERNAL POOLS

Vernal pools are small wetlands resulting from the persistence of standing water for a portion of the year, characterized by a lack of vegetation, though they may support some herbaceous wetland species. Vernal pools are perhaps best known as important breeding habitat for amphibians. Typical Vermont species that rely on vernal pools for reproduction include the Spotted Salamander, Blue-spotted Salamander, the Jefferson Salamander, the

Eastern Four-toed Salamander, and the Wood Frog. Other animals use pools as well, such as fairy shrimp, fingernail clams, snails, eastern newts, green frogs, American toads, spring peepers, and a diversity of aquatic insects. The Vermont Center for Ecostudies hosts an on-line interactive database of vernal pools in the state in the Vermont Vernal Pool Atlas.

Vernal pools and the organisms that depend on them are threatened by activities that alter pool hydrology and substrate, as well as by significant alteration of the surrounding forest. Construction of roads and other development in the upland forests around vernal pools can negatively affect salamander migration and mortality. Adjacent timber harvesting can have significant effects on vernal pools, including alteration of the vernal pool depression, changes in the amount of sunlight, leaf fall, and coarse woody debris in the pool, and disruption of amphibian migration routes by the creation of deep ruts.

WETLANDS

The region's wetlands are vital for their role in recharging groundwater, regulating and filtering surface water flow, storing water, mitigating floods, and providing significant aquatic and wildlife habitat. For example, several Windham Region wetlands are host to a federally listed endangered plant species, the northeastern bulrush. Consequently, they require careful protection. The Vermont Agency of Natural Resource's Natural Resources Atlas provides an inventory map showing Class I and Class II wetlands. There are currently no Class I wetlands in the Windham Region. New to the Natural Resources Atlas are the results from wetland health monitoring. This is a growing area of monitoring, but at this time only wetlands that have been reported as having some level of concern have been monitored.

WATER QUALITY

The surface waters of the Windham Region are monitored by both the State of Vermont and non-profit entities in the area. The 2022-2023 Water Quality Monitoring and Assessment Summary Report shows the majority of surface waters in the Windham Region to be in good condition. The Vermont Integrated Watershed Information System hosts an on-line data portal for water quality information. The Connecticut River Conservancy (CRC), and the Deerfield River Watershed Alliance in conjunction with the CRC, conduct water quality monitoring along several streams throughout the region. Information from their water monitoring efforts can be found on the Is it Clean? website.

Based on the results of the Vermont Lake Score Card the most common issue found in lakes and ponds in the Windham Region is atmospheric pollution. The most common pollutants for this region are acid and sediment, and the most common use impaired is aquatic life support. The sources of pollution identified as causing the greatest stresses on the region's rivers and streams are:

- Streambank erosion and de-stabilization
- Agricultural land uses and activities
- Removal of riparian vegetation from streambanks
- Developed land and road stormwater runoff
- Flow alteration from hydroelectric facilities
- Snowmaking water withdrawals to support ski resort operations
- Channel instability and confined streams

Riparian buffers are important for mitigating many of these pollution sources, preventing them from entering surface waters.

FIGURE 5-2: BALL MOUNTAIN DAM

Source: US Army Corp of Engineers Digital Visual Library

DAMS

There are numerous dams of various sizes constructed on streams and rivers in the Windham Region. They provide a variety of benefits including power generation, flood control, and recreational opportunities, such as swimming and boating. However, these structures can have significant negative environmental impacts, contributing to stream siltation, altered water levels and flow fluctuations, increased water temperature, decreased dissolved oxygen, and impeded fish passage

Dams used for power generation impact rivers in many ways beyond those listed above. Storage and release cycles of water for generating power need to be monitored to ensure aquatic habitats are not adversely impacted, generator turbines must be situated and designed to minimize damage to passing fish and storage capacities of dams holding water for future release, and power generation must be monitored to ensure dam structural safety.

Dams whose removal might provide substantial or unique environmental restoration potential, or that produce very little in terms of cost-effective renewable energy, might be candidates for removal. The removal decision must be made with consideration of the benefits derived, as well as the costs of removal and, if an energy generation facility, for replacement power that would be passed on to power companies and consumers. Evaluation on a case-by-case basis, use of appropriate guidelines and agreement on a replacement value is important. The Vermont Department of Environmental Conservation Dam Safety Program administers the State Dam Safety Rule, manages the Vermont Dam Inventory (VDI) database, oversees a permit program for construction and alteration of dams, an inspection program, and an annual registration program.

MANAGEMENT OF SURFACE WATER RESOURCES

Improved watershed management and cooperation among towns, state, and federal agencies, and area residents, will be required to meet competing uses of the region's rivers, lakes, and ponds. There are several plans and assessments that help with the management of surface waters. These include Tactical Basin Plans, Stormwater Master Plans, Stream Geomorphic Assessments, River Corridor Management Plans, and Stream Classification.

Vermont's Tactical Basin Planning process develops management plans for the waters of the state. The goal of the Tactical Basin Plan is to provide a roadmap for achieving watershed health. In the Windham Region, the two primary Basins are Basin 12, for the watersheds drained by the Deerfield, Green, and North Rivers, and several Connecticut River direct tributaries, and Basin 11, for the West, Williams, and Saxtons Rivers, and several Connecticut River direct tributaries. The basin planning process is on a five-year update cycle.

Stormwater Management Plans (SWMP's) are developed for municipalities to identify runoff from infrastructure and what can be done to mitigate the hazardous effects of the runoff before surface waters become impaired. The Vermont Department of Environmental Conservation(DEC) maintains a list of communities that currently have SWMP's. At the start of 2024, Brattleboro is the only town in the Windham Region with a Stormwater Master Plan and Londonderry, Wilmington, and the Greater Bellows Falls Area have SWMP's in progress.

Stream Geomorphic Assessments examine and address the condition of a river system. The River Corridor Management Plan then provides recommendations of projects that will help improve the aquatic environment, such as river corridor protection, restoration projects, and hazard mitigation. DEC maintains a list of all Stream Geomorphic Assessments and River Corridor Plans conducted throughout the State.

All surface waters in the state are divided into four possible classes based on water quality: **B(2) – good; B(1) very good; A(2) public water source; and A(1) excellent**. All waters at or below 2,500 feet are designated Class B(2) for all uses, unless specifically designated as Class A(1), A(2), or B(1) for any use. All waters above 2,500 feet are designated Class A(1) for all uses, unless specifically designated Class A(2) for use as a public water source. All waters must continue to meet the criteria for their class, otherwise they are then listed as impaired, and a restoration plan must be developed and implemented. There are many surface waters below 2,500 feet that achieve a very high level of water quality. There is an effort to reclassify some of these waters to an A(1) status. Recommendations for reclassification are listed in the Tactical Basin Plans.

Efforts should be made to protect all surface water in the region (lakes, ponds, streams, vernal pools, wetlands) by maintaining their riparian zone in an undisturbed (or minimally disturbed) vegetated state, preferably in woodland, the recommended width depending upon various factors. When area for this type of protection is not available, such as in downtown areas, other best management practices (BMPs) should be implemented to slow the rate of runoff from a site, such as through the use of minimized development footprints, bioswales, or green roofs. Of special concern is the West River watershed, including the Rock River, Winhall Brook and Wardsboro Brook,

which see a high rate of bank failures and are hazardous to infrastructure.

GROUNDWATER

Groundwater provides the primary supply of potable water for most of the region. Despite its high resource value, it remains a poorly understood resource. Groundwater moves beneath the ground through aquifers, which are underground water-bearing formations of sand, gravel and fractured rock. Due to Vermont's geology, groundwater is often unpredictable as it travels through a maze of cracks in bedrock formations. It can infiltrate rock fractures and travel quickly in unknown directions for long distances, or break out to the surface in a short distance.

Groundwater occurs in the unconsolidated sediment of streams and buried valleys and in bedrock fractures. While groundwater potential in areas of unconsolidated sediment is generally favorable, wells producing water from rock fractures usually have low yields (ranging from two to fifteen gallons per minute). The region's mountains and uplands have either exposed bedrock or bedrock covered by a thin layer of glacial till with low permeability; in these areas bedrock fractures are the primary source of groundwater.

GROUNDWATER

The Vermont Department of Environmental Conservation (DEC) maintains a comprehensive groundwater management program and puts groundwater in trust for the public now and for future generations. The three main components are:

- **Information** or the science and mapping of groundwater resources, including the location and movement of groundwater, its use, contamination, remediation, and protection.
- **Regulation:** classifying types of groundwater and developing and implementing rules that govern or permit activities that may impact groundwater.
- **Communication** or outreach to provide help and guidance to towns, municipalities, and the public through partnerships with EPA, USGS, VGS, VRWA, and other groups to encourage and support protecting groundwater resources.

Technical assistance for municipalities is available through DEC to help towns analyze the groundwater potential within town boundaries. The towns of Londonderry and Rockingham have undertaken such studies. These types of studies are especially important in the siting of landfills and in planning for village centers that need a public water supply to accommodate village expansions.

By statute, all groundwater of the state is classified as Class III water unless reclassified by the Secretary of ANR under provisions of 10 V.S.A., Chapter 48 Groundwater Protection, Subchapter 2, § 1394. The groundwater beneath

the Windham Solid Waste Management District landfill in Brattleboro has been reclassified to Class IV, as has the Southern Windsor/Windham Counties Solid Waste Management District landfill in Rockingham. All other groundwater in the region remains Class III.

GROUNDWATER QUALITY

Groundwater generally moves through soils very slowly. As a result, the cleansing processes that occur through dilution and movement in surface water do not take place underground. When an aquifer becomes polluted, simply removing the source of contamination does not clean up the groundwater. A contaminated aquifer may remain polluted for many years, and practically forever in some cases. Groundwater occurring in rock fractures is highly susceptible to contamination. While unconsolidated sediment can usually filter out organic pollution contained in water, the same water can travel for miles through rock fractures without appreciable purification. Once contamination occurs, control and abatement are extremely difficult. Consequently, one of the most important challenges of environmental planning is to prevent pollutants from entering rock fractures.

Potential groundwater pollutants include septage from improperly designed or malfunctioning septic tanks and leaching fields, leakage from underground gas and oil tanks, from commercial fuel, cooling and supply pipes, and from improper disposal of chemicals, both stable and radioactive. Public Community and Non-Transient, Non-Community Water Systems must have an approved Source Protection Plan (SPP). This Plan addresses the actions the public water system will perform to minimize the contaminant risks to their drinking water supply source(s). The water system is required to submit an updated plan to the Division every three years for approval.

SOILS AND TOPOGRAPHY

Soil characteristics impact farming, forestry, mineral extraction, and commercial development. Prime agricultural soils that are rated high for crop production potential are very limited in the region and are located primarily in the river valleys. Since most primary agricultural soils are flat and well drained, they are also desirable for many other uses. Soils suitable for sand and gravel extraction, found primarily in the Connecticut River Valley, are also limited. Many of the region's soils are shallow, unstable, highly erodible, wet, and/or poorly drained. Wet soils may cause basement flooding and failure of footings, foundations, underground piping, and septic systems. Road construction on wet sites can be damaging and prohibitively expensive. Drainage of excessively wet soils is often not an acceptable solution because of expense, rate of failure, and potential for environmental damage. Any of these features alone, or in combination with steep slopes and/or high elevations, are potentially critical factors in determining appropriate land use in the region.

PRIME AGRICULTURAL SOILS

Vermont soils are mapped based on their physical characteristics through the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture. There are three levels of classification that have an impact on development on these soils. These soils are classified as “prime,” of “statewide significance,” or of “local importance.” Within the Windham Region, prime agricultural soils are primarily located within the Connecticut River Valley. Agricultural soils are both a vital and limited resource in this region, and for that reason must be protected from development pressures either through conservation or effective mitigation practices. If a development project is subject to Act 250 jurisdiction and contains soils that are mapped by NRCS as of “prime”, “statewide”, or "local" importance, the VT Agency of Agriculture Food and Markets will review and provide recommendations. See the Important Farmland Soils map for a look at important soils in our region.

SEWAGE DISPOSAL

Development in the region has traditionally been encouraged on soils suitable for in-ground sewage disposal systems; however, because permeable soils are often closely associated with sites having high potential for aquifer recharge, their development may result in pollution of subsurface and surface waters. The “travel time” of liquid wastes, the rate of absorption, and the location of groundwater and surface waters are all important factors to consider when planning development on permeable soils. Installation of public waste water systems, especially in villages located in close proximity to rivers and streams, would help alleviate this issue.

MINERAL RESOURCES

Mineral resources in the Windham Region include deposits of sand, gravel, and other minerals, such as granite, slate, limestone, sulfide, uranium, iron ores, and ultramafics (sulfide, talc, soapstone, and serpentine). With the exception of sand and gravel operations, extractive industries have steadily declined in the region. This decline and abandonment of mining industries is primarily due to decreasing demand, changes in economic value, and local opposition to mining operations, rather than to exhaustion of the region's reserves. Public and private interests often are in conflict over extraction of mineral resources, making the balance between the need to use these resources with public’s right to minimize potential nuisances an increasingly visible issue.

Sand and gravel deposits of varying quality are scattered throughout the region and are the principal mineral resources being extracted. Sand occurs in good quality deposits, with large reserves along the Connecticut River and near most of its larger tributaries. Deposits of good quality gravel, however, are usually small. The region's good quality, accessible gravel reserve is low.

Sand and gravel are economically important regional resources and significant portions of them occur in only a few towns: Brattleboro, Dummerston, Vernon, Halifax, Guilford, Newfane, and Jamaica. Few towns own and operate their own gravel pits, even though they experience a steady demand for highway construction and maintenance of

unpaved roads. During the reconstruction period following Tropical Storm Irene large quantities of gravel were trucked in from out of state, supplemented by gravel extraction from impacted streams as local gravel pits could not keep up with demand. As the region grows, sand and gravel deposits will continue to be extracted for construction, fill, erosion control, and highway maintenance.

In recent years, the limited availability of aggregate, in the form of gravel, sand, and stone, has drawn the attention of State, as well as town highway officials. Rising costs and the future prospect of decreasing availability impacts maintenance and construction costs of all road improvements, whether paved or unpaved. In our region, towns farther from the aggregate sources in the Connecticut River Valley are often the hardest hit. In coming years, a significant issue in land use planning may be standards, regulations, and community acceptance of new or expanded aggregate facilities.

NATURAL AREAS, FRAGILE AREAS, AND WILDLIFE RESOURCES

Healthy, functioning ecosystems are important for ecological, educational, scenic and contemplative value. The Vermont Conservation Design project is a landscape level of design to promote ecological functioning. According to the Agency of Natural Resources, "The lands and waters identified in this project are the areas of the state that are the highest priority for maintain ecological integrity. Together, these lands comprise a connected landscape of large and intact forested habitat, healthy aquatic and riparian systems, and a full range of physical features (bedrock, soils, elevation, slope and aspect) on which plan and animal natural communities depend." The identified elements of Vermont Conservation Design can be found on Vermont BioFinder. Outside of the high priority areas, some areas are unique and considered rare. They provide ecological preserves of relatively unaltered environments that are important to wildlife, biological diversity and the natural heritage of the region.

In addition to the state identified natural and fragile locations, the WRC identifies bear habitat and corridor areas, deer wintering areas, brook trout fish habitat, large blocks of forested lands, critical wildlife corridors, areas where threatened or endangered species are found, significant natural communities, amphibian and reptile crossings and locally identified important natural areas as important wildlife resources.

DESIGNATED NATURAL OR FRAGILE AREAS

Vermont law enables the State to designate Natural Areas (10 V.S.A. § 2607) and Fragile Areas (10 V.S.A. § 6551).

- A Natural Area is a "limited areas of land that have retained their wilderness character, although not necessarily completely natural and undisturbed, or have rare or vanishing species of plant or animal life or similar features of interest that are worthy of preservation for the use of present and future residents of the State and may include unique ecological, geological, scenic, and contemplative recreational areas on State

lands." Designated Natural Areas are owned by the Vermont Department of Forests, Parks and Recreation.

- The State of Vermont defines a Fragile Area as "… an area of land or water that has unusual or significant flora, fauna, geological, or similar features of scientific, ecological, or educational interest." Any party can own a Fragile Area, but it must have been determined to be of statewide significance.

These designations provide protection and the assurance that the areas will be managed to maintain their natural integrity. Hamilton Falls, on Cobb Brook in Jamaica State Park, and Terrible Mountain on the eastern border of Weston are the Windham Region's only state-registered Natural Areas. The only state-registered Fragile Area is the J. Maynard Miller Memorial Forest (the Black Gum Swamps) in Vernon.

LANDS ABOVE 2,500 FEET

Although not formally designated as such, areas above 2,500 feet in elevation are often fragile areas in Vermont. Lands above 2,500 feet are especially vulnerable natural environments because of their generally thin soils, steep slopes, sensitive vegetation, important wildlife habitats and often greater than average precipitation and wind. Some 24,800 acres (4 percent) of the Windham Region are above 2,500 feet in elevation. By state law, all waters above 2,500 feet are classified A1 – Ecological Waters.

BEAR HABITAT & CORRIDORS

Eastern black bears require forest territory for survival. Stands of oak and beech trees are especially important in that these trees produce nuts for food in summer and fall. Bears also need wetland forest habitat, where they get food in spring. Because bears use different habitats seasonally, they must also have a way to move between them. Bears travel through "corridors" to move across roads or through developed areas from one habitat area to another.

Bears are large animals, and they require large, unbroken areas of habitat. Habitat fragmentation causes many problems for bears by restricting their movement within their home ranges, by reducing food supplies, and by increasing the chance of collisions with automobiles. It also increases the frequency of contact with humans, a situation that often ends badly for the bears. Fragmentation of bear habitat should be minimized and bear travel corridors should be protected. Visit the WRC Ecological Resources map to see regionally identified bear corridors.

DEER WINTERING AREAS

Deer wintering areas or "deer yards" are a critically important habitat type for deer to survive through the winter. Only 7 to 8 percent of Vermont's forests make up such wintering areas. An important part of a deer yard is the evergreen trees that catch the snow in their branches, thus reducing snow depth underneath and making deer travel easier and less energy intensive when food is relatively scarce. The trees also provide thermal cover that

gives the deer protection from the wind. Deer may move 10 to 15 miles to go to a yard and stay in the protection of the area all winter. Deer wintering areas can be found on the Vermont Natural Resources Atlas.

COLD WATER FISH HABITAT

Most of the region's rivers and streams provide important cold-water fish habitats. Shaded stream banks, clean gravel and rocky bottoms, and clean, cool water are necessary to maintain these cold-water fisheries (e.g. brook trout). Lakes, ponds, and larger, slower moving rivers provide warm-water fish habitat. Healthy fisheries are important for both their ecological and economic value. Sedimentation from runoff, bacteria from septic systems, clearing of streambank vegetation, damming of rivers and streams, development of on-stream ponds and lowering in-stream water flows all negatively impact important fish habitats. Stream crossings that do not provide aquatic organism passage and/or are not geomorphically compatible can also have negative impacts. Wetlands, vernal pools and other surface waters also provide specialized habitats for fish, reptiles, amphibians, mammals and migratory birds. Vegetated stream buffers and corridors provide important wildlife travel corridors, help maintain cooler water temperatures and stabilize stream banks from erosion. Additionally, connectivity both laterally and vertically is important for the ecologically health of the waterway.

FOREST BLOCKS AND CORRIDORS

The mountainous, forested landscape remote from community centers is the stronghold and haven for the region's large mammals, including black bear, moose, deer, bobcat, fisher, coyote, otter, and beaver. Large populations of deer and coyotes can also be found in the less remote areas. Completing the forest ecosystem are the smaller mammals, reptiles, amphibians, game birds, raptors, and many valued songbirds, insects and a network of plants, fungi, mosses and micro-organism working together to create a diverse forested landscape. New roads, guardrails, and construction of homes and other forms of development, as well as indiscriminate timber cutting, outbreaks of tree disease and replacement of native vegetation with invasive plant species, endanger both the quantity and quality of these important wildlife habitats.

RARE, THREATENED OR ENDANGERED SPECIES

A rare species is one that has only a few populations in the state and that faces threats to its continued existence. Rare species face threats from development of their habitat, harassment, collection, and suppression of natural processes, such as fire.

The term "endangered" generally refers to species whose continued existence as a viable component of the state's wild fauna or flora is in jeopardy, while "threatened" species are those whose numbers are significantly declining because of loss of habitat or human disturbance, and unless protected will become an endangered species. The Vermont Natural Resources Atlas, can be used to identify areas where threatened or endangered plant and animals

are located in the state. Due to threat of threatened and endangered species being harvested from the wild, the map does not name the species of concern nor give a pinpointed location.

In the Windham Region, the Town of Vernon, the West River, Herrick's Cove at the mouth of the Williams River and other Connecticut River direct tributaries have high occurrences of rare, threatened or endangered species.

CRITICAL NATURAL AREAS (HIGH LEVELS OF BIODIVERSITY)

Critical natural areas are zones that can support a high level of biodiversity because of their natural characteristics. Based on Vermont Conservation Design, BioFinder is a map and database identifying Vermont's lands and waters supporting high priority ecosystems, natural communities, habitats, and species. Within the Windham Region, Stratton and Somerset mountains, the Black Gum Swamp in Vernon, Herrick's Cove in Rockingham, and the upper and lower West River reaches and tributaries all have areas supporting high levels of biodiversity.

BEAVER FLOWAGES

Beavers are unique amongst wildlife in the region in that they have the ability to change the environment that they live in through their activities. Beavers can create and/or enhance wetlands which become an important part of the broader ecosystem. The benefits of beaver created wetlands are multi-faced, including habitat enhancement, creation of wetlands that support a wide variety of terrestrial and aquatic plants and animals, flood storage, improvement of water quality and increased recharging of groundwater. As beaver populations continue to rise in the region, the ecosystem services that they provide are to be encouraged.

Conflicts between beavers and humans can exist in areas where beaver activities cause disruption to human infrastructure. Conflicts can occur when culverts become plugged, roads are overtopped with damned water, ornamental trees are toppled, dams fail due to the inability of beavers to maintain them, or dry land becomes a new wetland on areas that are actively managed by humans. There is a long history of trapping "nuisance" beavers. This human intervention has a short-term effect of eliminating the activity of current beaver residents, but is not necessarily the most cost effective or efficient alternative in the long run. Beavers move through the landscape to establish new suitable habitats and the site is likely to be re-inhabited by new beavers in the future.

In order to protect and enhance the many public benefits provided by beavers, the WRC encourages local governments and landowners to minimize interference with beavers and the wetland habitats that they create. WRC also encourages the undisturbed protection of headwater lands where beaver habitats can reduce flooding at lower elevations. In cases where intervention is deemed necessary, valuable trees, property, and infrastructure can be protected using a variety of well-proven strategies that allow beavers to remain on site to do their important work. There are several public and private consulting services available to help towns and individuals assess beaver and human conflict zones.

INVASIVE SPECIES

Invasive species, also called invasive exotics or simply exotics, are "non-indigenous" or "non-native" species that adversely affect the habitats and bioregions they invade economically, environmentally, and/or ecologically. Such invasive species may be either plants or animals and may disrupt the native habitat by weakening or eliminating natural controls such as predators or herbivores. In the Windham Region, the most notable terrestrial invasive plants are Japanese Knotweed, Barberry, Garlic Mustard, and Glossy Buckthorn. Aquatic invasives include Eurasian Watermilfoil, Water Chestnut, Hydrilla, and Curly Leaf Pondweed. Forest pests include emerald ash borer, hemlock woolly adelgid, elongate hemlock scale, Asian longhorned beetle, spotted lanternfly, beech leaf disease, oak wilt, and jumping worms. To find out more information on invasive species of Vermont, including identification, biology, management options, and Vermont distribution, visit Vermont Invasives.

Early detection is very important in controlling the spread of invasive species. When detected at the early stage, there is some hope, that with treatment, the species root hold can be disrupted. Once established, evasive species are not likely to be eradicated, but there are steps for managing their spread. In Windham County, the Southeast Vermont Cooperative Invasive Species Management Association (SE VT CISMA) is a non-profit volunteer group working on educating the public about terrestrial invasive species. For aquatic invasive education, the Windham County Natural Resource Conservation District hosts the Vermont Public Access Greeter Program at several lakes throughout the region . Vermont DEC runs an aquatic invasive monitoring program called the Vermont Invasive Patrollers (VIP) Program and volunteer monitors in the region report sightings to Vermont DEC's ponds and lake division.

AIR QUALITY

The Clean Air Act of the Environmental Protection Administration identifies two types of national ambient air quality standards. ***Primary standards*** provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. ***Secondary standards*** provide protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The Vermont Department of Environmental Conservation Air Monitoring Section operates the division's statewide ambient air monitoring network for the measurement of EPA criteria pollutants- ozone, particulate matter, nitrogen oxides, carbon monoxide and sulfur dioxide, as well as meteorological parameters such as wind speed and direction, temperature, barometric pressure, precipitation and solar radiation. The two closest monitoring stations to the Windham Region can be found in the Towns of Bennington and Rutland.

Aside from national air quality standards, outdoor air pollution in significant concentrations can raise aesthetic and nuisance issues such as impairment of scenic visibility; unpleasant smoke or odors; atmospheric impacts to water quality; and can also pose human health problems, especially for more sensitive populations like children, asthma sufferers, and the elderly. The region's air quality is impacted by both local and distant sources of air

pollution. Local sources include discharges from industries, combustion of fuels for residential heating, and significantly from non-point sources such as automobile operation. As in other parts of New England, the topography, prevailing wind and weather patterns also bring air pollution to southeastern Vermont from other areas of the country.

SCENIC RESOURCES

The region enjoys exceptional scenic quality. Mountain and farm landscapes, historic villages and towns, ridgelines, the night sky and nighttime landscapes, shorelines, and scenic corridors are all highly vulnerable to development and should be reviewed.

Structures such as utility poles, telecommunication towers, wind turbines, cleared powerline rights of way, large-scale signage, and streetlights are considered by many to be incongruous with our scenic landscape. Careful planning and design will often provide development opportunities without adversely affecting the scenic value of the landscape. Some towns in the region have developed specific zoning or policies related to ridgeline development, such as limiting residential, commercial or industrial development on certain ridgelines. It is important for towns to identify the specific scenic resources that they deem significant and to clearly delineate those resources in their plans. Scenic resources can be a highly subjective topic in review processes, which is why it is important to be proactive about clarifying the scenic resources the town wishes to preserve.

LIGHT AND NOISE POLLUTION

Light pollution is a cumulative and increasing problem that can disrupt wildlife patterns, impact human health, waste money and energy, and contribute to climate change. In the Windham Region, light pollution is especially increasing near the urban clusters along the region's eastern border and near major resort development centers. Light projecting upwards from these areas produces a glow near the horizon that diminishes the natural quality of the nighttime landscape and night sky. As these urbanized areas continue to expand, special consideration needs to be given to lighting design in order to minimize this cumulative adverse effect. Automatic shut-off mechanisms and down-shielding of light sources should be considered for any development with outdoor lighting.

In the Windham Region, Green Mountain National Forest, especially in the towns of Somerset and Searsburg is a popular dark sky location for stargazing and astronomy activities.

Unpleasant or otherwise unwanted sound that travels through the air is another type of pollution that may be caused by traffic, airplanes, snowmobiles & all terrain vehicles, construction and industrial activity such as mining, quarrying and logging, sound equipment, and yard equipment. Noise pollution can negatively affect both humans and wildlife. One often-discussed noise problem is the vehicular and truck traffic passing though the region's

villages.

Noise Impact Assessments model the potential impact of noise from a particular project on the surrounding environment. These assessments are essential for evaluating the impacts of projects that will emit significant sound levels, either during construction or through ongoing activities. The assessments identify vulnerable areas and evaluate the effectiveness of possible mitigation measures in reducing the decibel level of sound reaching surrounding areas. Towns can further improve the outcomes of these noise impact assessments by predetermining noise standards for specific land uses or identified vulnerable areas. The Vermont Act 250 process has determined some baseline standards for certain uses, but towns should evaluate these standards based on their specific circumstances.

NATURAL RESOURCE POLICIES

FOREST RESOURCES

1. Maintain a mixed aged forested landscape in the region composed of a variety of forest blocks that support ecological and economic functions.
    a. Encourage the use of conservation subdivision models, conservation easements, and purchase and ownership of lands for conservation purposes by conservation organizations, land trusts, and state and local government.
    b. Continue to support the Vermont Use Value Appraisal (Current Use) Program—a program critical to the forest resource in the region—on a fully funded basis.
    c. Encourage the preservation of old growth forest blocks.
2. Encourage public, private and business landowners to maintain and enhance forests on their lands to support both ecological and human use functions.
    a. Encourage the development of local markets for all forest products.
        i. Encourage the local manufacture and marketing of value-added forest products.
        ii. Promote the purchase of locally produced forest products.
3. Support early detection, rapid response and long-term management of invasive species in the region.
    a. Require the mitigation of invasive species as a condition on permits for development where the introduction or spread of invasive species is likely.

4. Support the establishment and protection of public access to forested lands.

    a. Encourage preservation of historic access points.

    b. Promote public access connections in development proposals.

5. Facilitate the understanding and appreciation of the environmental, economic, and recreational benefits offered by the region's forests.

    a. Support organizations and educational programs that teach or demonstrate sustainable forestry and Acceptable Management Practices.

6. Forestlands should be managed so as to maintain and improve forest blocks and habitat connectors.

    a. Direct development to locations that will avoid the fragmentation of identified important natural areas, wildlife habitat and large forest blocks.

    b. Encourage the sale or gift of land rights to land trusts or private conservation groups to maximize forest land and contiguous forest tracts.

SURFACE WATERS

7. Maintain and restore the chemical, biological, and physical quality of the region's surface water and, at a minimum, meet the objectives stated in State and Federal water regulations.

    a. Encourage towns and community organizations to identify critical surface waters and support efforts to protect these exceptional natural resources.

    b. Encourage municipalities and other regional organizations to purchase easements on land bordering streams to establish woody vegetation for the purpose of mitigation of erosion during flash flood events and provide wild animal cover for movement between forest blocks.

8. Support efforts that reduce Nitrogen and other pollutants from entering our streams and rivers.

9. Maintain and/or restore woody buffers of vegetation along watercourses, lakes, ponds, wetlands, and vernal pools consistent with State regulations and the highest precedent established by the District Environmental Commission and State Environmental Court.

    a. Protect shorelines, provide shading to prevent undue increase in stream temperatures, minimize effects of erosion, sedimentation and other sources of pollution, and to maintain scenic, recreational, and habitat values.

b. Bioengineered bank stabilization is the preferred method of streambank restoration. When rock armament of streambanks is necessary, efforts should be made to revegetate on top of the rock to reduce water temperature.

10. Restore floodplain areas along rivers in order to accommodate floodwaters.

11. Evaluate the licensing or re-licensing of hydroelectric power generating facilities in a manner that supports the provisions of this plan.

    a. When considering either licensing of new dams, or relicensing of existing dams, the WRC will ensure that all issues are addressed and given balanced consideration.

12. Maintain any designated Class I wetlands in their natural condition and restore wetlands when possible.

    a. Ensure that any permitted alterations to Class II and Class III wetlands do not significantly diminish their functional, ecological, or aesthetic values.

    b. All projects shall provide evidence that onsite wetlands have been field checked and verified by an environmental official or State agency representative.

13. Evaluate inter-basin transfers of water and require project proposals to demonstrate that the water quality in both the sending and receiving basins will not be significantly lowered, that the water table and stream flow in the sending basin will not be detrimentally lowered, and that peak flows in the receiving basin will not be detrimentally increased. For purposes of this policy, a basin is the drainage area of a watercourse that is at least 1,000 acres in area.

14. Support surface water classification and management strategies which are consistent with the municipal and regional land use planning objectives for the affected watershed, and which will effectively maintain or improve existing water quality.

15. Maintain water flows in streams at levels that support a full range of in-stream uses, habitat needs, and water quality values.

    a. Follow state regulations in relation to water withdrawals.

    b. The WRC will give due consideration to the economic, safety, and environmental factors involved in the construction of surface water impoundments and withdrawals for any development activities.

16. Support flood hazard policies.

    a. The WRC shall continue to assist in the study of the region's waterways, and discourage development in river and stream corridors, floodways, floodplains, and fluvial erosion hazard zones

unless appropriate and proven mitigation measures are taken.

17. Continue to support State regulations and programs to protect surface waters from run-off and sedimentation caused by agriculture, forestry, recreation, and development activities.

    a. Support the use of tools and programs such as: Acceptable Agricultural Practices (AAP's), Acceptable Management Practices (AMP's) for forestry, Better Roads, and Best Management Practices (BMP's) for erosion control.

18. Continue to support municipalities in employing road maintenance techniques to prevent soil erosion and road surface deterioration.

19. New or replacement bridges and culverts must be adequately designed and constructed to handle stormwater, flood waters (i.e. provide for a 100-year flood event at the minimum), provide sediment transport, and accommodate fish and wildlife passage.

20. Support towns and dam owners with the removal of dams, high-hazard and otherwise, that no longer serve a use and are a hindrance to aquatic organism passage and/or create a flood hazard.

GROUNDWATER

21. Maintain or Improve Class I groundwater. These are high-quality resource areas mapped by the Agency of Natural Resources and so classified by the Secretary as currently being used or suitable for a public water supply source.

    a. In undertaking the above, regional land use policy and decision making should limit human activities in these areas.

22. To ensure that groundwater in the region is not contaminated.

    a. Avoid contamination of wells and groundwater by encouraging the use of proper drilling technology and appropriate well placement.

    b. Require testing for large amounts of material deposited on soil surfaces to ensure that no elements or chemicals are present that could contaminate ground water.

    c. Require facilities that house or generate hazardous waste to meet Tier II reporting requirements, and to have storage and disposal plans demonstrating that contamination risks have been minimized per the requirements of the Emergency Planning and Community Right to Know Act (EPCRA).

d. Support efforts to make appropriate disposal of small-quantities of hazardous waste convenient and effective in the region.

23. Groundwater aquifers are important communal resources and need to be sustainably allocated and used.

    a. Support the Department of Environmental Conservation Water Supply Division in regulating and monitoring water withdrawal from underground sources to ensure that aquifers and surface waters are not significantly depleted, and that water is properly allocated. Promulgation of specific laws and regulations to control water withdrawal and to ensure minimum flows is encouraged.

    b. Evaluate new development plans through the lens of groundwater usage. New development should not deplete water resources currently being used by existing developments.

SOILS, TOPOGRAPHY AND MINERAL RESOURCES

24. Protect the region's soils.

    a. Require developers to take special precautions on slopes to avoid environmental damage, including negative consequences associated with erosion and landslides.

    b. Minimize areas of earth disturbance, grading, and vegetation clearing on slopes over 15 percent;

    c. Design development on slopes over 15 percent such that it minimizes the potential impacts of slides and earthquakes; and

    d. Avoid development (other than appropriately designed recreational trails and ski lifts) in areas with slopes exceeding 25 percent or above 2,500 feet in elevation.

25. Recommend detailed site studies to determine suitability for development where steep slopes occur with shallow soils. Ensure that all development proposals on such soils provide and conform to a site drainage plan and an ANR approved erosion control plan for construction phases of the development.

26. Avoid development on wet soils, mucks, clays, silts, and other unstable soils that offer poor support for foundations or footings or that are subject to slippage.

27. Ensure that any ground disturbance (including quarry activity) does not have negative impact on groundwater, surface waters, recreation sites, historic sites, scenic areas, and special community resources. Future access to gravel resources should be considered in development proposals.

    a. When ground disturbance occurs, best practices are to be used to minimize dust, noise, and other degradation of air quality.

b. Ensure that effective site rehabilitation plans are provided and implemented for new development projects.

NATURAL AREAS, FRAGILE AREAS AND WILDLIFE RESOURCES

28. Support the designation and protection of State or regionally significant natural areas, fragile areas, and rare, threatened or endangered species.

    a. Support local, regional, state and federal programs and incentives that encourage private and public landowners to restore or enhance fish and wildlife habitats and ecosystems.

29. Protect Natural and Fragile Areas from development.

    a. When development is proposed near a natural or fragile area a buffer strip, designed in consultation with the appropriate state agency, must be designated and maintained between the development and any natural or fragile area.

    b. Vernal pools and their surrounding terrestrial amphibian habitat should be identified and protected from development.

30. Development should be designed and sited in a manner to preserve contiguous areas of active or potential wildlife habitat. Corridors connecting habitat areas for large mammals must be incorporated in plans for management and conservation of forested areas. Fragmentation of critical wildlife habitat should not be approved.

    a. Development should utilize existing roads and field edges to avoid additional forest fragmentation.

    b. Developers must demonstrate that they have taken reasonable steps during development planning to minimize impacts on critical habitats, including, but not limited, to the following:

        i. Habitat connectors.

        ii. Grassland regions.

        iii. Cliff areas identified as potential or active nesting places for peregrine falcons.

        iv. Areas over 2,500 feet in elevation.

        v. Large tracts of contiguous forest land identified as priority or high priority forest blocks.

AIR QUALITY

31. Require that development activities meet state and federal standards for air quality.

    a. Proposed developments must be reviewed for their direct and *indirect* impact upon air quality and acceptability by local and regional airshed users.

    b. Air pollution impact reviews should include visual quality in addition to contaminant concentrations over time and distance.

32. Any emissions of hazardous or toxic air pollutants by commercial operations shall monitored for public health and safety so that concentrations of hazardous or toxic air contaminants in local and regional airsheds are below those listed for human health protection by federal and state regulations.

LIGHT AND NOISE POLLUTION

33. Minimize visual impacts of existing and new high-elevation or ridgeline structures through co-location, design, siting, and color choice.

34. Require illumination of structures and exterior areas only at levels necessary to ensure safety and security of persons and property. Require arrangement of all exterior lighting so that the light source (lamp) is not directly visible from public roads, adjacent residences or distant vantage points. Require shielding of exterior lighting so that the light does not project above the lamp. Discourage exterior area illumination of regionally prominent physical features and landscapes.

35. Require that development activities meet state and federal standards for noise.

    a. Proposed development that may have noise impacts should include a noise study to understand those impacts before they are permitted.

    b. When deemed appropriate, mitigation strategies should be utilized to reduce noise pollution to acceptable levels.

SCENIC RESOURCES

36. Encourage towns to identify their scenic resources and support efforts for their enhancement and maintenance.

    a. Encourage towns to accept suggestions and input on scenic resources from neighboring towns and WRC.

    b. Encourage towns to develop policies in their town plan that identify and protect their scenic

resources.

c. Encourage donation of scenic easements to public agencies or to private conservation organizations.

37. Require that the scale, siting, design, and management of new development maintains or enhances the landscape and protects high quality scenic landscapes and scenic corridors as identified by town plans.

38. Plan new or improve existing roads so that they maintain or enhance scenic resources.

39. Screen new development from I-91 and state highways and other identified scenic roads and rivers, as identified by town plans, to the greatest extent practicable using vernacular perimeter plantings of hedges, hedgerows, and trees.

TRANSPORTATION

BACKGROUND

Transportation is a vital and necessary part of the larger planning landscape in the Windham Region. Our transportation infrastructure provides the mechanism for residents and visitors to move about the region and is a fundamental component of social, cultural and economic life. Ensuring that all residents are able to travel to work, school, healthcare, recreation, and social activities as safely and efficiently as possible is one of the primary goals of this plan.

The rural character of Vermont creates unique transportation challenges. Much of our region is dispersed in rural areas with relatively little commercial, industrial, educational and healthcare infrastructure. This necessitates that residents travel further to access such services than those in more heavily developed areas. For someone living in Jamaica, their commute to work, a visit to the doctor, or a trip to the grocery store can mean an hour and a half round trip to Brattleboro.

As such, most Vermonters are dependent on access to a personal vehicle to meet the majority of their transportation needs. Ensuring that our roads and bridges are built and maintained to a standard sufficient to safely and efficiently handle the region's commercial and personal vehicle traffic is critical. This includes being properly maintained during winter and as resilient as possible to the increasingly frequent flood events that we have experienced in the Windham Region over the past decade.

The car dependent nature of the region brings its own challenges. Average annual CO2 emissions are significantly higher in Vermont than New England as a whole. Additionally, transportation is a major challenge for those without access to a personal vehicle and limited alternative transportation options can create substantial barriers to employment, education, and healthcare access. Expanded access to public transit as well as improved infrastructure for bicyclists and pedestrians is critical to reducing the environmental impact of the transportation system as well as ensuring all residents are to get where they need to go to lead happy, healthy, productive lives.

This section outlines the existing conditions and major challenges of the transportation system as well as regional goals for improvements that will benefit the social, cultural, environmental, and economic character of the Windham Region. The plan identifies local and regional implementation strategies to help meet these goals and outline the role the Windham Regional Commission in working with our state and local partners to maintain and improve transportation infrastructure in the Region.

LAND USE AND TRANSPORTATION

Transportation and land use are closely linked. Land use patterns determine how systems of transportation function in a particular place, and the transportation system will have an impact on existing and future land use and development in a given area. This is especially true in Vermont where our historic pattern of compact settlement creates a particularly sharp divide between densely populated downtowns and villages and the surrounding rural areas. Context sensitive transportation planning that adequately considers existing and future land use is a critical to address the challenges identified in this plan.

DOWNTOWN BELLOWS FALLS
Photo Credit: WRC

The dispersed rural character of the Windham Region contributes to unique transportation challenges. Many residents live a considerable distance from healthcare, shopping, education and employment and must travel long distances each day to go to work or school, to buy groceries or to see a doctor. Behind housing, transportation is the 2nd largest expense for Vermonters. The 2022 Vermont Basic Needs and Livable Wage Report estimated that rural Vermonters spend an average of $666 per month on transportation, equal to approximately 25% of their monthly budget.

There is a critical link between housing and transportation costs. The further people live from their place of employment, the grocery store, and other daily needs, the more they will spend on transportation. Transportation costs and impacts must be considered when planning for housing development in the region. Siting new housing in such a way that is as convenient to employment, education, and commercial centers will reduce travel distances and transportation costs.

Additionally, transportation improvements for all users and modes must be incorporated into planning for housing. Housing that is close to important destinations, as well as connected to those destinations by public transportation and adequate infrastructure for walking and biking, will reduce transportation costs for residents. This also supports the local economy by improving accessibility and expanding the customer and employee base for businesses. Transportation, housing, and the local economy are deeply interwoven; the vitality of our downtowns and village

centers is largely dependent on having a concentration of population sufficient to support local business and a transportation system that is adequate to allow people to conveniently access those businesses.

Our Designated Downtowns, Brattleboro, Bellows Falls, and Wilmington, as well as the many villages in the region, are densely populated hubs for commerce, culture and civic life. The scale and design of these areas should enhance the functions of the village at the human scale, and not simply increase the efficiency with which a vehicle may pass through the village. Downtowns and villages are the places in the region that people can navigate most easily without a vehicle and improving bicycle and pedestrian infrastructure is particularly important in this land use context. Sidewalks and bicycle lanes should be improved and expanded where possible. Traffic calming techniques and complete streets principals should be adopted to reduce functional conflict between drivers and other users.

Ensuring that our downtowns and villages are as safe, attractive and efficient as possible for people walking and biking will make our region a more desirable place for people to live and work, promoting economic development and improving quality of life. Furthermore, improving the bicycle and pedestrian network will increase access to education, employment, healthcare and other basic needs for residents without access to a personal vehicle.

Resort centers are important centers of the regional economy and the seasonal influx of visitors creates unique transportation conflicts. Efficient, reliable transportation systems for accessing the resort areas will reduce congestion and improve the seasonal experience of visiting these areas.

The transportation corridors of the rural lands in the Windham Region provide connections between downtowns, villages, and resort centers, as well as to destinations in neighboring areas. Preserving the rural character of the region must be considered when reconstructing or redesigning roads and bridges and unnecessarily increased traffic volumes and speed should be avoided. Bicycling facilities should be enhanced along roadways, and connections to regional trail networks that combine separated paths, road shoulders, Class 4 Town Highways, and Legal Town Trails should be considered.

ENERGY AND TRANSPORTATION

The rural, largely dispersed character of the Windham Region causes residents to travel longer distances and be more dependent on personal vehicles than other more urbanized states. Addressing car dependence through improved transit and multi modal connectivity is an important step in reducing emissions and energy consumption. However, given the rural character of the area it is likely that cars will remain the primary mode of transportation for the foreseeable future. Reducing emissions through the adoption of low and no emissions vehicles is therefore is an important step towards improving the efficiency and sustainability and reducing the negative environmental impact of our transportation system.

Transportation is a major contributor to the state's overall energy consumption and greenhouse gas emissions. As

of 2021, transportation accounted for 34% of total energy consumption and 40% of GHG emissions in Vermont. The most recent data from the Federal Highway Administration shows that while Vermont produces approximately 20% less per capita emissions than the national average, the State lags behind the rest of New England in reducing the transportation sector's carbon footprint. Reducing both annual vehicle miles travelled through land use planning for compact settlement and improved multi modal transportation infrastructure, as well reducing carbon emissions per vehicle mile by promoting the adoption of low and no emissions vehicles, are critical steps in reducing the overall carbon footprint of the transportation sector in the Windham Region.

In 2022, the State of Vermont adopted new standards for low and no emissions vehicles, generally known as the 'California Emissions Standards'. The transition to low and no emission vehicles in Vermont will require extensive planning and policy implementation efforts at the State, Regional and Local level. Currently, 98% of the total vehicle fleet in Vermont, equal to 591,273 registered vehicles, are classified as light-duty gasoline vehicles. In comparison there are 8,875 electric vehicles, representing only 1.5% of the overall fleet, as of 2022.

Specific goals and implementation strategies for climate and energy resiliency in Vermont are outlined in detail in the 2022 Statewide Comprehensive Energy Plan and the 2021 Climate Action Plan. While these goals are discussed in more detail in the Energy Section of the Windham Regional Plan, improvements in the transportation sector are of particular importance to meeting these statewide goals.

As the number of hybrid, electric, hydrogen, and other alternative fuel vehicles as a proportion of the total personal vehicle fleet rises, improvements are needed to ensure the infrastructure in our region is capable of meeting the needs of an increasingly diverse vehicle fleet. This includes expanding electric vehicle charging infrastructure, both in private homes and in public spaces, as well as ensuring fueling stations are available for hydrogen cell vehicles. Charging and fueling stations should be conveniently located, and easily accessible from all major transportation corridors in the region.

EV CHARGING STATION, BRATTLEBORO
Photo Credit: WRC

Electric vehicle charging infrastructure is particularly important in our town and village centers, as well as resort areas. The age of housing stock in Vermont represents a challenge to expanding private electric vehicle charging infrastructure. Older homes, particularly those built before 1950, represent a disproportionately larger share of the overall housing market in Vermont than in the United States as a whole. Costs to incorporate electric vehicle charging into historic homes are substantially higher than to build that same infrastructure into new development and this is a major challenge to implementation of the California emissions standards in Vermont.

Downtowns and village centers are centrally located destinations where people can fuel their low or no emissions vehicle while taking advantage of the commercial and cultural amenities those areas provide. This is a more attractive proposition than sitting at a rest area off of the highway waiting for your vehicle to charge. To this point, resort centers have not been prioritized for funding for public vehicle charging infrastructure and the current infrastructure is inadequate to meet the needs of the region, particularly during the busy winter months. Expanding charging and fueling stations for low and no emissions vehicles in resort centers is important to meet those demands and bolster the tourism economy.

Additional strategies to reduce emissions in the Windham Region include promoting greater use and efficiency of public transportation, promoting the adoption electric bicycles, and increasing the number and usage of park and ride lots in the region to encourage carpooling.

TRANSPORTATION RESILIENCY

The transportation system in the Windham Region is under increasing threat from changing, increasingly unpredictable weather patterns impacting Vermont and the United State as a whole. We have seen the devastating impacts of these storms in recent years, including the July 2023 flood emergency, the March 2023 winter storm, the July 2021 storms, and Tropical Storm Irene in 2011. These events caused billions of dollars of damage, isolated residents from essential services, and required extensive and costly repairs that in some cases took months of labor from state and municipal highway crews. Ensuring that our transportation infrastructure is resilient and able to mitigate the impacts of increasingly severe storms is central to the safe, efficient function of the network.

The transportation network in rural Vermont is uniquely vulnerable to the impacts of severe weather. Much of our road network is located along steep slopes, oftentimes directly adjacent to waterways, and is subject to intense run off and in some cases landslides during severe storms. This washes out the roadways, oftentimes making them impassable, and transports large amounts of harmful sediment into our waterways. Our unpaved roadways are particularly vulnerable to damages. Dirt roads are more often located in remote areas and challenging terrain than paved roads, and are therefore subject to more intense run off during storms and thus more prone to wash outs.

DAMAGE TO BACK WINDHAM ROAD, TOWNSHEND, JULY 2021
Photo Credit: WRC

Substantial improvements to our transportation infrastructure are needed to improve resiliency. This includes improved ditching, properly sizing culverts, and incorporating best practices when constructing road base and crown. The Windham Regional Commission works closely with our towns in implementing these improvements,

aiding in evaluating current conditions and vulnerability, identifying potential projects, and applying for and implementing grant funded improvement projects.

STORMWATER MANAGEMENT

Culverts are an important and often overlooked piece of the larger transportation network and ecology of the region. Culverts are critical infrastructure that move our rivers and streams underneath the road network, ensuring that riparian corridors can flow naturally with as limited an impact on our transportation system as possible. Each town owns and maintains hundreds of culverts spread across their roads, and the installation and maintenance of culverts represents a substantial and increasing cost for the Windham Region.

EXAMPLE OF ROAD CULVERT
Photo Credit: WRC

Proper culvert sizing and alignment is critical to reducing the impact of stormwater on our roadways. Culverts that are undersized or misaligned are prone to failure during major storms as high-water levels can cause the stream to overtop the structure, leading to wash outs, especially on gravel roads. Undersize culverts are also prone to blockage from woody debris filling the inlet and preventing the continued flow of water culvert, also contributing to culvert failure. Wash outs are major and expensive damages to town highways, they put large amounts of sediment and road materials into our waterways, endangering the health of the aquatic ecosystem, and in severe instances can cut of sections of the road network entirely, isolating residents and limiting access for emergency vehicles. While these impacts are not as dramatic or expensive as the damages from major rain events, they still have a significant cumulative impact on water quality and the sedimentation of our waterways.

It is important to the overall resiliency of our transportation infrastructure that culverts are large enough to accommodate high water events consistent with the Agency of Transportation Hydraulics Manual Standards. In addition to these standards, best practices also include ensuring that all culverts are properly aligned with the natural course of the stream channel and that the bottoms of culverts simulate a naturalistic environment as best possible.

Culverts are also critical to the overall aquatic ecology of the region. Properly constructed culverts allow fish and other aquatic animals to move freely through the environment with minimal conflict with the transportation system, preserving the natural character of Vermont and supporting healthy aquatic animal populations. This in turn supports recreation and the recreation economy in the region, ensuring that fish populations are healthy and widespread to support fishing. Aquatic animal passage should be considered when making decisions about culverts and other structures in our waterways.

Responsibility for driveway culverts is another challenge that many towns have grappled with in recent years. They are most often located within the town's right of way; however, they may be privately owned depending on the policy of the municipality. When undersized or improperly installed, driveway culverts can contribute to significant issues with drainage and washouts. Local policies on driveway culverts vary substantially. The Windham Regional Commission recommends that all towns in the region adopt formal language related to driveway culvert responsibility to minimize conflict and improve the overall resiliency of our transportation system.

Vermont made significant changes to standards and best practices related to stormwater management and transportation infrastructure in the wake of Tropical Storm Irene. Most relevant is the Municipal Roads General Permit. Reissued in 2023, the MRGP requires towns to bring hydraulically connected road segments up to state standards for stormwater infiltration in order to mitigate impacts of future major storm events. The scope of this work most often includes upsizing culverts as well improving ditching on town highways. The State has required that towns bring all segments classified as "very high priority" into compliance by 2028 and that hydraulically connected roadways be brought up to MRGP standards by 2036.

EXAMPLE OF BOX CULVERT
Photo Credit: WRC

Increases in the costs of culverts present a substantial challenge to the implementation of the policies outlined above. The cost of replacing existing culverts with larger structures is often beyond the financial capacity of already strained town highway budgets. Several federal and state grant funding sources are available to help towns offset these costs, including the VTrans Town Highway Structures, Grants in Aid, Better Roads, Transportation Alternatives and Municipal Highway and Stormwater Mitigation programs.

IMPACTS OF A WARMING CLIMATE

The general warming trend the Windham Region has experienced in recent decades has affected the overall function of our transportation system. Historically, towns could rely on a hard freeze for several months of the year, and gravel roads generally froze from early December to Mid-March before the spring thaw and the onset of mud season. This freeze created favorable conditions for gravel road maintenance, with towns able to plow and sand roads on top of a solid frozen base.

Increasingly, winters have warmed in the region to the point where a solid winter freeze has been replaced by a continuous freeze-thaw cycle throughout the winter months. Mud has become a serious issue for town highways

outside of the normal late March-April mud season, and unpaved roads increasingly experience mud season-like conditions throughout the winter months. This puts considerable strain on our local transportation infrastructure, making winter travel more difficult for visitors and residents and substantially raising sand and gravel, as well as labor, costs for towns. As muddy roads have become increasingly common during the winter months and our summers have gotten wetter, dealing with mud is more important now than ever for the overall function of our town highway infrastructure. Furthermore, the combination of muddy winter roads and snow storms has resulted in substantial damage to our roadways, as well as the health of our rivers and streams, from the large amounts of sediment that was plowed up and transported into waterways. Improved ditching is the primary tool available to towns to combat the impacts of mud. Properly constructed, stone lined and planted ditches improve drainage and collect sediment, more quickly drying out our dirt roads and trapping run off related sediment before it enters our waterways.

SAND AND GRAVEL MATERIALS

Finally, sand and gravel costs have increased dramatically for towns in the Windham Region in recent years and have become a substantial burden on town highway budgets. The recent closure of several sand and gravel pits in the region has caused many towns to truck in aggregate from greater distances, leading to a substantial increase in transportation costs. Furthermore, increased demand at the smaller number of regional aggregate suppliers coupled with significant challenges in permitting and approving new or expanded pits at both the State and Local level has driven up prices significantly even without factoring in increased transportation costs. This is a major concern for our towns.

HIGHWAYS AND BRIDGES

WEST DUMMERSTON COVERED BRIDGE
Photo Credit: WRC

There are approximately 1,700 miles of roads in the Windham Region, ranging from the limited access highway Interstate-91, which averages more than 20,000 vehicles per day at its busiest section in the region, to unmaintained, impassable class 4 town highways, which see few, if any, vehicles on any given day. Town highways are the primary transportation system in the region, carrying thousands of residents, visitors, commuters and others to and from important destinations each day. Town highways also represent the largest expense for most communities in the region and rising costs for road materials and paving represent a significant challenge for our communities. Ensuring that town highways are properly constructed and sufficiently maintained to accommodate traffic volumes is critical to the

overall vitality of the Windham Region.

In addition to the town's local highway budget, the VTrans Town Highway State Aid provides substantial funding for towns to maintain and improve their transportation infrastructure in accordance with 19 V.S.A. § 306(a). Towns are paid quarterly by the State depending on their total town highway mileage and no application or local match is required. The only stipulation is that State Aid highways funds are used solely for town highway construction, improvement, and maintenance purposes, and that towns expend no less than $300 per road mile. These rates vary based on roadway class, with Class 1 town highways receiving the highest allocation per mile and Class 3 the lowest. As of 2023 the current per mile town highway State Aid rate for Class 1 is $13,365.59, for Class 2 is $4,916.01, and for Class 3 is $1,825.45. This is a critical source of funding for towns to ensure that our transportation system can continue to function at a level adequate to meet the needs of the region.

TOWN HIGHWAY CLASSIFICATION

Town Highways in Vermont are divided into four classifications as described below, based primarily on the condition of the roadway and daily traffic volumes:

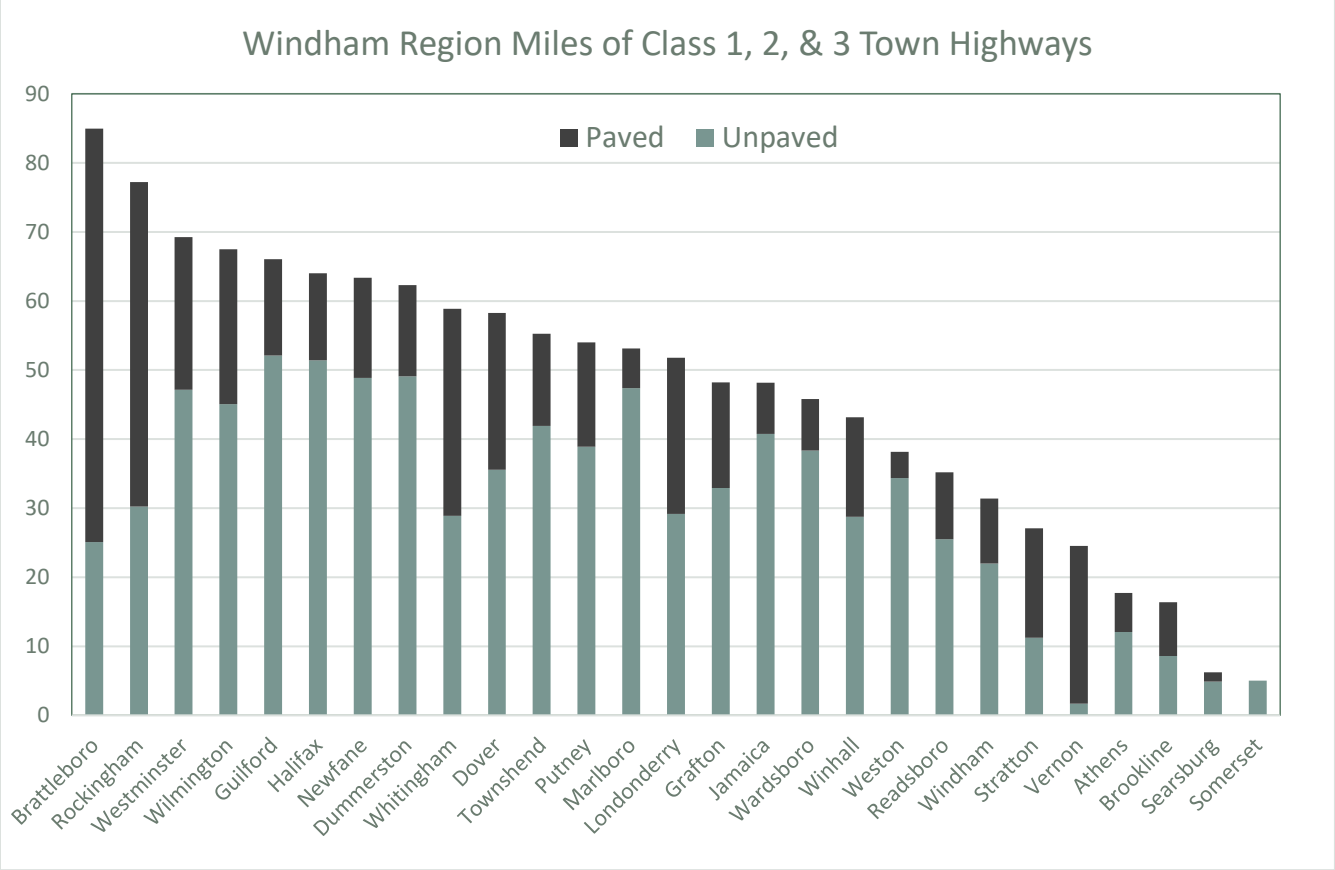
- **Class 1:** Class 1 town highways are sections of numbered state highways that are owned and maintained by municipalities. They are town generally a short section of town owned roadway within a larger section of the state highway, often in a village or urban setting. There are clearly defined boundaries for state and town responsibility.

- **Class 2:** Class 2 town highways are generally the most important local roads. They often handle the largest volume of daily traffic and provide the primary connection between towns or villages. Class 2 town highways are often but not always paved and the proportion of paved or unpaved town highways varies greatly between towns in the region.

- **Class 3:** Class 3 town highways represent the largest total number of road miles in the region. These are the majority of roads in a community, generally all local roads that do not serve as major connections between towns and villages. The State of Vermont requires that Class 3 roads must be "negotiable under normal conditions all seasons of the year by a standard manufactured pleasure car" and "should be plowed and made negotiable during the winter". Class 3 town highways are often unpaved in rural areas, while most are paved in or near villages and urban areas.

- **Class 4:** There are no minimum maintenance requirements for Class 4 town highways. Most towns do not maintain Class 4 town highways, though maintenance is at the discretion of the municipality. Some Class 4 town highways are maintained by local residents and provide access to homes and camps. Other Class 4 town highways may be passable only to high clearance/four wheel drive vehicles, or abandoned and completely impassable.

The chart below shows the total miles of paved and unpaved Class 1, 2, and 3 town highways in each municipality in the Windham Region. Approximately 83% of Class 2 town highways are paved, as compared to only 19% of Class 3 town highways. For most communities outside of the larger towns of Brattleboro and Rockingham, the total mileage of unpaved roads is significantly greater than paved roads, although there are exceptions, such as Whitingham, Stratton, and Vernon.



CLASS 1 HIGHWAYS

Class 1 roads in the Windham Region are concentrated in our two largest communities, Brattleboro and Rockingham, comprising of short sections of Route 5 through Downtown Brattleboro and the Village of Bellows Falls, Route 9 in Brattleboro from the intersection with Main Street to West Brattleboro, and a short section of Route 100 in Readsboro. Class 1 town highways give towns greater control and flexibility of state highways in their downtowns and villages, allowing towns to set speed limits, site crosswalks, build and maintain infrastructure such as sidewalks, bike lanes, or implement traffic calming techniques without the approval process required for VTrans-owned and maintained highways.

Any potential reclassification of State Highways to Class 1 town highways needs to be carefully considered. There are significant potential benefits for towns to take control of state highways within their downtowns and villages

centers. Reclassifying to Class 1 gives towns more autonomy to make decisions on important transportation issues that impact a communities' most important civic, commercial, and cultural centers. Reclassification of state highways does, however, increase local highway maintenance costs, as state highways in downtowns and villages are often the most heavily trafficked sections of roadway within a town.

VTrans is expected to issue updated guidance on reclassification of Class 1 town highways, as well as update design standards on state highways within villages and downtowns, by 2025. The Windham Regional Commission will provide support to municipalities when considering the reclassification of state highways to Class 1 in our downtowns and villages and planning support in accordance with the updated VTrans guidance and design standards once they are issued.

CLASS 2 AND 3 HIGHWAYS

The vast majority of roads in the Windham Region are Class 2 and Class 3 town highways. These are the roadways which move the majority of good and people throughout the region and the safe and effective function of Class 2 and 3 town highways is critical to social, cultural and economic life in the region.

Class 2 town highways may be paved or unpaved and the proportion of paved or unpaved town highways varies greatly between towns in the region. Gravel and dirt roads contribute greatly to the region's rural character and charm, but can also present greater maintenance challenges for towns during winter and mud season as discussed in the Transportation Resiliency section. It is a difficult decision for Selectboards whether or not to pave a road in their town. Paving unpaved roads is a substantial expense for most towns and gravel roads can be significantly less expensive to maintain, but factors such as volume and type of traffic, and existence of steep grades, may outweigh the lower maintenance costs. Gravel roads are more prone to erosion and wash out during high water events which can significantly increase costs as well as greatly impair overall transportation connectivity during severe storms. These factors must be carefully weighed and addressed in both the context of the specific needs of the town and the greater character and atmosphere of the Region.

The Class 2 Town Highway Paving Program is the primary funding source for towns to pave currently unpaved or to resurface existing paved Class 2 town highways. This funding is limited to a total sum of $200,000 and is allocated annually by the VTrans District based on a formula that accounts for a variety of factors including Class 2 town highway miles as well as how recently a town has received funding. Towns must apply to their VTrans District, in the Windham Region either District 1 or District 2 depending on the town, and the funding requires a 30% local match, reduced to 20% if the town has adopted road and bridge standards that meet the minimum state requirements.

Class 3 town highways represent the largest total number of road miles in the Windham Region. Class 3 highways are generally unpaved, primarily rural and residential in character, but also provide important connections for

agriculture, logging, and other industries in the region's resource economy. Constructing and maintaining Class 3 highways with a proper sub base and drainage is important to the overall functionality of the transportation system and the Windham Regional Commission will continue to work with towns on implementing best practices on gravel road construction and maintenance around the region.

CLASS 4 HIGHWAYS AND LEGAL TRAILS

Class 4 town highways and legal town trails are a small part of the region's overall road network, comprising 119.8 and 42.7 total road miles, respectively. Increasingly, the Windham Region has seen residential development taking place on Class 4 town highways. This development can create potential issues for municipalities where increased traffic volumes due to new development exceed the reasonable capacity of a Class 4 town highway. It is important that towns maintain clear policies on local maintenance limitations, as well as municipal versus property owner responsibilities for both the maintenance and reclassification of Class 4 town highways.

Legal Trails and Class 4 town highways can also provide significant opportunities for recreational use for hikers, bicyclists, and snowmobiles, and are often underutilized in this capacity across the region. The Windham Regional Commission supports planning and implementation for towns to examine how Class 4 town highways and legal town trails may fit into the larger trail and recreation network in their community and where opportunities may exist to encourage greater recreational use of such facilities and improve integration into the larger regional trail network.

BRIDGES

Bridges are critical pieces of the larger regional highway system, vital to the overall function of the transportation network in the Windham Region. Bridges are the most expensive and difficult transportation infrastructure for towns to maintain and replace. Towns are largely dependent on state funding to ensure that our region's bridges can continue to handle the daily traffic loads necessary to ensure the efficient function of the transportation network. Aging bridge infrastructure is a major challenge for our region and across Vermont. As of 2023, VTrans has identified 1,250 bridges across the state in need of repair, equal to 44% of all bridges in the State. The vast majority of these bridges are owned and maintained by municipalities, and ensuring that all bridges in need of repair are identified and addressed in a timely manner is critical to the continued functioning of our transportation network.

PUTNEY ROAD BRIDGE, BRATTLEBORO
Photo Credit: WRC

Bridge replacement and repair projects are expensive and substantial construction cost increases in the past few

years have put a strain on our ability to meet state and local infrastructure needs. The Vermont 2022-2025 State Transportation Improvement Program allocated funding for 32 town highway bridges across the state, including 8 in the Windham Region, totaling nearly $105 million in total cost. These 8 bridges represent just a small fraction of those in the Windham Region in need of repair. The Town Highway Bridge program is the primary source of funding for bridge replacement and repair projects for towns in the Windham Region. It is critical that we advocate for our town highway bridges to be prioritized and addressed in a timely manner whenever possible. Furthermore, the Windham Regional Commission will continue to work with towns on identifying and accessing funding for bridge replacement projects beyond the VTrans bridge program. This includes a variety of direct Federal grant programs, as well as funding from the Northern Borders Regional Commission.

The smallest, most resource-limited towns in the Region are in a particularly difficult position in securing funding to replace aging bridge infrastructure. Agency of Transportation funding formulas use a variety of criteria to prioritize local bridge projects, and funding is prioritized for bridges on more heavily trafficked sections of road in larger, generally more well-resourced, communities. It is difficult for our smallest towns to be competitive in this process and they often have no choice other than to continue to spend large amounts of their municipal budget on patchwork bridge repairs that do not provide lasting solutions for their aging bridge infrastructure. The Windham Regional Commission will continue to advocate for more equitable distribution of bridge funding that ensures that our small, rural towns are not forgotten during the state and federal infrastructure funding decision making process.

BICYCLE AND PEDESTRIAN

Infrastructure for bicyclists and pedestrians is a major component of the transportation network in the Windham Region. Ensuring that our communities are safe, attractive, and efficient places for residents and visitors to walk and bike is vital to the broader social, economic, and cultural life of the region, and contributes greatly to the overall livability of our towns. Adequate bicycle and pedestrian infrastructure is a major factor in the economic vibrancy of our downtowns and villages; people are more likely to spend time and patronize local businesses and cultural institutions if they are provided with space that creates a pleasant, inviting environment to walk down the street.

EXAMPLE OF PEDESTRIAN CROSSWALK
Photo Credit: WRC

This touches on many aspects of life in the Windham Region, including public health, equity, and sustainability. It has been demonstrated that people are more likely to be physically active when they are able to conveniently access sidewalks and bike lanes that connect their home or place of work with important destinations. Many people are

happy to walk half a mile from their home to the grocery store if they can do so on a well maintained, properly constructed sidewalk rather than on the narrow shoulder of a busy road. This passively introduces physical activity into the lives of people in our communities improving quality of life and overall health.

This is also critical to equity considerations in the region. Low income, older, and disabled residents are less likely to have access to a personal vehicle than the population as a whole. Sidewalks and bicycle lanes provide critical access to healthcare, education, employment, healthy food, and social engagement for vulnerable populations. Additionally, ensuring our towns are walkable and bikeable reduces dependence on personal vehicles for those who have access to them, reducing the environmental impact of gasoline powered vehicles as more people choose to walk or bike to their destinations each day.

DOWNTOWNS AND VILLAGES

EXAMPLE OF SIDEWALK IN HISTORIC VILLAGE SETTING
Photo Credit: WRC

Bicycle and pedestrian planning is closely linked with land use. Compact settlement principles are central to making our region as walkable and bikeable as possible. Physical distance is an important consideration to how often one will walk or bike, rather than drive, as they go about their day. If you live in close proximity to your place of work, your school, the grocery store, healthcare facilities, restaurants, religious and civic institutions, you are much more likely to access them on foot or on your bicycle than if the nearest grocery store or church is several miles away on a narrow rural highway.

The historic settlement patterns of the Windham Region bolster bicycle and pedestrian planning efforts within town and village centers. Brattleboro, Bellows Falls, Wilmington, and our numerous villages provide convenient access to economic, cultural and recreational facilities to the many people who live within them. The Windham Regional Commission supports efforts to improve bicycle and pedestrian infrastructure in the region, including installing and extending new sidewalks where feasible, incorporating bike lanes into our existing roadways, and the construction of off-road mixed-use paths where on road infrastructure is not possible. This also includes incorporating Complete Streets principles and best practices into roadway design, in particular in our Region's designated downtowns and villages.

Walkability in our downtowns and villages is closely linked with overall village vibrancy. The commercial, cultural and civic health of our downtowns and villages is central to increasing walking and biking in the region. Strong village centers with a variety of businesses and institutions that provide residents local options for grocery shopping, dining,

hardware stores, and other services, will bolster efforts to improve bicycle and pedestrian connectivity in the region. The closure of a general store or a restaurant in a village can have a significant negative impact on active transportation in a community; residents who once may have walked to their local hardware store now must drive several miles away to access those same services.

The recent closure of a pharmacy in Londonderry is one such example. Residents now must travel more than 15 miles to the nearest pharmacy in Manchester for necessary medical care that was once easily accessible within the village. This has increased the strain on the 'Neighborhood Connections' On-Demand transit service, which now must schedule and transport those customers, increasing emissions, road miles, and limiting availability of trips for other riders.

Safe, efficient, and attractive bicycle and pedestrian infrastructure also has a positive effect on the cultural and economic character of towns. It is well demonstrated that when this infrastructure exists, people are much more likely to walk from their neighborhood to spend time in nearby commercial centers. This leads to an overall increase in activity in downtowns and villages and the overall customer base available to local businesses and cultural institutions.

While the majority of our existing bicycle and pedestrian infrastructure network is located in downtowns and villages, it is also important that residents in rural areas be able to safely walk and bike on their rural town highways. Limiting conflict between vehicles and other road users is important to ensure all residents can safely and comfortably walk and bike on our rural roadways.

PLANNING AND FUNDING CHALLENGES

PUTNEY VILLAGE CENTER
Photo Credit: WRC

There are several common challenges that towns face in constructing new, or extending existing bicycle and pedestrian infrastructure. These include project costs, right-of-way acquisition, and planning within existing historic and narrow streetscapes. Such projects, particularly sidewalk construction projects, are very expensive, generally beyond the reach of what towns are capable of taking on without grant funding. A 2020 VTrans estimate put the average cost per foot of a concrete sidewalk with granite curbs at $317, meaning the construction of 1,000 feet of new sidewalk would cost in the range of $320,000. This number has almost certainly increased since the 2020 estimate and furthermore does not account for other costs associated with major construction projects, such as right of way, traffic control, project management, and built-in contingencies.

Ongoing maintenance of the existing bicycle and pedestrian network is also important. Winter maintenance in particular is a significant challenge to the effective year-round functioning of our pedestrian network. Sidewalks not being properly cleared of snow and maintained during the winter months creates substantial barriers to the overall walkability of our communities.

Right of way acquisition can be an expensive and controversial proposition. Acquiring privately-owned land for municipal projects is never a simple or easy process, and must be thoroughly considered and carefully navigated. Right of way acquisition is complicated by the narrow and dense historic streetscape of downtowns and villages in the region. The majority of our town and rural village centers were built out in the 18th and 19th centuries, and homes and roadways were laid out in a dense pattern of development intended to accommodate people walking or riding a horse, not motor vehicle traffic. This is compounded by national standards, outlined in the Manual Uniform of Traffic Control Devices (MUTCD), designed primarily with sprawling, 20th century suburban subdivisions in mind, often requiring much more space for transportation infrastructure than is reasonably available in our historic towns and villages. These Federal Highway Administration (FHWA) standards significantly complicates bicycle and pedestrian infrastructure projects and can create conflict between historic properties and the municipal right of way. These factors must be carefully considered when planning for sidewalks and bike lanes.

Navigating the State highway right of way is another significant challenge. Many of our region's villages are centered on state highways. With the exception of Brattleboro, Bellows Falls, and Readsboro, which maintain Class 1 roads in their downtowns, Windham Region towns do not own or maintain the state highway right of way within their downtowns and villages. Towns are very limited in their ability to construct bicycle and pedestrian infrastructure or implement changes aimed at traffic calming on state highways, because such projects require towns to navigate an oftentimes complicated and time-consuming state review and approval process.

Grant funded projects through existing Agency of Transportation programs provides one avenue for towns to improve bicycle and pedestrian infrastructure on state highways in downtowns and village centers. VTrans staff are involved in the design and approval of any proposed infrastructure identified through these state grant programs, providing towns with a more easily navigable process towards implementation and construction of bicycle and pedestrian projects within the state highway right of way.

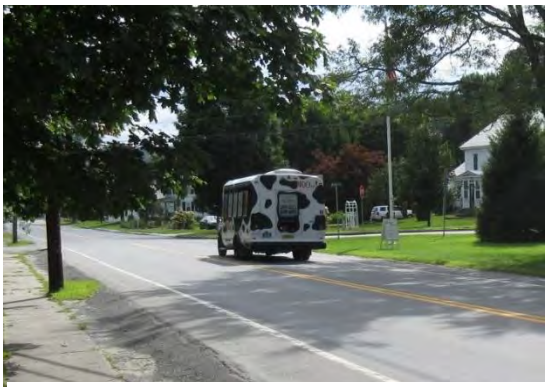
Scoping studies are a valuable tool available for towns to advance bicycle and pedestrian infrastructure projects. Towns may hire an engineering firm, oftentimes utilizing grant funding, to identify and design preferred solutions to improve walking and biking infrastructure. These studies include significant input from both residents and the Agency of Transportation, and provide towns with detailed plans and cost estimates that better position the town to seek construction funding.

TRANSIT

Public transportation is a critical component of meeting the overall transportation needs and climate goals of the Windham Region. Adequate bus and rail service are a vital piece of our overall transportation system, providing needed transportation for those without access to a personal vehicle and reducing dependence on personal vehicle trips. This is an important piece of transportation equity in our region, providing vulnerable transit dependent populations such as the elderly, people with disabilities, and low-income residents needed access to education, employment, health care and all other manner of daily needs. This in turn strengthens the overall vitality of the region.

BUS SERVICE

Transit service in the Windham Region is provided primarily by Southeast Vermont Transit, widely known as the MOOver. Southeast Vermont Transit was formed from the merger of Deerfield Valley and Connecticut River Transit in 2015. Easily recognizable by their black and white cow patterned vehicles, the MOOver provides bus service throughout most of the region. Currently, fixed route service is available between Readsboro and Dover by way of Wilmington and Whitingham in the Deerfield Valley, between Brattleboro and Bellows Falls in the Connecticut River Valley, and along the Route 9 corridor between Brattleboro and Bennington with a connection in Wilmington. In town service exists in both Bellows Falls and Brattleboro, including connections from Brattleboro to Guilford and Hinsdale, NH, and from Bellows Falls to Springfield, White River Junction, and Dartmouth-Hitchcock Hospital. Furthermore, a pilot program running seasonal winter buses from Stratton Mountain to Manchester Center has recently been made permanent.



MOOVER BUS
Photo Credit: WRC

Despite the overall success of the MOOver transit service, there still exist unmet transportation needs in the region and the Windham Regional Commission is supportive of continued efforts to expand transit both within the region and to neighboring regions. Fixed route bus service has historically been the primary mode of public transportation service in the region and across Vermont. However, the limitations of fixed route bus service to effectively and efficiently meet the transportation needs of the public are increasingly being recognized and expanding access to alternative modes of transit is an important part of improving the overall transportation landscape.

Substantial portions of the region remain underserved by public transportation, particularly rural towns outside of the Connecticut and Deerfield River Valleys. The WRC supports the expansion of SEVT service wherever possible, however it also recognizes the need for alternative options to fully meet the transportation needs of the region. Local

non-profit organizations have begun to help fill this gap in our region, organizations like the various local 'Cares' groups providing some transportation service to underserved communities.

NEIGHBORHOOD CONNECTIONS ON-DEMAND TRANSPORTATION SERVICE

Neighborhood Connections is a social services organization based in Londonderry in the northwest corner of the Windham Region. Neighborhood Connections recognized the severe impact a lack of transit options had on overall health and vitality for residents of underserved towns along the spine of the Green Mountains. In 2020, Neighborhood Connections launched the Mountain Town Connector, a door to door transit service providing on demand transportation to five towns in the northwest corner of the region. The Mountain Town Connector provides a successful model for other organizations to emulate to meet unmet transportation needs in the Windham Region.

The expansion of micro transit service is another alternative. Micro transit is smaller scale transportation that provides On-Demand, Door-Door to service to riders. Passengers can request a ride, either over the phone or using a smartphone application, and be picked up, sometimes within minutes of having requested a ride, and dropped off directly at their requested destination. Improvements in technology have greatly increased the feasibility of such on-demand services, allowing riders to request a ride and be routed efficiently to their destination using software that identifies available drivers based on other currently scheduled riders. Micro transit service provides a more efficient, convenient, and cost-effective transportation option for riders than traditional fixed route service. Furthermore, the efficiencies made possible by micro transit allow for more effective use of fixed route service over distances where micro transit service is not feasible, improving the transit network as a whole.

As of 2024, the Vermont Agency of Transportation has invested in seven micro transit pilot programs across Vermont, including a service operated by Southeast Vermont transit just north of our region in Windsor. Ridership in the Windsor pilot program has greatly exceeded projections, and the expectation is that similar service will be expanded across Vermont in the coming years. Brattleboro and Rockingham are strong candidates for the expansion micro transit programs.

Interstate transit connections remain a significant gap in the overall transportation network of the Windham Region, most notably the lack of regular service between Brattleboro and the nearby cities of Greenfield, Massachusetts and Keene, New Hampshire. Our location at the corner of three states puts the Windham Region in a unique position within Vermont, and many people travel across state lines each day for employment, education, and healthcare. Greenfield and Keene are the largest out of state destinations for residents of the Windham Region, as well as the most important points of origin for commuters into our region. No bus service currently exists between Brattleboro, Keene, and Greenfield. A 2022 study commissioned by the Southwest New Hampshire Regional Planning Commission, the Windham Regional Commission's counterpart across the river in Cheshire County, NH, examined the possibility of a future fixed route service connecting Brattleboro and Keene, and received significant public support.

PASSENGER RAIL SERVICE

In addition to bus service, passenger rail is a critical piece of the transportation landscape of the Region. Currently, the only passenger rail service in the Windham Region is the Amtrak Vermonter line, running once daily each way with stops in both Brattleboro and Bellows Falls, with service north to White River Junction, Montpelier-Berlin, and Essex Junction, as well as south to Greenfield, Northampton, and Springfield, Massachusetts, before continuing onward into Connecticut and New York City. The Vermonter is an important link between our region and popular destinations within Vermont and neighboring states, increasing regional mobility for residents and visitors alike. Passenger rail is an important piece of overall mobility and economic development in the Region, providing a direct connection to our region for potential visitors from nearby major metropolitan areas as well as expanding access to economic opportunities for residents. With the rise of hybrid-remote work schedules in the wake of the Covid-19 pandemic, the importance of these connections has increased and expanding passenger rail service in the region is an important goal of this plan.

Data from Amtrak demonstrates the success of passenger rail in the Windham Region, with ridership in Brattleboro being above average in the larger context of the Vermonter corridor. Ridership data from 2022 counted 14,258 trips originating in Brattleboro, the 2nd most of any station in Vermont behind only Essex Junction, and the 4th most on the entire Vermonter line, far exceeding the number of riders in much larger cities such as Hartford, Connecticut and Springfield, Massachusetts. The New York City-Brattleboro connection rated as the 2nd busiest on the entire line, second only to the NYC-Northampton connection. The success of the Vermonter train in Brattleboro despite the significant limitation of only one daily trip in each direction points to an unmet passenger rail need in Southeastern Vermont.

There are several initiatives to expand passenger rail service within Vermont and the larger New England region. In December of 2023, the Federal Rail Administration announced three planning grants to examine expanded passenger rail in Vermont. This includes a study for expanded service on the Vermonter line, including increased trip frequencies between New York City and White River Junction with up to four daily round trips at both Brattleboro and Bellows Falls, reduced travel time with the goal of saving 90 minutes between Essex Junction and Springfield, Massachusetts, and the extension of the service north to Montreal. This is a major development for passenger rail in our region and would greatly improve the viability of rail as a local and regional commuting option for residents. Increased potential for local ridership would reduce passenger vehicle trips and allow for greater efficiencies for our regional bus system, improving mobility, expanding regional housing and employment options, and helping the Windham Region achieve its energy goals.

Also relevant to our region are ongoing passenger rail initiatives in neighboring Western Massachusetts, officially known as the 'Compass Rail Plan'. After several years of study, the Massachusetts Department of Transportation has received funding to begin construction in 2027 of an East-West passenger rail connection between Boston and the Albany, New York through Western Massachusetts. This service will provide up to ten daily round trips between

Boston and Albany, with stops in Worcester, Springfield and Pittsfield. Together with expanded north-south service within the Connecticut River Valley, Compass Rail will provide a passenger rail connection between the Windham Region and Boston, the Berkshires, and Upstate New York.

In addition to the Compass Rail Plan, the ongoing Massachusetts 'Northern Tier Rail Study' has the potential to provide an even more direct connection to Boston for the Windham Region. This initiative is examining East-West rail service in the northern part of Massachusetts along the Massachusetts Route 2 Corridor, exploring potential for new passenger rail service between Boston, Greenfield, and North Adams. Given the close proximity of Greenfield, this line would provide the most direct passenger rail connection between Boston and the Windham Region.

The Windham Regional Commission strongly supports these ongoing rail initiatives. Expanding passenger rail service is an important piece of improving mobility, promoting economic development and enhancing overall quality of life for the Windham Region.

FREIGHT

The import and export of goods by truck and rail is a critical piece of the Windham Regional economy and ensuring the safe and efficient movement of goods along our highways and railroads is a vital to ensure residents and businesses have access to needed goods and services. This is closely linked with best practices in town highway roadway and bridge construction and maintenance, and it is important that our region's roads and bridges are maintained at a level adequate to support necessary freight traffic. Furthermore, freight traffic is a significant contributor to overall emissions from transportation and improving the efficiency and resiliency of the freight sector is necessary to meet the goals outlines in the Vermont Climate Action Plan.

According to the 2021 Vermont Freight Plan, one-third of Vermonters are employed in "freight reliant industries," defined as businesses within the manufacturing, utilities, construction, wholesale, retail trades, and agriculture sectors. These sectors account for approximately one-third of the State's total Gross Domestic Product (GDP). As of 2018, truck transport accounted for 84% of all goods moving within, into, and out of Vermont, with rail accounting for a further 15%. In total, 46.7 million tons of freight were moved through the state in 2018, and this number is expected to increase to 78.7 million tons by 2045. More information on statewide freight trends and future projections is available in the 2021 Vermont Freight Plan.

New England Central Railroad is the largest freight rail company in the Windham Region. New England Central rail lines run the length of the Connecticut River Valley in southeastern Vermont, from the Massachusetts border to White River Junction, then travel northwest to Burlington by way of Montpelier before terminating at the Canadian border. New England Central also provides freight connection to Massachusetts and Connecticut, with lines running south to the major junction with at Palmer, MA before continuing to New London, CT. This north-south route also

provides freight connection to Boston by way of CSX lines in Massachusetts. Additionally, there is a short section of freight rail owned by Green Mountain Railroad in the Windham Region. This line begins in Bellows Falls and runs northwest parallel with Route 103 through Rockingham, before crossing into Windsor County and continuing on to Rutland.

E-commerce deliveries represent an increasingly large proportion of total freight traffic in the region, and the fulfillment of online orders directly to consumer's homes increased dramatically during the Covid-19 pandemic. While historically freight was moved primarily to major commercial centers in the region, such as Brattleboro, Bellows Falls, and Wilmington, these goods are now being delivered direct to consumers across rural towns. This has significantly increased truck traffic on rural roadways, particular Class 3 town highways that historically did not handle large volumes of commercial vehicles. While the long-term impacts of this trend remain to be seen, initial indications are that commercial vehicle traffic from deliveries has placed an increased burden on rural, unpaved town highways, in particular during winter and mud season, where larger, heavier vehicles may be unable to successfully navigate difficult road conditions. This is a concerning trend within the Windham Region, and it is critical that we work to limit the impact of changing trends in commercial traffic on our region's vulnerable rural roadways.

TRANSPORTATION POLICIES

LAND USE AND TRANSPORTATION

1. Maintain a Support transportation planning consistent with compact settlement goals, including promoting the incorporation of complete streets principles into planning for compact settlement.

2. Recognize the link between housing and transportation costs and support planning efforts to reduce transportation costs for Windham Region residents, including improved multimodal transportation linkages between residential, commercial and industrial areas.

3. Preserve village character through appropriate design and scale of commercial, industrial, residential, transportation infrastructure and community structures and uses.

4. Preserve and create Right-of-Ways for future transportation linkages between communities, neighborhood services, and other destinations.

5. Avoid extension of roads into and through Resource Lands and discourage habitat fragmentation from town highways.

6. Support improvements to multi modal transportation infrastructure to promote infill of existing strip

areas.

7. Support bicycle and pedestrian infrastructure improvements in our urban centers, designated downtowns, village centers and resort centers.

ENERGY AND TRANSPORTATION

8. Support planning to reduce car dependence and reduce emissions in the Windham Region.

9. Support implementation of the California Low and No Emission Vehicle Standards consistent with the 2022 Statewide Comprehensive Energy Plan.

10. Support planning and implementation of infrastructure necessary to facilitate the transition to low and now emission vehicles.

11. Support creation of infrastructure for hydrogen cell vehicle fueling.

12. Support expansion of electric vehicle charging infrastructure in the region, in particular in downtowns and village centers, as well as along major corridors and in resort centers.

13. Promote the use and adoption of alternative forms of transportation that reduce emissions, including improvements to the public transportations system, promoting walking and biking including electric bicycles and encouraging carpooling through the expansion and promotion of park and ride lots in the region and the use of the Way To Go! Vermont App.

TRANSPORTATION RESILIENCY

14. Promote the adoption of best practices to ensure that our transportation infrastructure is resilient and able to mitigate the impacts of increasingly severe storms to ensure the safe and efficient function of the network

15. Encourage the proper sizing of culverts across the region in accordance with VTrans Hydraulics Manual standards for bankfull width and stream equilibrium and support efforts to upsize existing culverts where necessary or possible.

16. Support best practices in roadway and ditch construction to mitigate the increasingly severe effects of the spring mud season on our roadways.

17. Assist towns with identifying potential funding sources for local projects to improve the resiliency of our transportation network and help in developing competitive grant applications to those programs and with the management of such projects once funded.

18. Support continued efforts to implement the Municipal Roads General Permit (MRGP) across the region and to bring all 'Very High Priority' segments into compliance by 2028.

19. Minimize conflicts between our transportation system and wildlife and encourage the consideration of aquatic organism passage, including the incorporation of natural bottom culverts, as part of road and culvert projects wherever feasible.

20. Encourage towns to adopt clear driveway culvert policies and provide assistance in developing best practices for the management of driveway culverts as part of the larger transportation infrastructure network.

21. Encourage towns to utilize the VTrans Transportation Resiliency Planning Tool (TRPT) in planning for transportation resiliency and continue to train regional stakeholders on the use of the tool.

22. Continue to explore solutions to rising aggregate costs, including advocating for a review of sand and gravel pit permitting at the state level, working with towns and suppliers on evaluating and addressing current market conditions within the scope of our mandate as well as continuing to explore possibilities for the WRC to facilitate bulk purchasing options for the region.

HIGHWAYS AND BRIDGES

23. Support the implementation of best practices in town highway construction to improve resiliency and efficiency of the Windham Region's transportation infrastructure.

24. Support projects that ensure the adequate and efficient function of our region's highway and bridge infrastructure.

25. Support planning efforts to assist towns in carefully considering the paving of unpaved roads, including providing a cost benefit analysis of long-term construction and maintenance costs of paved vs unpaved roads in accordance with VTrans guidance.

26. Provide support to municipalities when considering the reclassification of state highways to Class 1 town highways.

27. Support efforts to identify and prioritize regional highway and bridge needs through the Vermont Project Selection and Prioritization Process.

28. Support the implementation of infrastructure aimed at calming traffic on our region's roads based on best practices, including the implementation of radar feedback signs, improved line striping, bump outs and other infrastructure where practical or possible.

29. Encourage towns to implement long term capital planning practices in the maintenance of their town highway and bridge infrastructure.

30. Support best practices in the management of Class 4 town highways and encourage towns to adopt bylaws related to the maintenance and improvement of Class 4 roads, in particular in relation to increasing development pressure on our Class 4 town highways.

31. Encourage towns to expand and encourage the incorporation of Class 4 town highways and legal trails as part of our region's outdoor recreation network.

32. Advocate for the funding necessary to repair and improve our region's town highway bridge network, including promoting an equitable distribution of bridge funding to all communities.

33. Work with towns to identify and prioritize funding sources for the improvement of our region's road and bridge network.

34. Encourage best practices in setting speed limits on town highways and provide technical assistance.

BICYCLE AND PEDESTRIAN

35. Supports traffic calming efforts on our rural roadways to encourage bicycle and pedestrian accessibility throughout the region, including but not limited to the installation of radar feedback signs where possible.

36. Supports the improvement bicycle and pedestrian infrastructure in the region, including installing and extending new sidewalks where feasible, incorporating bike lanes into our existing roadways, the construction of off-road mixed-use paths where on road infrastructure is not possible, as well as the incorporation of rectangular rapid flashing beacons and raised crossings into crosswalks.

37. Support the creation and expansion of bicycle infrastructure on the region's primary transportation corridors, in particular along the proposed Route 5 Bicycle Corridor, as well as along Route 30 and Route 100.

38. Encourage the consideration and incorporation of Complete Streets principles into all roadway and bridge construction projects wherever possible.

39. Recognize bicycle and pedestrian connectivity as an important part of overall downtown and village vibrancy in the Windham Region and encourage the adoption of best practices for bicycle and pedestrian infrastructure in our downtown's and village centers.

40. Support clear and enforceable municipal policies on winter sidewalk maintenance responsibilities in the region.

41. Support efforts to update and improve statewide policies on traffic calming and bicycle and pedestrian infrastructure on state highways in our downtowns and villages and help towns when seeking improvements on state highways in their downtowns and village centers.

42. Work with towns to identify local priorities, gaps within the existing network and planning for the construction of new, as well as the expansion and improvement of existing, bicycle and pedestrian infrastructure.

43. Provide assistance to towns with applications for funding to the VTrans Transportation Alternatives and Bicycle and Pedestrian programs in support of new bicycle and pedestrian planning and implementation projects.

44. Encourage the consideration of equity for all users, in particular vulnerable populations such older adults, disabled persons, low income residents and people of color, when planning for and implementing bicycle and pedestrian projects.

TRANSIT

45. Support the expansion and creation of micro transit services in the region wherever feasible, including the ongoing Brattleboro 'Micro-Moo' pilot.

46. Support maintaining existing Southeast Vermont Transit service and the expansion of SEVT services wherever possible.

47. Support efforts to extent bus service along the Route 30 corridor between Brattleboro and Manchester.

48. Support the expansion of transit both within the region and to neighboring regions, including the extension of bus service from Brattleboro to Keene, NH and Greenfield, Mass.

49. Support the exploration, implementation and expansion of alternative on-demand transit services to towns in the region currently unserved by Southeast Vermont Transit.

50. Consider the needs of transit dependent populations when planning for public transit service in the region.

51. Support the maintenance and improvement of existing passenger rail infrastructure in the region, including efforts to rehabilitate the historic Bellows Falls train station.

52. Support the expansion of passenger rail service in the region, including efforts to extend the Valley Flyer service from Greenfield, Mass to Brattleboro and Bellows Falls and the addition of more daily trips on the existing Vermonter service.

53. When possible, support ongoing efforts to implement East-West rail in Western Massachusetts, including the Northern Tier service between Greenfield and Boston, to provide the Windham Region passenger rail access to Boston.

FREIGHT

54. Promote rail freight as a preferred alternative to truck freight when possible.

55. Maintain, improve, and expand passenger and freight rail services.

56. Encourage businesses and industries with high freight demands to locate within the rail corridor, improving mobility of goods by rail.

57. Work with towns to evaluate the impact of increased E-commerce traffic on town highways and encourage best practices to limit negative impacts whenever possible.

COMMUNITY UTILITIES, FACILITIES, AND SERVICES

BACKGROUND

Communities in the Windham Region depend on numerous infrastructure systems and public services to support public health, the function of communities, and the ability of the region to attract and retain businesses and residents. Broadly speaking, these include potable water supplies, wastewater treatment systems, solid waste management facilities, emergency planning and response, communications infrastructure, and human services facilities. This chapter examines the existing conditions, levels of service, and future needs of public and private facilities and services provided in the Windham Region. Discussion on public roads and pedestrian and bicycle facilities is included in the Transportation Chapter.

Infrastructure systems and public services are critical to supporting the health and well-being of our communities, but are often unnoticed. These utilities, facilities, and services are provided by a variety of different entities, including municipalities, private cooperatives, non-profit organizations, and private businesses. In terms of land use planning, the types and location of infrastructure investments can significantly influence how development occurs in communities. For example, in order to support higher levels of residential density and expanded commercial uses in village centers, adequate public water and wastewater systems are essential. Infrastructure investments should be planned and prioritized consistent with the future land use goals in the Land Use chapter.

Towns also need to look to the future when planning for their infrastructure needs for financial reasons. Maintenance and upgrade costs for water and wastewater systems and emergency response services are costly and by developing long-term plans towns can better forecast needs. State statute allows municipalities to create Capital Improvement Plans, which include an investment schedule for capital costs over several years and priority projects. This approach allows towns to budget and finance for future costs to minimize large, unexpected costs. Towns can benefit from encouraging growth and development within areas served by utilities and facilities to take advantage of public investments that have already been made.

The region will also need to consider how community utilities, facilities, and services continue to serve our residents given changing demographics and needs. Our population is ageing, which has implications for planning for health care facilities, emergency response services, and senior housing projects that require water and wastewater systems. The region has also dealt with an increase in substance abuse and mental health issues and there is a need for enhanced and comprehensive support services. Finally, many workplaces have shifted to having an option for

remote work, which requires adequate internet and cellular services for workers. These utilities are still lacking in parts of the region and need to be improved to support the local economy and ensure residents have adequate service.

WATER SYSTEMS

The majority of the Windham Region is served by individual private water supplies. In addition, there are over 50 public community water systems, which may be operated by a town, village or special purpose municipality, or privately operated, either individually or cooperatively. Municipally-owned public water supply systems are often provided in the more densely settled sections of towns and villages that may not otherwise have access to a safe and reliable domestic water supply. Many of the region's non-public water supplies serve seasonal housing developments located close to ski resort areas and some of the smaller villages.

Centralized systems allow residents to share in the cost of acquiring and maintaining their water supplies. Generally, public water supplies are easier to maintain and protect than individual water supplies in densely settled areas. Along with wastewater facilities, public water supplies allow for denser development within town and village centers. Public water systems are particularly important to support higher density residential projects that require fire sprinkler systems and a variety of different commercial uses, in particular manufacturing, that need a reliable and high volume of water.

The most common problem facing communities that have or are exploring the creation of municipal or privately-owned public water supply systems is obtaining funding to acquire or upgrade water supply facilities. These systems are very expensive and communities can face challenges when trying to put together sufficient and sustainable financing for projects. The State has recognized the critical role of public water systems to support public health and revitalization in villages and recently created a new funding source for municipalities using State and Local Fiscal Recovery Funds received under the American Rescue Plan Act of 2021.

Table 8-1 below provides current data on the public water supply systems operated in Brattleboro, Bellows Falls, Guilford, Putney, Readsboro, Wilmington, and the Wilmington/Cold Brook Fire District. These systems serve populations ranging from approximately 330 to 12,000 people. In total, approximately 19,000 residents or 39 percent of the region’s population receives water through a public system. Policies regarding the extension of water mains for these municipal water supplies vary across the different entities.

TABLE 8-1: PUBLIC WATER SUPPLES IN THE WINDHAM REGION

Town/System Name	Source Name/Type	Population Served	Capacity (MGD)	Pct of Capacity Used
Bellows Falls/Bellows Falls Village Water Department	Minard's Pond	3,500	1	30%
Brattleboro/Brattleboro Water Department	Pleasant Valley Reservoir Sunset Lake Retreat Meadow Wells	12,000	3	40-47%
Guilford/Guilford Water System	Extension of Town of Brattleboro Water System			
Putney/Putney Water System	Sand Hill Well	101 Properties	0.1	40%
Readsboro/Readsboro Village	Howe Pond	400-500	0.065	45%
Wilmington/Cold Brook Fire District "Golf Tract"	Wells	330	0.04	25%
Wilmington/Cold Brook Fire District "Base Tract"	Wells	808	0.15	7%
Wilmington Village/Wilmington Water District	Springs Haystack Pond Reservoir	1,500	Varies from 0.19-1.4	31%

Source: Information provided by water providers and town offices

According to the Vermont Department of Health, there are over 200 public non-community water supply systems in the Windham Region that serve non-residential uses, such as schools, offices, and motels. These small-scale systems are regulated by the Vermont Department of Environmental Conservation in the same manner as large systems. While almost every town in the region has at least one non-community system, the highest number are found in the towns with ski resorts (Dover, Londonderry, and Wilmington).

Each public water system has an accompanying source protection area. The adjacent graphic illustrates the source protection areas in Saxtons River as an example. Within the 200-foot radius of the primary water collection area, contamination impacts are likely to be immediate and certain. Beyond that, source protection areas are tested and mapped to determine further sources of probable and possible contamination. Where there has been no mapping, the State assumes a circular area with a 3,000-foot radius around the water source. The DEC has jurisdiction over the protection of public water supply sources. Within source protection areas, the DEC reviews Act 250 and wastewater facility applications. The DEC also requires that towns develop a plan for protecting source areas. Such protection may become part of a municipal zoning bylaw, though towns are not currently required to restrict land uses within these areas. Key Source Protection Areas in the region are identified on the Utilities Map.

GROUNDWATER SOURCE PROECTION AREAS, SAXTONS RIVER

Source: Vermont Natural Resources Atlas

Threats to groundwater and wells in the region include agricultural runoff, nearby salt storage areas, road salting, contaminated runoff from paved areas, flood events, and failing septic systems. Some private water systems have been pumped at rates exceeding the aquifer's capacity, resulting in yields that do not adequately meet the needs of users. Some systems have inadequate storage capacity, creating problems during power failures when homes may be without water.

As more PFAS (per-and polyfluoroalkyl substances) contamination is discovered in groundwater, additional public water systems may be required by the State of Vermont. This will require significant public investments. PFAS are a large group of commonly used chemicals whose components breakdown very slowly over time. Studies have shown that exposure to PFAS may be linked to harmful effects in humans. Since 2016, the Vermont Department of Environmental Conservation and the Vermont Department of Health have been working on identifying PFAS sources in Vermont, protecting consumers from existing exposures to PFAS, and encouraging the EPA to provide leadership

on the management of PFAS.

WASTEWATER TREATMENT SYSTEMS

Most of the region is served by on-site wastewater disposal systems and the majority of new housing is being built with private septic systems. There are 15 publicly and privately-owned wastewater treatment plants in the region. These systems are primarily located in village and town centers and in ski resort areas where there is a high concentration of commercial facilities and residential housing.

Villages that do not have centralized systems have difficulty attracting or retaining businesses and more concentrated residential development because these uses require a public system in a more densely settled area. Towns face high costs associated with the installation and maintenance of new systems, and there is often a lack of available land in village centers to site wastewater treatment facilities. Many of the existing wastewater facilities in the region also have trouble obtaining funding needed to maintain and upgrade their infrastructure. Funding can be obtained through user fees, capital reserve funds, bonding, and grants and loans.

Similar to public water systems, the State recognizes the need to help smaller towns with developing these systems and has set aside State and Local Fiscal Recovery Funds for grants for community wastewater systems in addition to existing funding programs. In the Windham Region, the towns of Londonderry, Grafton, and Jamaica are exploring systems for village centers in their communities. These towns are considering decentralized wastewater that includes small and larger soil-based water systems on suitable parcels. In comparison, centralized water treatment facilities have significantly higher costs and require more extensive permitting.

There are 9 municipalities with publicly owned wastewater treatment plants providing secondary or tertiary treatment and 4 privately owned treatment plants in the region (see Table 8-2). Facility types include lagoons, extended aeration and oxidation ditches, and rotating biological contactors. Most systems are operating under hydraulic capacity. However, the difference between design flow and current average flow does not necessarily represent available capacity. Other factors, such as capacity already allocated or being held in reserve, the ability to safely and economically dispose of the sludge that results from the treatment process, the organic load on the treatment plant that may be presented by different materials, and local decisions regarding how close to the limit the plant should operate, all affect the potential to use any remaining capacity. Generally, when a facility is operating at 80 percent capacity, the plant may be required to upgrade. Federal regulations and future nutrient loading limits may also play a prominent role in affecting the potential use of remaining capacity.

TABLE 8-2: WINDHAM REGION WASTEWATER TREATMENT FACILITIES

Municipality	Facility Design Capacity (MGD)	Percent of Design Hydraulic Capacity Remaining	Sludge Treatment or Disposal Technique	Effluent Disposal Location
Bellows Falls (serves Walpole & N. Walpole, NH)	1.4	66%	Compost	Connecticut River
Brattleboro	3	50%	Land Application	Connecticut River
Jacksonville	0.0501	41%	Landfill/Compost	East Branch North River
Putney	0.1	50%	Landfill/Incineration	Sacketts Brook
Readsboro	0.075	42.9%	Land Application	Deerfield River
Saxtons River	0.105	50%	Co-treatment	Saxtons River
West Dover	0.475	40%	Landfill	Spray-Deerfield River Basin
Whitingham	0.0123	43%	Landfill/Compost	Deerfield River
Wilmington Village	0.135	73.75%	Landfill	Deerfield River
Wilmington/Cold Brook FD, Golf	0.049	80%	Incineration	Spray-Deerfield River Basin
Wilmington/Cold Brook Fire District, Base	0.03	--	Incineration	Spray-Deerfield River Basin
Winhall-Stratton Fire District	0.83	30%	Treatment	Erving WWTF Erving, MA

Source: Information provided by town offices and fire districts

Wastewater must be treated before being released to groundwater or surface water in order to ensure adequate removal of solids, destruction of pathogens, and removal of other pollutants, such as certain metals and organic compounds. Sludge disposal from municipal wastewater treatment plants is accomplished by land application, composting, landfilling, or incineration. No sludge is incinerated in the Windham Region, but several small treatment plants in the region ship sludge to be incinerated in Connecticut and landfilled in Massachusetts. The State of Vermont regulates the levels of nitrates, phosphates, PCBs, and seven metals in each land application of sludge.

Effluent that remains after treatment is discharged to either surface waters or groundwater. Four plants in the region

discharge treated effluent by "spray irrigation," which involves spraying the effluent at controlled rates and at approved times of the year onto an area that is approved for that purpose and where public access is restricted. The remaining plants discharge effluent directly into one of the following streams: Connecticut River (four discharges), Deerfield River (three discharges), and one discharge each in Sacketts Brook, Saxtons River, East Branch North River, and No Name Brook. Discharges of effluent into surface waters are regulated by State and Federal agencies in accordance with regulatory requirements.

SOLID WASTE MANAGEMENT

Solid waste disposal services are essential to protect public health and the environment. In addition to the typical residential and commercial waste, there are numerous special wastes, such as hazardous materials, used motor oil, and septage that need to be properly separated and handled. As the region plans for its future solid waste management needs, it is important to develop strategies that reduce the quantity of waste generated and to ensure proper disposal of all materials. Recycling, composting, and hazardous waste collection are important components of solid waste management.

Eighteen towns in the region belong to the Windham Solid Waste Management District (Brattleboro, Brookline, Dover, Dummerston, Guilford, Halifax, Jamaica, Marlboro, Newfane, Putney, Readsboro, Stratton, Townshend, Vernon, Wardsboro, Westminster, Whitingham, Wilmington, and Winhall), two belong to the Southern Windsor/Windham Counties Solid Waste Management District (Grafton and Rockingham), and three (Londonderry, Weston, and Windham) belong to the Londonderry Cooperative Group. Searsburg operates its own municipal facility. Athens has a contract with Triple T Trucking for services and Somerset (an unincorporated town) has no waste management facility.

Vermont state law requires all towns to adopt a Solid Waste Implementation Plan (SWIP), either individually or through a solid waste district or inter-municipal association. The SWIP must document town or district waste facilities, explain how solid waste will be managed, and demonstrate compliance with the statewide Materials Management Plan adopted in 2019. In addition, SWIPs must be in conformance with any Town Plan and the Regional Plan.

In 2012, the Vermont Legislature passed the Universal Recycling Law (Act 148), mandating universal recycling and composting throughout the State by 2020. The law was phased in and banned the disposal of common recyclables in 2015, leaves, yard debris, and clean wood in 2016, and food scraps in 2020. The law requires all facilities and haulers that collect trash to offer recycling and food scrap collection. Transfer stations and bag drop haulers must also offer leaf and yard debris collection seasonally. According to the Universal Recycling 2019 Status Report, approximately 72% of recyclable paper and containers are being recycled statewide. Home composting of food

scraps is also on the rise with 58% of Vermonters reporting they compost or feed animals at least some food scraps in a 2018 poll by the Castleton Polling Institute.

The disposal of hazardous waste occurs in two different ways. District facilities accept wastes such as antifreeze, waste oil and cadmium batteries for recycling. Other household hazardous waste items (and waste from conditionally exempt small quantity generators) are disposed during special hazardous waste collection days that are held several times each year. Federal and State regulations govern the management and disposal practices of all industries, businesses, and institutions that generate in excess of 100 kg (220 pounds) of hazardous waste or 1 kg (2.2 pounds) of acute hazardous waste per month.

The only large industrial sources of wastewater sludge in the region are paper mills. Paper mill wastewater is treated on site by its generators. The solid and liquid portions from that process must be treated or disposed of, sometimes with wastewater treatment plant sludge and septage.

RADIOACTIVE WASTE MANAGEMENT

The former Vermont Yankee (VY) Nuclear Power Station is located on the Connecticut River in the Town of Vernon and first became operational in 1972. Since it was first proposed, the WRC has been engaged in discussions about VY because of its regional economic, energy, land use, and emergency planning significance. The plant was owned and operated by the Vermont Yankee Nuclear Power Corporation up until 2002 when it was purchased by Entergy Nuclear Vermont Yankee. In 2013, Entergy announced it would cease operations and close VY in 2014 due to economic factors. Entergy filed its Post Shutdown Decommissioning Activities Report, its decommissioning activities plan, with the Nuclear Regulatory Commission (NRC) in December 2014 and ceased operation fifteen days later.

In January 2019, ownership was transferred from Entergy to NorthStar for the purpose of decommissioning and site restoration after receiving approvals from the NRC and the Vermont Public Utility Commission. The approvals for the transfer of ownership were conditioned upon a decommissioning plan, related budget, and financial assurances. The WRC was a signatory to a Settlement Agreement and Memorandum of Understanding that were foundational to the Vermont Public Utility Commission (PUC) order.

Once the decommissioning has been completed and the site has been restored per federal and state standards and the PUC order, high-level nuclear waste and spent fuel will remain on the site, stored in casks in the on-site Independent Spent Fuel Storage Installation (ISFSI) until transferred to the US Department of Energy (DOE). The transfer to DOE is assumed to be complete by 2052 at which point the ISFSI will be decommissioned and the NRC license terminated. This assumption is made by the federal government which has thus far failed for decades to establish either a permanent or temporary high-level nuclear waste and spent fuel repository, thus how, when or if the spent fuel will ultimately be removed from the site is uncertain. The WRC has taken the position that the Vermont

Yankee license holder should use its commercial best efforts to remove spent fuel and high-level nuclear waste from the site as soon as possible. The WRC has also commented on U.S. Department of Energy consent-based siting of spent nuclear fuel and high-level radioactive waste. While the footprint of the ISFSI is small, the Vermont Yankee site itself is also small (approximately 125 acres), and the presence of an ISFSI has historically contributed an impediment to redevelopment of decommissioned nuclear power station sites in the United States.

EMERGENCY SERVICES

Resilient communities are better able to withstand and recover from disasters. Two key elements of resilience are emergency planning and preparedness. Comprehensive emergency planning is achieved by mitigating potential hazards through implementation of sound land use practices and establishing emergency procedures to guide effective response and recovery. Community experiences during and following Tropical Storm Irene in 2011 and the flooding of July 2023 revealed the importance of direct emergency preparedness, achieved through having the infrastructure and resources, trained personnel, and emergency services in place to respond swiftly and effectively.

EMERGENCY PLANNING

Vermont Emergency Management contracts with most Vermont regional planning commissions to assist towns with emergency planning. Statewide, this has changed emergency planning from a top-down system to a more locally and regionally coordinated process. The WRC coordinates with Vermont Emergency Management (VEM), the Federal Emergency Management Agency (FEMA), local emergency responders and emergency management directors, mutual aid organizations, the Red Cross, the Vermont Agency of Transportation, the State Emergency Response Commission and other regional planning commissions to continually promote emergency planning and disaster resilience for our member towns.

Building disaster-resilient communities through sound land use planning is a primary goal of emergency planning. Emergency planning involves prevention, preparedness, response, recovery and mitigation. Prevention and mitigation involve strategies aimed at vulnerability reduction or elimination to protect and/or relocate public and private property away from predictable hazards. Preparedness planning involves having the appropriate policies, plans, protocols, training and equipment in place prior to an event. Response planning is both creating tools to assist towns with their own on-the-ground response efforts and ensuring that they have what is needed for that response. It also involves up and down information sharing between state agencies and towns during and after events. At the planning level, recovery involves short- and long-term actions taken to assist towns with recovering to a less vulnerable state and it involves coordination across many organizational boundaries. In short, accidents and natural hazard events will always happen; the extent to which they become emergencies or disasters is partly a function of readiness.

With the enactment of the Federal Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986, Congress imposed upon state and local governments additional planning and preparedness requirements for emergencies involving the release or spill of hazardous materials. Provisions of this law require that facilities with hazardous materials stored on-site report these products to local fire departments, the Local Emergency Planning Committee (LEPC) and the State Emergency Response Commission (SERC). VEM and the SERC have organized the LEPC structure to form a statewide LEPC that fulfills EPCRA requirements with Regional Emergency Management Committees (REMC)in place to maintain local engagement. WRC provides administrative support for the Windham REMC. Membership is composed of two REMC appointees from each member town: the local emergency management director and a second interested volunteer who is actively a part of an emergency response organization serving the Windham Region. REMC meetings cover requested topics or the latest emergency management issue facing the region and provide opportunities for networking, skill sharing, problem solving and learning. The WRC also has an Emergency Planning Committee to provide an opportunity for commissioner engagement in the work of the WRC that is supported by funding through the Emergency Management Planning Grant, to develop effective strategies to support emergency planning within towns, and to develop a cadre of commissioners to supplement staff in the event of another large-scale disaster.

Response assistance for all types of emergencies may be provided by local and Vermont State Police, local fire companies, public works departments, state agencies, the local Red Cross Chapter and private contractors. Other disaster relief services, such as emergency shelters, are provided by these same local response organizations, and may be coordinated with FEMA or state agencies, as appropriate. The role of Regional Planning Commissions (RPCs) in disaster response and recovery is defined through a comprehensive memorandum of understanding (MOU) between the RPCs and VEM. This MOU recognizes the essential and varied emergency response and recovery roles RPCs have assumed both within their own regions in support of their towns, in the provision of assistance to sister regions, and at the State Emergency Operations Center.

EMERGENCY PREPAREDNESS AND CROSS-TOWN EFFORTS

National Incident Management System (NIMS) provides a consistent nationwide framework and approach to enable government at all levels, the private sector, and non-governmental organizations to coordinate response and recovery efforts. NIMS trains emergency responders from different jurisdictions and disciplines to work together effectively and efficiently in response to natural disasters and emergencies, including acts of terrorism. One of the major elements of the Command and Management component of NIMS is the Incident Command System (ICS). ICS is used to organize on-scene operations for, ranging from small to complex incidents, both planned (such as a parade or holiday event), and unexpected, such as the sudden onset of a natural or man-made disaster. ICS is structured to facilitate activities in five major functional areas: Command, Operations, Planning, Logistics and

Finance/Administration. ICS is used by all levels of government – federal, state, tribal and local. VEM and the FEMA provide in-person and virtual training in ICS throughout the year. These and other emergency management trainings can be found on the Learning Management System. WRC promotes the importance of training all town employees in ICS 100, which is the most basic level.

WRC works or has worked with the vast majority of member towns to develop or update a Local Hazard Mitigation Plan. FEMA approved Local Hazard Mitigation Plans are critical in helping towns to identify their vulnerabilities to natural hazards, determine the level of risk and the potential impact of those hazards, and to ultimately develop strategies to mitigate the loss to property or lives which could result from those hazards. The WRC helps member towns understand the significance of natural land processes and how such knowledge should inform their land use decisions, i.e.: where to build, and where not to build. Workshops and trainings with experts in various fields of emergency planning are held occasionally for town officials and interested members of the public. These events are a way of bringing officials from the region's towns together to meet one another, develop cross-town communications networks, and come away with new knowledge about how to plan for and manage emergency events.

Each major hazard event we experience teaches lessons about emergency preparedness. Towns now know how critical it is to have a consistent and thorough documentation mechanism in place to keep track of all recovery and repair work for reimbursement purposes. Towns also realize the importance of keeping their emergency shelters ready and fully functional in the case of an event that displaces people from their homes. The Red Cross Local Shelter Initiative is able to offer towns permanent supplies of cots, blankets, and pillows for their local shelter, as long as the space is capable of meeting Red Cross standards and the town recruits a separate pool of volunteers, not including town officials and first responders, who will be trained for emergency shelter operations. In many towns it is a challenge to find and keep up to date volunteers for this task. Towns must also have staff trained and ready to run the town Emergency Operations Centers (EOC) where response efforts are coordinated at the local level. Other practical steps for towns to increase their resiliency are: to develop interoperability of communications between fire, police, road crew, and town officials; have hydraulic and hydrologic studies for road/culvert/bridge improvements done in advance; and create detailed capital improvement budget plans to implement the mitigation strategies in their Hazard Mitigation Plan.

FIRE

Most towns in the region have local fire-fighting capacity within their boundaries. The towns of Brattleboro and Wilmington and the villages of Bellows Falls and Saxtons River have fire departments which are also divisions of local government. The remaining towns are served by privately incorporated volunteer fire companies and some are partially staffed by paid firefighters. Many of these private fire companies receive a significant amount of their funding from the towns they serve, but they operate successfully because of the dedication of the fire company personnel who volunteer their services and a great deal of their time. Several towns have more than one fire company within their boundaries to better serve different areas. Only Athens, Searsburg, and Somerset do not have local fire companies. Athens is served by the Saxtons River fire department. Searsburg and Somerset are served by the Wilmington Fire Department.

MARLBORO FIRE STATION

All of the region's fire companies are members of mutual aid systems, associations that allow local fire companies to receive fire-fighting assistance or back-up service from other member fire companies. There are five mutual aid systems that serve Windham Region towns: Keene Mutual Aid, Tri-State Mutual Aid, Tri-Mountain Mutual Aid, and Deerfield Valley Mutual Aid. Some towns belong to more than one mutual aid system. These types of mutual aid systems are critical for providing emergency response services given that many communities in the region have small fire departments with limited equipment and personnel.

Increasingly, the lack of volunteer fire-fighters and rescue personnel threatens to seriously compromise the effectiveness of the region's fire companies and emergency medical squads. As is true for many fire services nationwide, limited discretionary time at work, increased cost, increased training demands, and an aging population of fire service personnel combine to restrict volunteers' availability. Additionally, many fire departments are seeing increased calls to respond to medical emergencies and there is a need for properly trained personnel for these service calls.

EMERGENCY MEDICAL SERVICES

First response squads respond to calls for emergency medical service by getting to the injured person as soon as possible and stabilizing the person's condition until a licensed emergency medical transport vehicle arrives. Many members of these local rescue squads also volunteer to use their own vehicles and equipment to respond to calls for emergency medical services when contacted by a mutual aid system or other dispatching service. The following towns maintain volunteer first response squads: Brattleboro, Dover, Dummerston, Grafton, Guilford, Halifax,

Jamaica, Marlboro, Putney, Rockingham, Vernon, Wardsboro, Westminster, Whitingham, and Winhall.

Five ambulance/rescue squads provide emergency ambulance services between towns and health care facilities. The professional and private State-licensed ambulance services include Deerfield Valley Rescue (Wilmington), Rescue, Inc. (Brattleboro & Townshend), Golden Cross Ambulance (Rockingham & Westminster), and Londonderry Volunteer Rescue Squad. Other entities outside of the region provide back-up service to these companies through mutual aid agreements. In addition, C&S Wholesale Grocers has a full-time rescue squad for its facility in Brattleboro which will respond to Mutual Aid calls as needed. Stratton Mountain Rescue functions during winter months only.

POLICE

Law enforcement is organized into town and village police departments, the Windham County Sheriff's Department, and the Vermont State Police. The Village of Bellows Falls and the towns of Brattleboro, Dover, Winhall, and Wilmington have municipal police departments. Towns are allowed by Vermont Statute to employ constables, although the level of activity and authority of constables varies. Typical duties of a town constable include patrolling at sporting and community events and serving court summonses.

The Windham County Sheriff's Department has contracts with towns for the provision of service. The towns of Dummerston, Halifax, Jamaica, Marlboro, Newfane, Putney, Rockingham, Vernon, Westminster, and Windham have contracts with the Windham County Sherriff. This Department also has contracts for police protection with schools (Dummerston Elementary, Leland and Gray, and Windham Central Supervisory Union), Saxtons River Village and Newfane Village. The County Sheriff's Department responds to calls in towns that do not have contracts and which do not have their own police department; however, this service is provided only when staff is available and the Department is not responding to more urgent calls. The County Sheriff's Department also provides backup support to town police departments and the Vermont State Police when requested.

Troop B1 of the Vermont State Police serves the majority of the Windham Region out of their station in Westminster. The western towns of Readsboro, Searsburg, Somerset, Stratton and Winhall are served by Troup B3 of Shaftsbury. Vermont State Police provide backup assistance to towns that have their own police departments (sometimes through contract) and often provide primary police service to towns which do not have their own police squads and do not contract with the Windham County Sheriff's Office for service. The Vermont State Police has primary responsibility for patrolling Interstate 91.

Law enforcement is a problem for many towns in the region, especially since only five municipalities have police departments. Traffic and speed enforcement continue to be issues that towns are struggling to address. Other concerns include slow response times and drug trafficking, especially along the Interstate 91 corridor.

ENHANCED 911

The rural pattern of development in the Windham Region can present frustrating and potentially life-threatening delays to callers, dispatchers and emergency responders. The Vermont Enhanced 911 (E911) emergency calling system was developed to reduce these delays through a statewide system of street or road addresses linked to telephone numbers and to mapped locations. Each town regularly updates its street address data and forwards the information to the State E911 board.

HEALTH CARE SERVICES AND FACILITIES

Health and human services and facilities are important to the health and well-being of the public. These services include care for children, the elderly, and persons with physical and mental disabilities, as well as services to support impoverished families and individuals. The Windham Region has an aging population that will increasingly need care and new facilities in the coming decades. The rising cost of healthcare raises concerns regarding the financial condition of regional hospitals and healthcare facilities. Meanwhile, disparities in income and growing issues around substance use and mental health are increasing demands on social service agencies and their resources of food, shelter, heat, and other needs.

This plan also recognizes the importance of the built environment in influencing public health outcomes. This includes how we design and plan for our homes, streets, infrastructure, workplaces and open space. A lack of opportunities for walking, recreating, and socializing with others can lead to an increase in rates of obesity, heart health, mental health problems, and isolation. The Land Use chapter of the plan addresses community design and land use recommendations to help support healthy lifestyle options.

HOSPITALS

Six hospitals serve most of the region's general and emergency medical care needs: Brattleboro Memorial Hospital, Southwestern Vermont Medical Center in Bennington, Rutland Regional Medical Center, Springfield Hospital, Mount Ascutney Hospital in Ascutney, and the Cheshire Medical Center/Dartmouth-Hitchcock in Keene, NH. These hospitals have facilities that provide surgery, X-ray, outpatient, laboratory, and physical therapy services. The Grace Cottage Family Health Center and Hospital in Townshend provides primary care, rehabilitation, wellness, prevention, inpatient care, and emergency services. The Dartmouth-Hitchcock Medical Center in Lebanon, New Hampshire and hospitals in Massachusetts and New York provide more specialized medical care for the region.

The Mountain Valley Health Center in Londonderry, Rockingham Health Center in Bellows Falls, and the Deerfield Valley Health Center and Green Mountain Healthcare in Wilmington, along with the region's many medical offices, serve the day-to-day health care needs of the region. In order to provide immediate emergency health care, the

Stratton Mountain and Mount Snow resorts provide health care facilities staffed by physicians during the ski season.

The financial condition of the region's hospitals is of primary concern, as it is for rural areas across the country. The level of service that hospitals can provide is determined to a great extent by the resources available to purchase new equipment, upgrade facilities, and attract and retain physicians and other staff. In recent years there has also been a trend in smaller hospitals affiliating with the larger Dartmouth-Hitchcock Health for financial and maintaining service level reasons. For example, Cheshire Medical Center and Southwestern Vermont Medical Center now have affiliations with Dartmouth-Hitchcock.

MENTAL HEALTH

Mental health services are provided by Health Care & Rehabilitation Services of Southeastern Vermont and the Brattleboro Retreat. The Brattleboro Retreat is one of this country's oldest and largest independent mental health organizations, and provides a full range of psychiatric in-patient care and a variety of out-patient services. Health Care & Rehabilitation Services of Southeastern Vermont has extensive outpatient programs in a number of towns in the region.

ELDER CARE

As the population continues to age, there will be a growing need for nursing homes and residential care facilities that are convenient to resident's families and homes. As of 2021, there were only 3 nursing homes, 2 assisted living centers, and 5 residential care facilities in Windham County. The Valley Cares facility in Townshend provides both independent living and assisted living facilities and is one of the few examples of this type of facility in the region. Without the development of more elderly housing options, residents in need of care and assistance may need to find facilities outside of the region. New facilities should be encouraged in village and town centers to take advantage of existing infrastructure, services, and pedestrian amenities.

Southern Vermont Home Health Agency and the Visiting Nurse Alliance of Vermont and New Hampshire are the primary home health care agencies in the region that provide care for residents ageing in place. Two others, Brattleboro Area Hospice Care and Bayada Home Healthcare, are located in the Brattleboro area, and a third, My Community Nurse Project, serves residents in Weston and Londonderry as well as three other communities outside of the Windham Region. Home health care service providers are Medicare certified by the Vermont Department of Disabilities, Aging and Independent Living.

HUMAN SERVICES

Helping people meet their needs is essential to the social and economic well-being of the region. There are a variety

of reasons why residents may need help: poverty, illness, language and cultural barriers, lack of education, physical and/or mental disability, addiction, and isolation are just a few of those reasons. Supporting approaches that prevent problems from developing and that meet the needs of residents in the region is critical. Among the challenges to the region's human service agencies are an aging population, poverty, substance use, and a lack of affordable housing.

Over 100 organizations and agencies provide a variety of programs to meet the region's human service needs including social services and nutrition programs for elders, energy assistance for low-income households, employment referral services, emergency food and shelter programs, and a range of programs for children. To better support residents, these organization and agencies often collaborate with one another and with healthcare and housing agencies.

As in many rural areas, access to services can be a challenge for households that do not have a car or who cannot afford much gasoline. Access not only includes being able to physically reach the service but also includes outreach and technology that make people aware of the services.

COMMUNICATIONS INFRASTRUCTURE

Communications technology is rapidly advancing and adequate and reliable cellular and internet services are now essential infrastructure for all businesses, organizations, and residents in the region. Many rural towns and villages still lack sufficient internet and cellular infrastructure, which is a barrier when it comes to attracting new residents and businesses. At the same time, communications infrastructure can receive public resistance due to concerns of its negative impacts to the area's natural and scenic resources. Development and maintenance of modern communications systems is vital to promote stronger connectivity within the region and provide quick and efficient connections with the rest of the country and world. This has become even more critical with the shift of some employers to offering remote work options.

The Public Utilities Commission established the following goals in the 2014 Vermont Telecommunications Plan relevant to communities in the Windham Region:

- Every address in Vermont should have available broadband Internet access with the minimum technical requirements of 4 megabits per second (Mbps) download and 1 Mbps upload. By year end 2020, a majority of addresses in Vermont should have access to the Internet at speeds of at least 100 Mbps symmetrical (download/upload), and every address should have access at speeds of at least 10 Mbps download.
- Every address in Vermont should have access to wired and wireless broadband Internet access service.
- Broadband service should be affordable to all members of every customer class.

- Universal adoption and use of broadband service at home and at work.
- Universal availability of mobile service along roadways and near universal availability statewide.
- Reliable, economical telephone service in all areas of the State, including rural areas. All residents, regardless of income or location, should have access to basic telephone service.

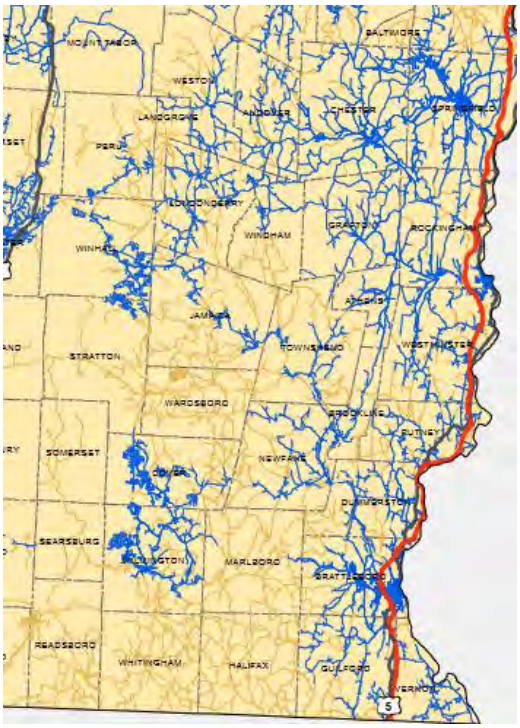
INTERNET

Internet access in the Windham Region is provided by cable, DSL, fiber optic cable, cellular, wireless, and satellite. These different means for broadband access have a wide range of effectiveness and availability across the region. Broadband infrastructures is being expanded across the region and current availability data is regularly changing as improvements are made. Based on data collected by the Vermont Department of Public Service, as of November 2022, 72 percent of buildings in the Windham Region were served by internet at speeds of at least 100/20 Mbps, but 20 percent of buildings still lacked service of at least 25/3 Mbps as shown in Table 8-3 below.

TABLE 8-3: INTERNET SERVICE LEVELS FOR WINDHAM REGION (NOVEMBER 2022)

Service Level	Percent of Buildings in Windham Region
Served 100/100	33%
Served 100/20 or better	72%
Served 25/3 or better	80%
Served 4/1 or better	97%
Lacking 4/1	3%

Generally, the parts of the region served by 100/20 Mbps or better are located along major roadways in Connecticut and West River valley towns, in Wilmington and Dover along Routes 100 and 9 and adjacent roads, and in the Winhall, Londonderry, Weston areas. The map to the right depicts in blue roads and addresses served by 100/20 Mbps or better as of November 2022 according to data from the Vermont Department of Public Service. There are approximately 986 buildings, or 3 percent of total buildings, in the region that lack 4/1 Mbps service. These properties are primarily located in more isolated areas of the region because broadband providers tend to focus on areas with higher population concentrations. The communities of Dummerston, Halifax, Jamaica, Marlboro, Newfane, Readsboro, Searsburg, Somerset, Stratton, and Wardsboro have the highest rate (7 percent or greater) of buildings without 4/1 Mbps service.



ROADS AND ADDRESSES SERVED BY 100/20 MBPS OR BETTER IN BLUE, NOVEMBER 2022

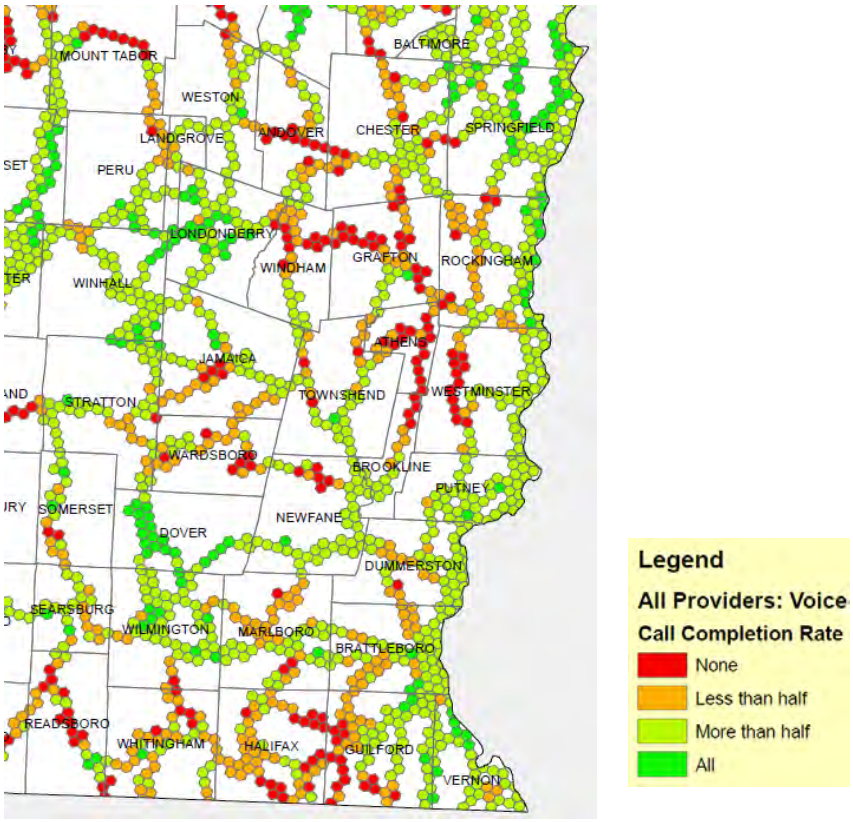
Source: Vermont Department of Public

The State of Vermont has invested significant funding in several initiatives over the last several years to improve broadband coverage. These have included the Broadband Innovation Grant program to help communities conduct studies and create business plans for broadband deployment, the Connectivity Initiative Grant for internet service providers to extend service to designated areas, and the Line Extension Customer Assistance Program that provided small-scale grants for telecommunication line extensions to properties just beyond the reach of existing infrastructure.

Much of the work to improve broadband access in rural and underserved areas in being completed by local Communication Union Districts (CUDs). For-profit companies, and in particular Fidium Fiber, are also expanding the availability of the fiber network. A CUD is a governing structure similar to a water or wastewater district that allows multiple municipalities to join together to address the need for improved broadband service. Broadband build-out expenses are covered by grants, service fees, and donations. CUDs cannot use municipal taxes for the infrastructure costs. There are currently two CUDs serving municipalities in the Windham Region: Deerfield Valley Fiber (DV Fiber) and Southern Vermont Communication Union District (SoVT CUD). Deerfield Valley Fiber represents 23 towns in the region. SoVT CUD represents two towns, Londonderry and Winhall, which are also members of DV Fiber. Rockingham, Grafton, Athens, and Somerset do not belong to a CUD at this time.

CELLULAR AND TELEPHONE COMMUNICATIONS

Cellular phone service coverage varies widely in the region because some areas remain difficult and less practical to serve. Generally, the best cellular service coverage is found along the Interstate 91 corridor and major state highways, like Routes 9, 100, and 30. Based on driving tests completed by VTrans in the summer of 2022, areas in the region with the least cellular coverage include more remote areas in Guilford, Halifax, Whitingham, Readsboro, Wardsboro, Jamaica, Marlboro, Windham, Grafton, Athens, and Westminster. Coverage also varies based on the provider. The region is currently served by AT&T, FirstNet, T-Mobile, US Cellular, Verizon, and VTel Wireless.



MOBILE WIRELESS VOICE COVERAGE – ALL PROVIDERS
BASED ON DRIVE TESTING CONDUCTED JULY – SEPTEMBER
2022 USING OOKLAN WIND TEST SOFTWARE

Source: Vermont Department of Public Service

Wireless telecommunication facilities in Vermont are permitted under the Section 248a process. Municipalities can also adopt zoning bylaws to regulate these facilities. However, applicants seeking approval through the Section 248a process are not required to adhere to local zoning bylaws. For projects requiring Section 248a permitting, the Public Utilities Commission is required to issue a Certificate of Public Good finding that the project will not unduly interfere with the orderly development of the region and with due consideration given to the recommendations of the municipality and the regional planning commission. The Section 248a process was set up to expedite the approval of telecommunication facilities and projects that are interconnected with other proposed or existing facilities are exempt from local zoning and Act 250. However, Act 250 still regulates towers over 50 feet in height from ground

level or more than 20 feet in height above the structure it is attached to. In cases where an Act 250 permit is required for a tower, an applicant is also required to comply with any local zoning bylaws.

The demand is not only for the expansion of mobile voice services, but also mobile broadband internet access. To increase capacity and meet demands, service providers will likely need to increase the number of transmission sites in the region. While there is a need for improved cell phone service, the expansion of telecommunication facilities can potentially have environmental and aesthetic impacts. A concern for the WRC and for member towns is the impact that cellular towers and related facilities may have on rural and scenic landscapes and villages.

Vermont continues to have a high rate of households that still have a traditional phone landline. This is likely due in part to the lack of cellular service in rural locations, as well as household preferences. As cellular service expands, it will be important to retain landline services for those households that choose it, particularly for more vulnerable populations and those in remote areas.

COMMUNITY UTILITIES, FACILITIES AND SERVICES POLICIES

GENERAL

1. Encourage towns to consider and plan for their future public utility needs and support their acquiring of future public and quasi-public utility sites, properties, or interests.

2. Support towns to identify and seek opportunities for shared services and infrastructure with other towns in order to reduce cost and improve efficiencies and the quality of service.

WATER AND WASTEWATER FACILITIES

3. Support water conservation measures to reduce demand for water and to promote the life span and efficiency of water facilities.

4. Ensure that any proposed land use or growth within existing or planned public water supply well-head protection areas will not pose a threat of contamination. No development that would cause any threat of contamination shall be permitted.

5. Minimize erosion and runoff to protect public and private water supplies by maintaining town roads consistent with Best Management Practices for erosion control.

6. Encourage towns to develop capital improvement plans to budget for public water and wastewater facility

management and operations and to have contingency planning in place for facility failure. Plan development so as to manage wastewater effectively and to maintain surface and groundwater quality.

7. Support development of new public water and wastewater treatment facilities in areas where future growth is appropriate and in consideration of flood hazards, including regional centers, villages, resort centers, industrial locations, and growth centers as identified by town plans, and in areas where extension is required for public health purposes.

SOLID WASTE MANAGEMENT

8. Support the regular review and update of solid waste implementation plans (or "SWIP") that regulate the safe disposal of all solid waste, including household hazardous wastes. Ensure that each town is covered by a SWIP that meets all state requirements.

9. Support federal, state, and local actions that reduce the volume and toxicity of solid waste in the Windham Region, including implementation of the Universal Recycling Law.

10. Work with solid waste entities and towns to plan for waste disposal needs, including regulations under the Universal Recycling Law, through the establishment of recycling, composting, waste reduction and reuse, and general waste management programs, while addressing public health, environmental quality, and impacts on adjacent and nearby land uses.

11. Support the assessment of waste disposal fees that accurately and fairly charge disposal costs to the waste generators.

12. Encourage towns to maintain membership in a solid waste management district, or join with other towns if there is desire for change. Multi-town districts can lessen SWIP requirements for individual towns involved and serve to increase efficiencies versus single town districts.

RADIOACTIVE WASTE

13. Ensure the safe and effective storage, transportation, and disposal of radioactive waste.

14. Work to assure that standards proposed for any radioactive materials storage site in Vermont are at least as stringent as those applied to any alternative site.

15. Support public involvement regarding all spent nuclear fuel and radioactive storage permitting and licensing decisions.

16. Compensation for permanent or interim storage of spent nuclear fuel and/or high-level radioactive waste must

benefit everyone in the host community, as that community is providing a critical public service to the nation as a whole. This siting and the benefits derived from it must respond to the economic and environmental justice needs of the host community.

EMERGENCY PLANNING

17. Build disaster resistant and resilient communities by promoting sound land use planning that accounts for known hazards, especially climate change.

18. Encourage towns and the State of Vermont to continue to improve and adopt road, bridge and culvert codes and standards that exceed federal minimums.

19. Encourage towns to require that all new public and private roads and driveways are properly constructed so that they do not contribute to the damage of town roads from stormwater.

20. Support towns in hazard mitigation planning according to FEMA guidelines that stress consideration of mitigation possibilities and include decisions and programs related to infrastructure, policy, education and the effective utilization of the natural environment to lessen vulnerability.

21. Encourage towns to adopt the most stringent flood and fluvial erosion hazard bylaws possible. Support towns in understanding and properly implementing their bylaws. Advocate to the Agency of Natural Resources for training and other needs that towns express around bylaw administration.

22. Encourage the development and regular review and update of local emergency plans, including local emergency management plans and local hazard mitigation plans, and encourage towns to engage in climate preparation planning.

23. Support towns and emergency management entities with planning needs through the entire disaster cycle: prevention, preparedness, response, recovery, and mitigation.

24. Encourage towns to consider and create evacuation plans related to their hazards and the evacuation needs around those hazards specific to their town.

25. Support efforts by Green Mountain Power to relocate utility lines underground in order to improve grid resilience.

EMERGENCY RESPONSE

26. Ensure that towns are able to provide timely and effective emergency services to all persons and properties in their community.

27. Ensure that all proposed developments plan for fire hydrants or other water sources in proposed developments so that fire-fighting personnel can adequately serve all structures.

28. New roads shall be designed and built so that emergency vehicles can readily maneuver and access all proposed structures.

29. Ensure that any additional emergency service personnel, facilities, and equipment needed to effectively service new development are available to avoid placing undue demands on existing resources.

30. Support the development and installation of an additional or improved emergency communications infrastructure, systems, and procedures.

31. Support the regionalization of emergency services if that is deemed desirable for those departments or entities involved.

COMMUNICATIONS INFRASTRUCTURE

32. Promote universal access to broadband telecommunications and information services that are competitive in availability and cost.

33. Encourage modernization and expansion of transmission and receiving equipment at existing transmission and receiving stations, including co-location of cellular and radio communications.

34. Siting, design, and access to communications towers and structures must show consideration and minimization of negative impacts on natural and scenic resources.

35. Require that communications towers and structures be set back from property lines and public rights of way, such that the tower or structure will not cross the aforementioned lines or rights of way in the event of a collapse.

HUMAN SERVICES

36. Support the development and maintenance of appropriate facilities to provide for the care of children, elderly residents, and persons with disabilities in the region.

37. Assist the coordination of community service organizations to avoid duplication of effort, as is feasible and appropriate.

ENERGY

BACKGROUND

A reliable and affordable supply of energy is critical to our region. While many energy issues are national or global in scale, land use decisions and the way in which the region develops has a direct and lasting impact on the types of energy needed and amount of energy input necessary to sustain our communities. The Windham Region can lead by example by analyzing current energy usage, looking for areas of improvement, increasing the efficiency of the region's energy dependent systems, and supporting local energy generation options that benefit communities. For the purposes of this Plan, energy is defined as usable power that is derived from fuel sources such as transportation fuel, heating fuel, or electricity generation sources.

A key premise underlying this energy discussion is the need for significant progress on several fronts:

- **Energy Security**: Much of the Vermont's electricity is generated in facilities outside of the state, and the state has a significant reliance on imported fossil fuels. Diversifying our energy sources will allow the region to reduce dependency on foreign sources and to increase stability and resiliency in the event of supply interruptions or cost fluctuations.
- **Environmental Protection:** Our current pattern of energy use has significant negative impacts on the environment, especially regarding greenhouse gas emissions, other air quality impacts, and subsequent impacts on water quality and other natural resources.
- **Economic Costs:** Households spend a significant amount of money on annual electricity, heating, and transportation costs. Increased conservation and efficiency in all energy uses will allow residents to reduce their energy costs. There are also opportunities for economic and job growth in the clean energy sector, including renewable energy facilities and building weatherization.
- **Equity:** As the Windham Region, and the State, moves forward with energy transitions in order to meet greenhouse gas reduction and renewable energy consumption targets, energy policies and actions need to be accessible to all.

A primary purpose of the Energy Chapter is to implement the 2022 Vermont Comprehensive Energy Plan (CEP) and the 2021 Vermont Climate Action Plan within the Windham Region. The CEP lays out an ambitious task for the State: to source 90% of its energy from renewable resources by 2050 (referred hereafter as 90x50 Goal).

The following sections discuss current and anticipated future energy use for the Windham Region, specific renewable energy targets, and greenhouse gas emission reductions in the electricity, thermal, and transportation

sectors. This Plan identifies goals and strategies under the pathways of Conservation and Efficiency, Land Use, Transportation, Renewable Energy Siting, and Equity in order to achieve these energy targets. Additionally, the Plan provides maps showing the potential for solar and wind energy generation in the region, known and possible constraints in renewable energy generation siting, transmission and distribution resources and constraints, transportation infrastructure, and possible locations for siting renewable energy generation.

CURRENT USE

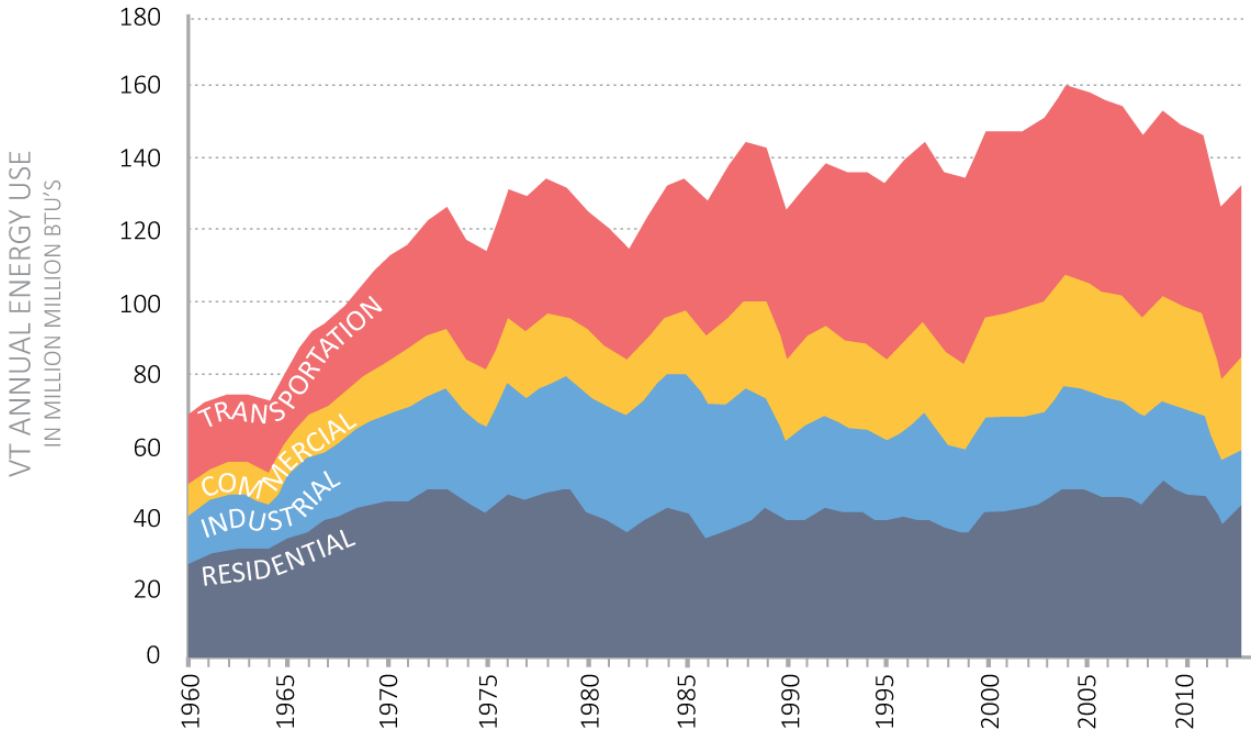
ENERGY CONSUMPTION AND DEMAND

In this plan, energy is divided into three sectors: electricity, transportation, and thermal. This section focuses on the amounts used in total units. The numbers presented are the most accurate estimates based on recent data sourced from the American Community Survey, Department of Labor, the Vermont Agency of Transportation, Efficiency Vermont, Drive Electric, and the Energy Information Administration. The discussion of this data serves as the context for the energy plan; it is the starting point from which the Region will progress to achieve the goal set out in the Vermont Comprehensive Energy Plan (CEP) of 90% renewable by 2050 (90x50 Goal).

NOTE ON ENERGY TERMINOLOGY

A significant technical note should be made here, and that is the distinction between energy measured at the point of consumption, called “end-use,” and energy measured as generated, called “primary-use.” End energy use is measured at the point of use, as it enters—or is delivered to—the consumer’s home, building or vehicle. Primary energy use includes the delivered energy plus the energy that is lost in generation, transmission and distribution. This is especially important in the case of electric generation because thermal power plants can shed up to two units of heat energy for every one unit of electric energy that is produced. End-use consumption is the measure most often used in reports of energy use because it provides a better baseline for comparison. It will be referenced here when that data is available.

FIGURE 1: HISTORIC ENERGY USE IN VERMONT BY SECTOR[1]



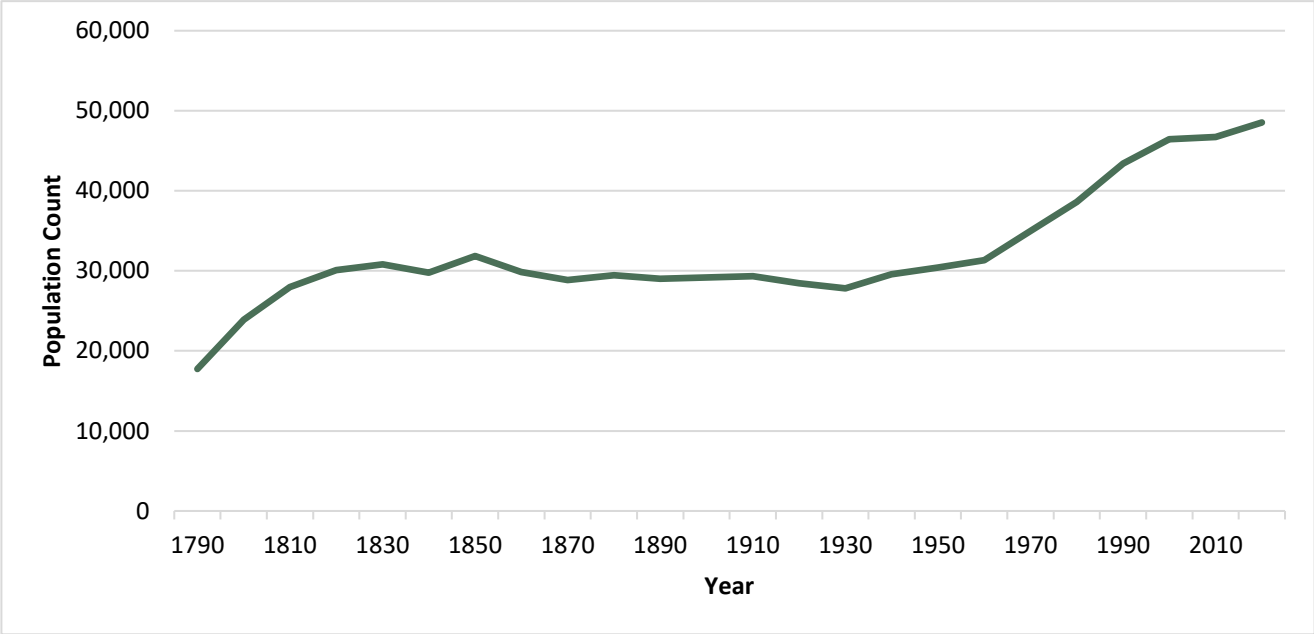
GROWTH AND ENERGY USE

Over the last 80 or so years, both the State of Vermont and the Windham Region have drawn energy from multiple sources, primarily gasoline, liquid petroleum gas, and wood. Overall consumption throughout the 20th century has increased dramatically, with some decline around the "Great Recession" of 2008 (see Figure 1).

Energy consumption has generally tracked with population growth. While still a rural state, the period of 1790 to 1830 saw significant growth within the Windham Region, which then leveled off for more than a hundred years until around the 1950s, when resort development and an in-migration known as the "back to the land movement" started a boom in population growth that has steadily increased through the 2020 Census. Figure 2 below shows the Windham Region's population over time.

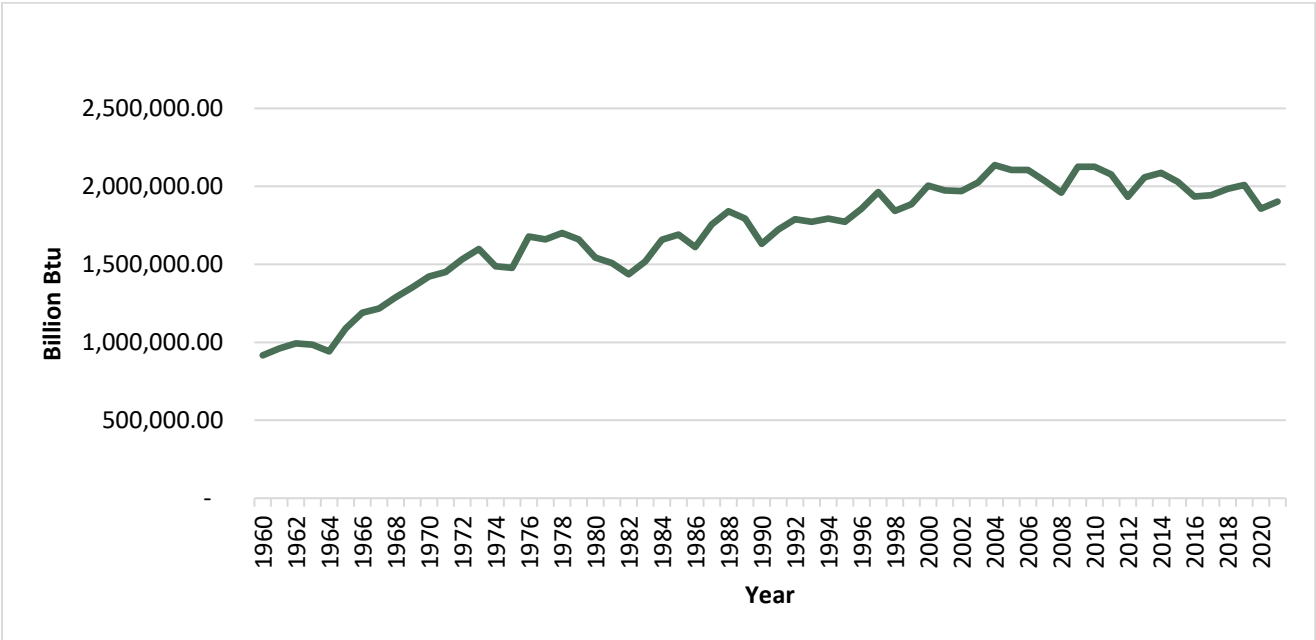
[1] Windham Regional Energy Plan, 2018.

FIGURE 2: WINDHAM REGION POPULATION, 1790 – 2020[2]



Overall energy demand in Vermont has grown from 916,422 Billion Btu in 1960 to its peak of 2,126,482 Billion Btu in 2009, a 43.1% increase. Since 2009, the demand has fluctuated with an overall decrease to 1,901,952.22 Billion Btu in 2021 (See figure 3).

FIGURE 3: TOTAL END-USE ENERGY CONSUMPTION ESTIMATES IN VERMONT, 1960-2020[3]



[2] Data Source: U.S. Census (2010, 2020) Vermont Indicators, http://www.vcgi.org/indicators (1790 - 2000).

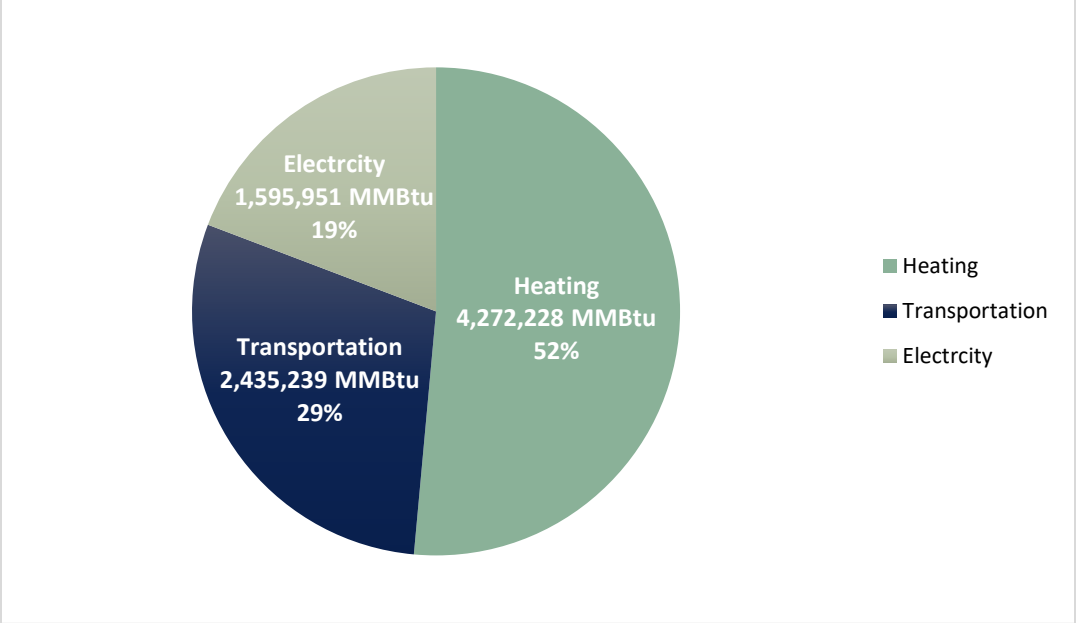
[3] US Energy Information Administration: State Energy Data System 1960-2022. https://www.eia.gov/state/seds/seds-data-complete.php?sid=VT#Consumption.

Economic activity in the Region has mirrored the population trends, and is another indicator of energy consumption within the Region. Additional employment, industrial output, and higher wages typically increase the demand for energy resources; however, the Vermont economy has been able to accommodate additional (real) economic growth with relatively steady energy input.

WINDHAM REGION CURRENT ENERGY USE AND THE COST OF ENERGY

In 2023, the Windham Region consumed **8,301,324 Million Btu (MMBtu)** across the electricity, heating, and transportation sectors (Figure 5). With each of the three sectors depending heavily on fossil fuels as the primary energy source, a majority of these dollars leave the state and local economy.

FIGURE 5: ENERGY CONSUMPTION IN THE WINDHAM REGION, BY SECTOR[4]



The economic cost of energy to individuals, as well as public and private entities, is one of the biggest concerns expressed about energy consumption in Vermont. During the Vermont Public Service Department's (PSD's) 2022-2023 public engagement process for reviewing Vermont's renewable energy policies and programs, energy affordability and reliability were the number one concerns for residents. Every person and business in Vermont need to be able to afford electricity, transportation access, and heat at prices that they can afford, and cost is an important factor to consider during our Region's transition to a more reliable, renewable energy future. As important as the

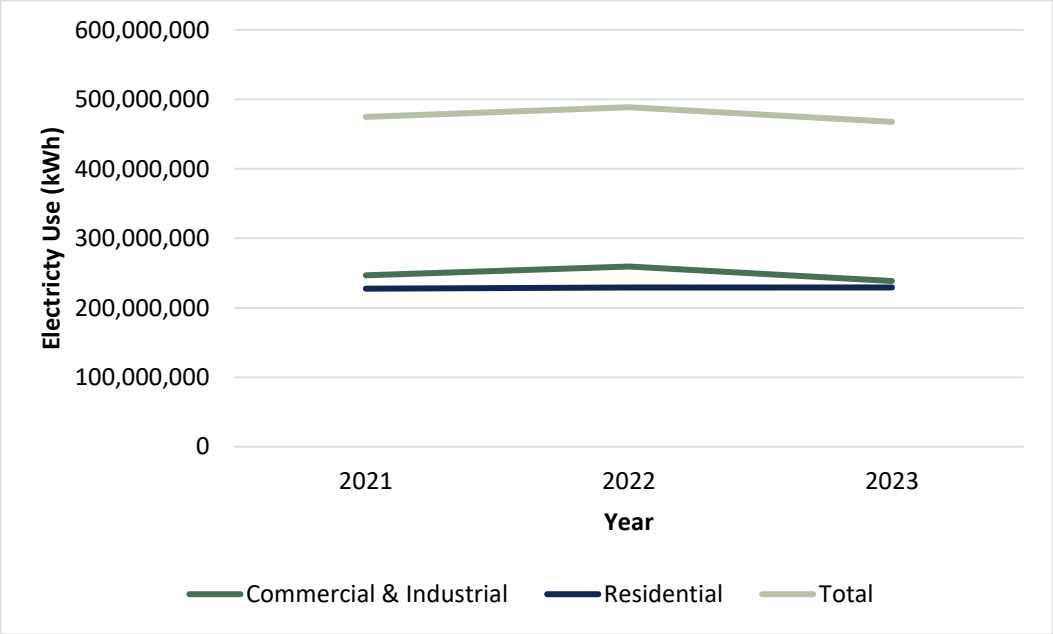
[4] Estimates for thermal and transportation sector energy use were calculated using the Vermont Public Service Department's (PSD's) Municipal Consumption Tool, with input from several key data sources, including the 2023 American Community Survey, the Vermont Department of Labor's Economic and Labor Market Information, the Vermont Department of Motor Vehicles, Drive Electric, and the US Energy Information Administration. Electrical energy use is reported directly to the Windham Regional Commission by Efficiency Vermont. Refer to Appendix B of the Energy Chapter for a full description of the methods used to calculate regional energy consumption.

cost of energy is, it is also variable and harder to build energy targets around. This plan will focus on amounts consumed as a way to track energy usage.

ELECTRICITY

Efficiency Vermont has compiled electrical usage data from Vermont distributors Vermont since 2014 and reported on regional usage to the Regional Planning Commissions. Since 2014, the highest total amount of electricity used in the Windham Region was in 2016 at 502,864,000 kWh. Since that time, there has been some fluctuation in total usage for the region, but the overall trend has been a decrease. In 2023, the year of the latest data report, total usage was **467,727,049 kWh**, a decrease of 6.9% from 2016.

FIGURE 6: ELECTRICITY USE IN THE WINDHAM REGION BY YEAR AND CATEGORY, 2021 - 2023[5]



EXISTING GENERATION FACILITIES

The Windham Region has a robust history of harnessing its natural resources to generate electricity. The Region has an installed generation capacity of **189.4 MW.** Based on this capacity figure, it is estimated that **623,819 MWh** are produced annually across 1,300 solar sites, 14 wind sites, 6 bio-generation sites, and electricity-generating dams on almost every major waterway.[6] The following two tables provide a town by town breakdown of the existing generation facilities in all 27 towns in the Windham Region.

[5] Data compiled from WRC Efficiency Vermont Data Reports between 2022-2024.

[6] Information on existing generation in the Region comes from ISO New England, which conducts a triannual survey of all distribution utilities in New England.

TABLE 1: INSTALLED GENERATION CAPACITY OF RENEWABLES IN WINDHAM REGION TOWNS (MW)

Town	Solar	Wind	Biomass	Hydro
Athens	0.11	0	0	0
Brattleboro	11.09	0	1.89	0
Brookline	0.18	0	0	0
Dover	0.92	0	0	0
Dummerston	1.02	0	0.14	0
Grafton	0.51	0.00	0	0
Guilford	2.20	0	0	0
Halifax	0.22	0	0	0
Jamaica	0.68	0.01	0	2.41
Londonderry	1.48	0	0	0
Marlboro	0.33	0.00	0	0
Newfane	0.95	0	0	0
Putney	3.34	0	0	0
Readsboro	0.12	0	0	0
Rockingham	2.45	0.01	0	41.29
Searsburg	0.01	36.00	0	0
Somerset	0	0	0	0
Stratton	0.11	0	0	0
Townshend	0.88	0.01	0	0.96
Vernon	0.87	0	0	32.40
Wardsboro	0.11	0	0	0
Westminster	6.20	0	0.45	0
Weston	0.42	0	0	0
Whitingham	0.25	0.01	0	33.60
Wilmington	1.09	0.02	0	0
Windham	0.08	0	0	0
Winhall	4.61	0.00	0	0
REGIONAL TOTAL	40.2	36.1	2.5	110.7

TABLE 2: ANNUAL ELECTRICITY PRODUCTION IN WINDHAM REGION TOWNS (MW)

Town	Solar	Wind	Biomass	Hydro
Athens	150	0	0	0
Brattleboro	14,573	0	11,589	0
Brookline	240	0	0	0
Dover	1,203	0	0	0
Dummerston	1,345	0	871	0
Grafton	675	4	0	0
Guilford	2,889	0	0	0
Halifax	291	0	0	0
Jamaica	891	19	0	10,539
Londonderry	1,947	0	0	0
Marlboro	440	2	0	0
Newfane	1,245	0	0	0
Putney	4,387	0	0	0
Readsboro	154	0	0	0
Rockingham	3,217	17	0	180,828
Searsburg	18	70,956	0	0
Somerset	0	0	0	0
Stratton	140	0	0	0
Townshend	1,153	19	0	4,200
Vernon	1,142	0	0	141,912
Wardsboro	146	0	0	0
Westminster	8,147	0	2,759	0
Weston	553	0	0	0
Whitingham	322	13	0	147,168
Wilmington	1,434	44	0	0
Windham	104	0	0	0
Winhall	6,064	4	0	0
REGIONAL TOTAL	52,870	71,078	15,220	484,651

DISTRIBUTION UTILITIES

Vermont distribution utilities source their electricity through generation and purchasing to meet demand. Figures 7 and 8 show Vermont's electricity characteristics. Figure 7 shows the electricity Vermont utilities generated and bought to meet demand. Figure 8 shows how renewable Vermont's energy is based on retired renewable energy certificates. Charts were provided by the Vermont Department of Public Service.[7]

FIGURE 7 - VERMONT'S RENEWABLE GENERATION AND PURCHASE ENERGY MIX

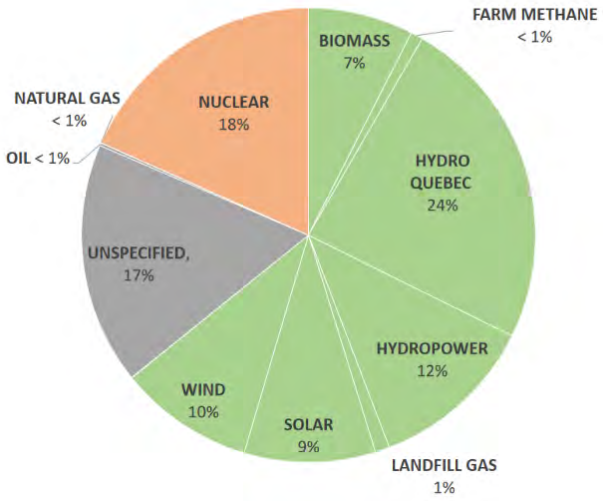
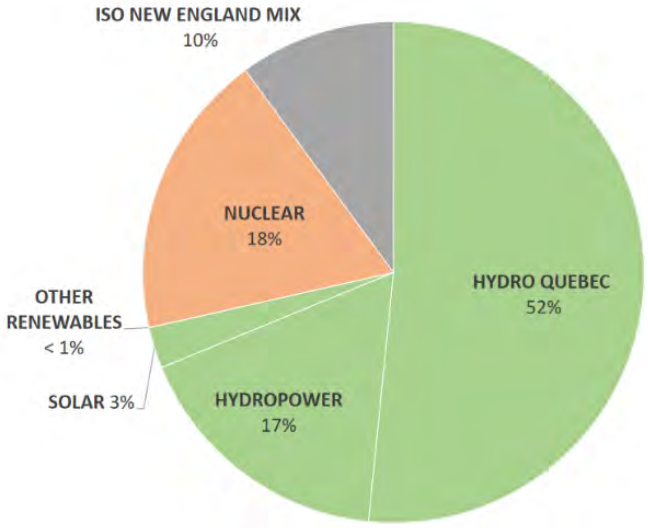


FIGURE 8 VERMONT'S RETIRED RENEWABLE ENERGY CERTIFICATE



[7] Where Does Vermont's Electricity Come From? Presentation by the Public Service Department on January 31 and February 2, 2023. https://publicservice.vermont.gov/sites/dps/files/documents/Webinar%201%20-%20Where%20does%20VT%20electricity%20come%20from.pdf

Vermont has several policies and programs that address renewable and clean energy in the state. Additional information can be found on the public service department website about the state policies and programs that address renewable electricity and the transitions required to achieve state energy and climate goals, as laid out in the 2022 Comprehensive Energy Plan (CEP) and the 2021 Climate Action Plan (CAP).

Vermont electricity distribution utilities purchased over 5.8 million MWh of electricity to meet the demand of Vermont consumers in 2021. Of this, approximately 64% came from renewable resources and about 18% came from carbon free resources. In 2021, Vermont distribution utilities also retired just over 4 million MWh in renewable energy certificates to meet the utilities' requirements under Vermont's Renewable Energy Standards. Of the retired credits, 72% was accounted for as renewable and, if nuclear is included, 90% of it was low-carbon[8]

The Windham Region is serviced by two electricity distribution utility companies: Green Mountain Power and Jacksonville Electric Company. Green Mountain Power cover the majority of the Windham Region and Jacksonville Electric's service area is the Village of Jacksonville and the Town of Whitingham.

ELECTRIC TRANSMISSION

The Vermont Electric Power Company, Inc. (VELCO) manages the safe, reliable, and cost-effective transmission of electric power throughout Vermont, and is a part of the integrated New England regional network. VELCO updates its Long-Range Transmission Plan every 3 years. The 2024 Long Range Transmission Plan highlights that peak demand is forecasted to grow significantly due to accelerating electrification of the heating and transportation sectors. While the transmission system has sufficient capacity to serve expected future demand for the first 10-years of the 20-year planning horizon, the Plan identifies several challenges that will need to be addressed:

- Substantial infrastructure investments will be necessary to meet future electrical demand–these will either come in the form of traditional grid upgrades (build out of transmission infrastructure, line rebuilds, transformer capacity enhancement, etc.) or alternative approaches, like increased energy efficiency, storage solutions, and smart grid technologies.
- Currently, distributed generation (DG) projects are reviewed on a project-by-project basis without regard to transmission system impact. To prevent further stressing transmission and distribution systems, carefully coordinated statewide planning is required to successfully integrate future distributed generation

[8] See 3 one-page resources for more info: Where does Vermont's electricity come from?, Current policies & programs, and Tradeoffs between different sources of electricity- these documents were made available as part of the Say WATT? Regional Event Series in the fall of 2023 during which the Department of Public Service partnered with the RPCs to offer a series of engagement opportunities for Vermonters to weigh in on renewable electricity policies and programs.

and storage without significant grid reinforcements.

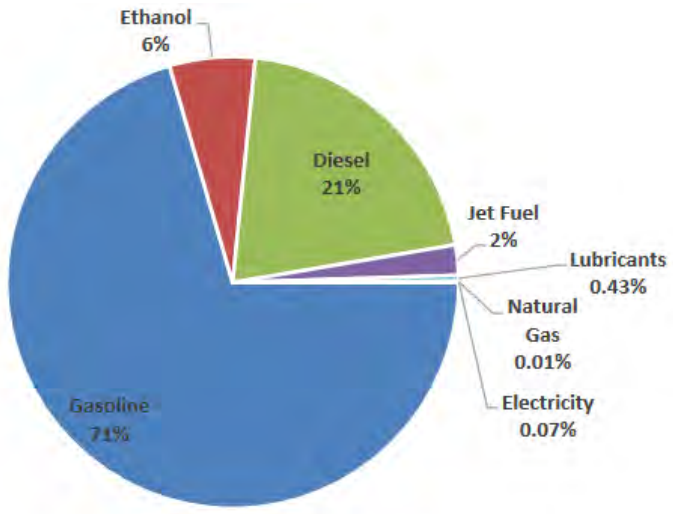
- There are sub-transmission scale reliability issues (categorized as causing high or low voltage, or a thermal overload in which equipment exceeds its rate temperature).

As distribution utilities prepare for increased electrification, coordination between VELCO, the utilities, the Region, and municipalities will be increasingly vital to ensure that Vermont can meets its energy goals, minimize negative impacts to natural resources, maximize benefits to Vermonters, and prioritize those who have been disproportionately burdened by energy costs and reliability issues.

TRANSPORTATION

As Vermont is a rural state, car dependency is not only a social norm but a necessity in most cases. The land use pattern of dispersed settlements encourages car use by creating long distances between destinations. In Windham County, the average travel time to work in 2022 was 22.2 minutes.[9] Most of these trips were with vehicles with a single occupant. Transportation consumes a large portion of the total petroleum used, and has steadily increased since the 1960's, though the trend is now leveling off.

FIGURE 9: TRANSPORTATION ENERGY CONSUMPTION BY FUEL TYPE IN VERMONT, 2019



When looking at the total number of registered private vehicles in the State, gasoline and diesel-powered vehicles greatly outnumber the number of plug-in electric vehicles (EVs). There has been consistent growth in the number of gasoline-powered hybrid electric vehicles (GHEVs), plug-in hybrid electric vehicles (PHEVs), and all-electric vehicles (AEVs) over recent years. However, the overall small percentage of this vehicle type does little to offset the substantial percentage of vehicles fueled by gas and diesel. Fuel efficiency of these classifications of vehicles has a

[9] Data USA: Windham County, VT https://datausa.io/profile/geo/windham-county-vt

direct impact on the amount of fuel used by the residents of the Region.

FIGURE 10: PRIVATE VEHICLES REGISTERED IN VERMONT BY FUEL TYPE, 2008-2020[10]

Fuel Type	PEV[1]		Propane / CNG	Diesel	Gasoline	
	AEV	PHEV			ICEV	Gas: HEV
2008	NA	NA	75	32,140	578,881	4,656
2009	NA	NA	69	30,724	528,930	5,473
2010	NA	NA	59	25,932	524,810	5,877
2011	NA	NA	51	28,513	550,711	7,056
2012	48	140	48	38,684	541,872	7,693
2013	130	466	43	28,209	516,339	7,945
2014	197	670	43	29,879	525,199	9,242
2015	248	865	44	31,239	533,118	9,895
2016	330	1,192	43	31,213	533,021	10,676
2017	695	1,632	40	30,597	548,417	11,556
2018	1,010	1,975	37	30,699	546,340	12,027
2019	1,600	2,116	37	30,961	533,196	12,219
2020	2,063	2,297	37	30,941	515,236	12,341

[1] PEV data includes public as well as private vehicle registrations.
Data for all years is through December 31st.
Sources: VDMV, 2021; Drive Electric Vermont, 2021.

According to data from Drive Electric, Electric Vehicle registration in the Windham Region has steadily increased between 2021-2023. This mirrors Vermont's trend, but in order to meet future goals, this rate of increase will have to be even greater than the past few years.

TABLE 3: ELECTRIC VEHICLE REGISTRATION IN THE WINDHAM REGION, 2021 – 2023[11]

Vehicle Type	2021	2022	2023
All Electric	245	316	497
Plug in Hybrid	289	358	436
Total	534	674	933

[10] Vermont Transportation Energy Profile, 2021.
https://vtrans.vermont.gov/sites/aot/files/planning/documents/planning/2021%20Vermont%20Transportation%20Energy%20Profile.pdf

[11] Drive Electric: Vermont EV Registrations by Municipality as of Jan 2024, 2024.
https://veic.maps.arcgis.com/apps/mapviewer/index.html?webmap=7a62de8f69954804889c86a12a9640c8

INDIVIDUAL VEHICLE MILES

In the Windham Region, transportation accounts for 29% of total energy consumption (Figure 5). The leading fuel for transportation is gasoline followed by distillate fuels (diesel). Because transportation-related energy use is mainly determined by the individual vehicle miles traveled by residents and visitors, addressing fuel consumption via the personal vehicle is a priority. Recently, fuel efficiency improvements have gained traction as a public policy issue. These gains in fleet efficiency, however, may be offset when total vehicle miles traveled increases faster than the population grows, since total petroleum consumption is still increasing.

Vehicle Miles Traveled (VMT) is an estimate of total miles driven by all vehicles on a road network. Factors affecting VMTs include how far vehicles go, frequency of trips, and number of people in a vehicle. According to the Federal Highway Administration, between 2008 and 2020 Vermont consistently ranked higher in VMTs per capita than the national per capita average number of VMTs. This is mostly due to Vermont's rural character. For 2020, Windham County accounted for 507.193 (in millions) VMTs. The entire state of Vermont came in at 5,990.6 (in millions) VMTs. Windham County contributes to 8.5% of Vermont's VMTs. Windham County has 6.74% of Vermont's population and accounts for a higher percentage of VMTs.

The Public Service Department's Municipal Consumption Tool was used to generate estimates for transportation sector energy use in the Windham Region. To account for the higher amount of VMTs per capita in the Windham Region, the average annual VMTs is assumed to be 13,250 VMTs compared to the state average of 12,500 VMTs. According to the 2023 American Community Survey (ACS), the Region has 20,680 primary housing units (not vacant or used for seasonal/recreational purposes). Based on the number of households, it can be estimated that there are 34,424 light-duty vehicles (LDV), which consume 18,785,147 gallons of fossil fuel each year. The total amount of energy consumption for internal combustion engine vehicles is calculated to be **2,435,239 MMBtu**.

FUEL EFFICIENCY

Fuel efficiency has increased over time, but the overall average miles per gallon (mpg) rate in the U.S. peaked in the late 1980s and then began declining. This downward trend should see a reversal in response to the Federal fuel efficiency standards of 2011, which required a 35.5 mpg average for the U.S. auto industry by 2016. Although this new standard would only affect cars built after that time, the potential exists for it to have an impact on the overall efficiency of the State's current vehicle fleet. The majority of the vehicle fleet in Vermont fell within the 21-27 mpg efficiency range based on the vehicles registered in 2021. This range is likely lower than the federal fuel efficiency standards due to the overall age of the vehicles currently on the road, and that 15% of the Vermont registrations could not be matched to fuel economy.

LAND USE

Settlement patterns and vehicle choice play major roles in high per capita fuel consumption, and the rural landscape of the Windham Region has led to homes being built far from downtown and village centers, where services are accessed. The result of separated residential areas is that trips to markets, schools, and work tend to be only possible with the use of an automobile. In the Windham Region, rural residential sprawl has occurred where homes located along rural roads have been separated from all other aspects of daily life.

Another factor affecting fuel consumption is the location of major employers far from residential areas and the development of strip commercial areas designed and built at scales that encourage automobile access and discourage pedestrian and bicycle traffic. Increased road capacities that encourage more driving at faster speeds may also have helped contribute to the increased per capita transportation energy use. The Vermont Department of Public Service estimates that lowering the speed limit to 55 miles per hour on the Interstate highways would lead to a 3% reduction in State-wide fuel consumption. While such a reduction in speed limits may not be politically feasible, education of drivers regarding driving habits and the costs of faster speeds may encourage individuals to reduce their driving speeds voluntarily.

THERMAL

Estimates for thermal energy consumption are significantly influenced by building type and use case. As a result, the following section describes the methods and assumptions used to separately determine residential and commercial heating consumption in the Windham Region. Industrial building thermal demand is not included in the analysis due to a lack of available data. The 2023 Municipal Consumption Tool was used to derive heating consumption estimates for the Region and to organize key assumptions about the data.

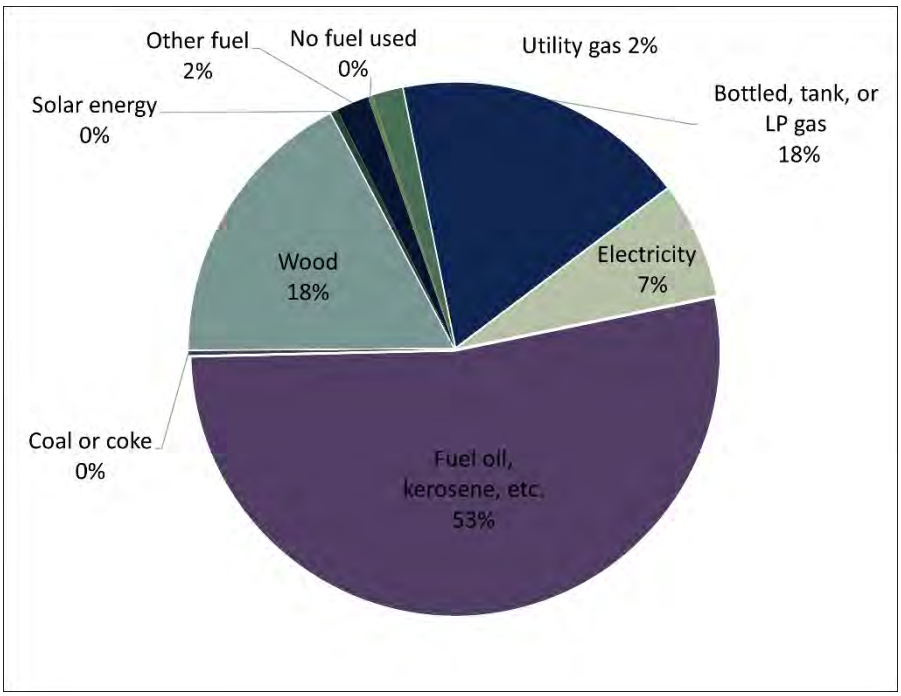
RESIDENTIAL

The average annual heating load for residences in the Region was assumed to be the same as the state average of 110 MMBtu for both space and water heating. According to the 2023 American Community Survey, there are 32,975 housing units in the Region, 20,680 of which are year-round residences (designated as “occupied units” by the Census). 1,459 of these primary residences are heated by electrical heating systems. Efficiency Vermont’s data on regional electrical demand (see “Electricity” section above) accounts for electricity used to heat homes, so to avoid double-counting this category of consumption, these 1,459 residences are subtracted from the analysis, leaving 19,221 residences. The annual thermal energy used in primary homes is therefore, **2,114,310 MMBtu**.

Figure 11 illustrates this energy consumption by fuel type. The Region depends heavily on fuel oil and kerosene, with this fuel source supplying over 50% of the residential heating needs. As most of the fuel types are not locally

produced (fossil fuel sourced), the funds going to this supply are funneled out of the state and Region.

FIGURE 11 WINDHAM REGION RESIDENTIAL HEATING FUEL TYPES[12]



Wood provides 18% of the residential heating needs for the Region. The Windham Region has some of the most robust lumber resources in the state. A study completed by Innovative Natural Resources Solutions (INRS) revealed Windham County has the most volume of standing trees of any Vermont county at 1.6 billion cubic feet and grows over 20 million cubic feet per year (approximately 250,000 cords). The forests in Windham County are more productive than other Vermont counties because they are found at lower elevations characterized by richer soils.[13] With this abundant resource, the Region has the ability to support a significantly higher percentage of its heating needs with advanced wood heating options while supporting an important local economy.

Electricity is currently only 7% of the energy used to heat homes. However, with State incentives, desires to move to a cleaner heat source, and the additional cooling benefits of Electric Heat Pumps, many residences and commercial establishments are increasingly installing these systems as primary or secondary sources of heat. WRC expects to see the electric sector rise as a source of heating in the region.

In the Windham Region, there is also a high percentage of seasonal homes, at 37.2% of total housing units. Based on the energy model projections from the state, (see Vermont Pathways Output Discussion below,) it can be assumed that seasonal homes only use about 15% of the energy of a primary home, due to more occasional use and a presumed higher energy efficiency. However, seasonal homes in the Windham Region are often used for longer

[12] Data Source: U.S. Census, American Community Survey, 2023.

[13] INRS, An Initial Wood Supply Analysis for the Windham Wood Heat Initiative, 2015.

periods of time and for more energy-intensive applications, like winter lodging. To account for this dynamic, towns on the eastern half of the region are estimated to use 15% of the energy of year-round homes, while towns on the western half of the region (which are closer in proximity to the region's winter recreation areas), are estimated to use 25% of the energy of primary residences. As such, seasonal homes in the Region are estimated to consume about **306,102 MMBtu** of the Region's total heat consumption.

COMMERCIAL

For commercial establishments, it is estimated that the average annual heating load in the Region is 1,080 MMBtu. For the state, the average is 700 MMBtu to 750 MMBtu, but the average for any given area will be significantly higher or lower, as the mix of businesses from region to region is highly variable. Based on the types of businesses in the Windham Region, the commercial heating load was determined to be higher than the state average.[14] With 1,713 commercial establishments in Windham County, there is an estimated thermal energy demand of **1,849,522 MMBtu** per year. Like the residential sector, the largest percentage of fuel type used for commercial heating is fuel oil and kerosene. With the variable costs of oil from year to year, some businesses have been looking for alternative ways to heat their establishments. For example, in the Windham Region, 49% of public schools are operating Advanced Wood Heat systems, and 6% are operating under solar systems.[15]

[14] Average commercial heating load value was determined using the Municipal Consumption Tool. Possible explanations for the higher than average commercial heating load could include an older (and less efficient) compared building stock in our Region and the specific mix of industries. The "Healthcare and Social Services" and "Manufacturing" sectors are prominent in the Windham Region, and these industry types typically use considerable heat energy.

[15] Windham Wood Heat program analysis completed by the Windham Regional Commission.

WINDHAM WOOD HEAT PROGRAM

The Windham Regional Commission and several partners operated the Windham Wood Heat Program from 2015 – 2022. This program, with funding provided by the closure of Vermont Yankee Nuclear Plant, was operated under guidance from the State of Vermont Clean Energy Development Fund. WRC distributed funds through competitive grants to public entities and public facing organizations. Through this program, 9 AWH systems were installed in public schools, 2 in public facing institutions, and 2 in new public facing institutions. Through an independent evaluation, these installations had a verified CO2 Reduction of 1,009 tons. Annual verified fossil fuels saved were 102,210 gallons of fuel oil and 15 tons of coal[16]. Financial assistance was a large driver in commercial establishments converting to renewable heating options.

ADVANCED WOOD HEAT PELLET BOILER, MARLBORO ELEMENTARY SCHOOL
Photo Credit: WRC

TARGETS

VERMONT PATHWAYS MODEL OUTPUT DISCUSSION

As part of the development of Vermont's 2022 Comprehensive Energy Plan (CEP) and 2021 Climate Action Plan (CAP), Stockholm Environment Institute (SEI) and Northeast States for Coordinated Air Use Management (NESCAUM) developed a scenario model of Vermont's energy consumption and emissions and used the model to construct pathways to meet statutory greenhouse gas (GHG) reduction obligations under the state's Global Warming Solutions Act (GWSA). This model is known as the Vermont Pathways model, and was built using SEI's Low Emissions Analysis Platform (LEAP), a software tool for energy system modeling and emissions accounting. The Vermont Pathways model contains an analysis and projection of residential, commercial, industrial, and transportation energy demand at the statewide level.

To support enhanced energy planning for regions and municipalities, PSD regionalized the final energy demand

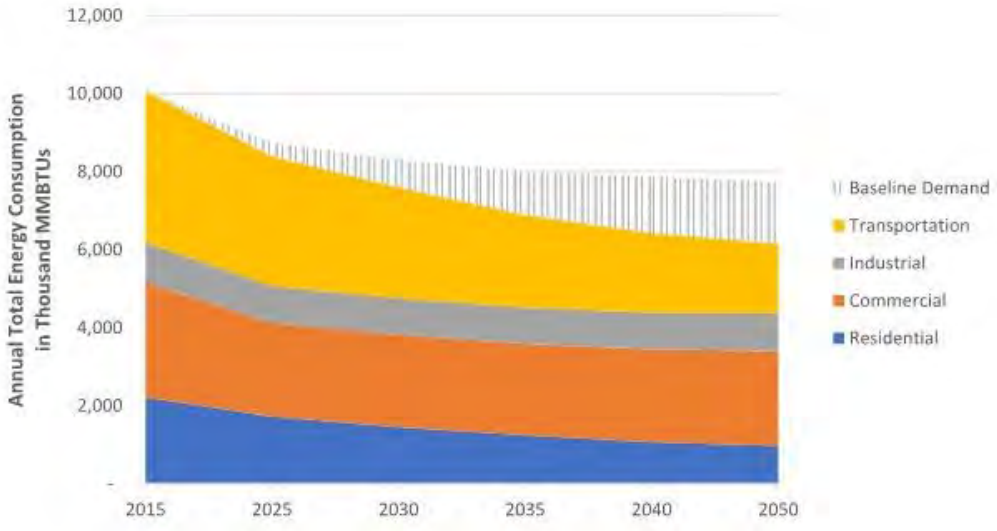
[16] Evaluation of the Windham Wood Heat Program, prepared for Windham Regional Commission by West Hill Energy and Computing. 2023.

outputs from the statewide Vermont Pathways model for four core sectors: residential, commercial, industrial, and transportation. A simple disaggregation of those results was conducted for each of the regional planning commissions based on key drivers of energy demand. The model was developed with two scenarios for Vermont's future in mind:

- The Baseline or "business-as-usual" scenario, developed to estimate Vermont/the Region's energy demand under normal policy and programmatic conditions;
- The Central GWSA Mitigation or "CAP Mitigation" scenario, developed to meet the state's GHG reduction requirements.

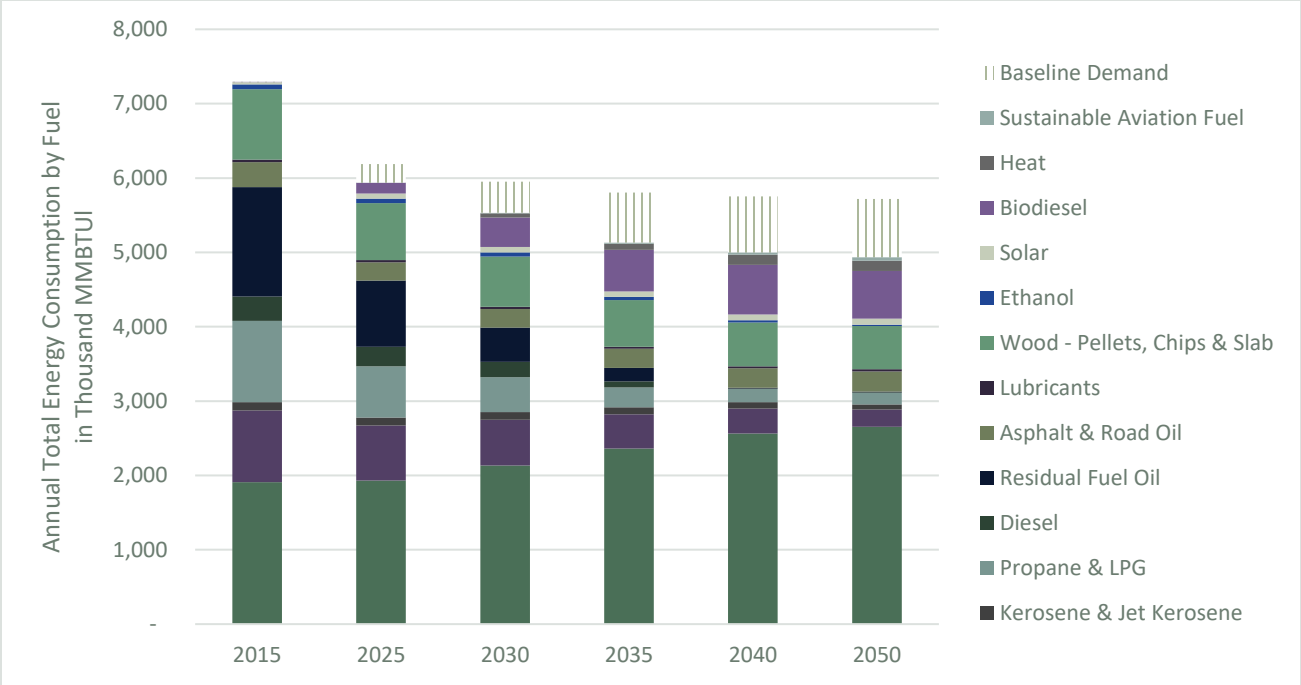
On state and regional levels, energy demand is depicted as decreasing substantially by the year 2050. Figure 12 below illustrates the total Windham Region demand by sector. The Baseline Scenario is the upper curve of the barred area. This barred area illustrates the difference between the energy demand of the Baseline Scenario verses the CAP Mitigation Scenario. Much of this difference is accounted for through assumed conservation and efficiency measures across all energy sectors (transportation, heating, electricity) due to gains in technological efficiency and decreased demand due to conservation measures.

FIGURE 12: WINDHAM REGION ENERGY CONSUMPTION BY SECTOR, CAP MITIGATION SCENARIO



The Windham Region's energy consumption by fuel type over time is depicted in Figure 13. Throughout the benchmark years, the model assumes fossil fuel consumption is phased out and replaced by more renewable resources. The total volume of fuel decreases due to assumptions about advancements in efficiencies across all sectors.

FIGURE 13: WINDHAM REGION ENERGY CONSUMPTION BY FUEL, CAP MITIGATION SCENARIO



ELECTRICITY

The electric sector is where much of the change will occur over time. The model assumes electrification of the light duty vehicle fleet and electrification of heating and cooling systems, resulting in a dramatic increase in electricity consumption. However, the model also assumes increased efficiency of these technologies over time. The increase in consumption is offset by the increases in efficiency and leads to what looks like gradual increases in the electricity consumed. In the year 2050, electricity is the primary source of fuel for the region and accounts for almost half of the total fuel consumed.

TRANSPORTATION

Transportation currently accounts for 29% of the Windham Region's energy consumption. To achieve the 90x50 goal, the transportation sector will need to radically transform its fleet efficiency and fuel sources. The model assumes consumption of fuels in the transportation sector will drop by 46% from the 2015 base estimates, and that the makeup of the energy mix will change from predominantly gasoline to electricity.

The Vermont Pathways model breaks down the transportation sector into passenger cars, light trucks, medium duty vehicles, heavy duty vehicles, and non-road vehicles. The model applies separate fuel switching assumptions for each of these transportation categories. The notable decreases in consumption are in the passenger car, light truck, and medium duty categories. Figure 14 and 15 show the changes over time for passenger cars and light trucks,

respectively.

FIGURE 14: REGIONAL PASSENGER CAR ENERGY DEMAND, CAP MITGATION SCENARIO

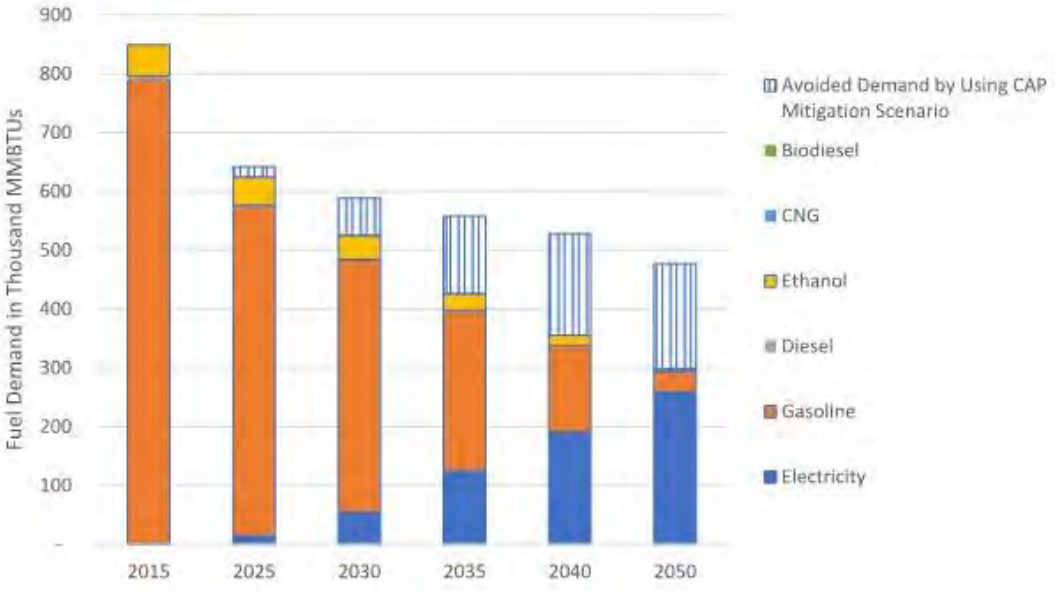
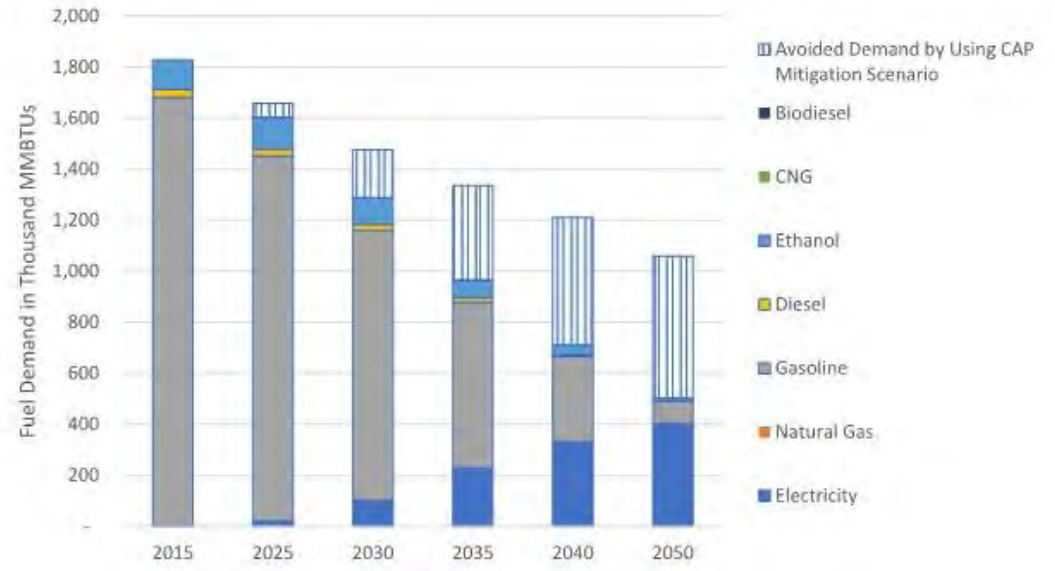


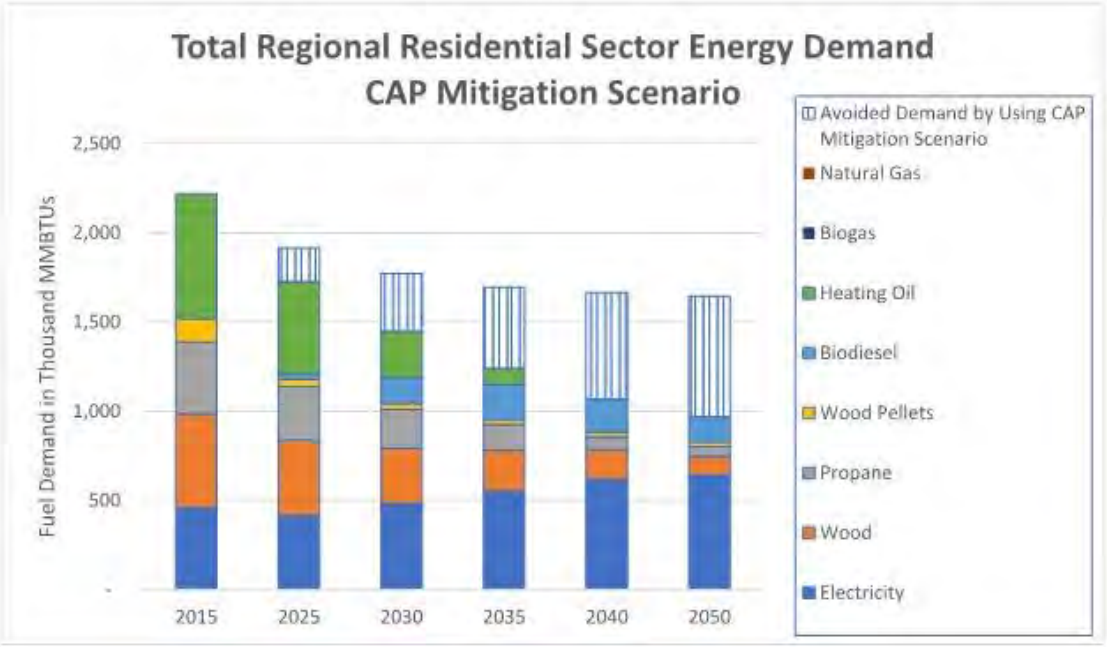
FIGURE 15: REGIONAL LIGHT TRUCK ENERGY DEMAND, CAP MITIGATION SCENARIO



RESIDENTIAL

Today, the heating sector consumes approximately 52% of the energy in the region. The Vermont Pathways model shows a substantial decrease in home heating consumption between 2015 and 2050. In Figure 16 below, the Baseline Scenario is accounted for on the upper limit of the lined bar. Both the Baseline and CAP Mitigation Scenario project a decrease in residential heating consumption over the next several decades. The decrease in consumption is a result of underlying assumptions in the Vermont Pathways model. The model indicates that even in the Baseline Scenario, a larger share of households in the state will adopt heat pump systems, leading to decreased energy use in the thermal sector. The model also accounts for technological advances in the efficiency of heat pumps and the efficiency that residential weatherization progress (with no programmatic or policy shifts) will bring about. Collectively, these modeling assumptions account for the decreases in energy use in the Baseline Scenario portion of the graph in Figure 16.

FIGURE 16: REGIONAL RESIDENTIAL SECTOR ENERGY DEMAND



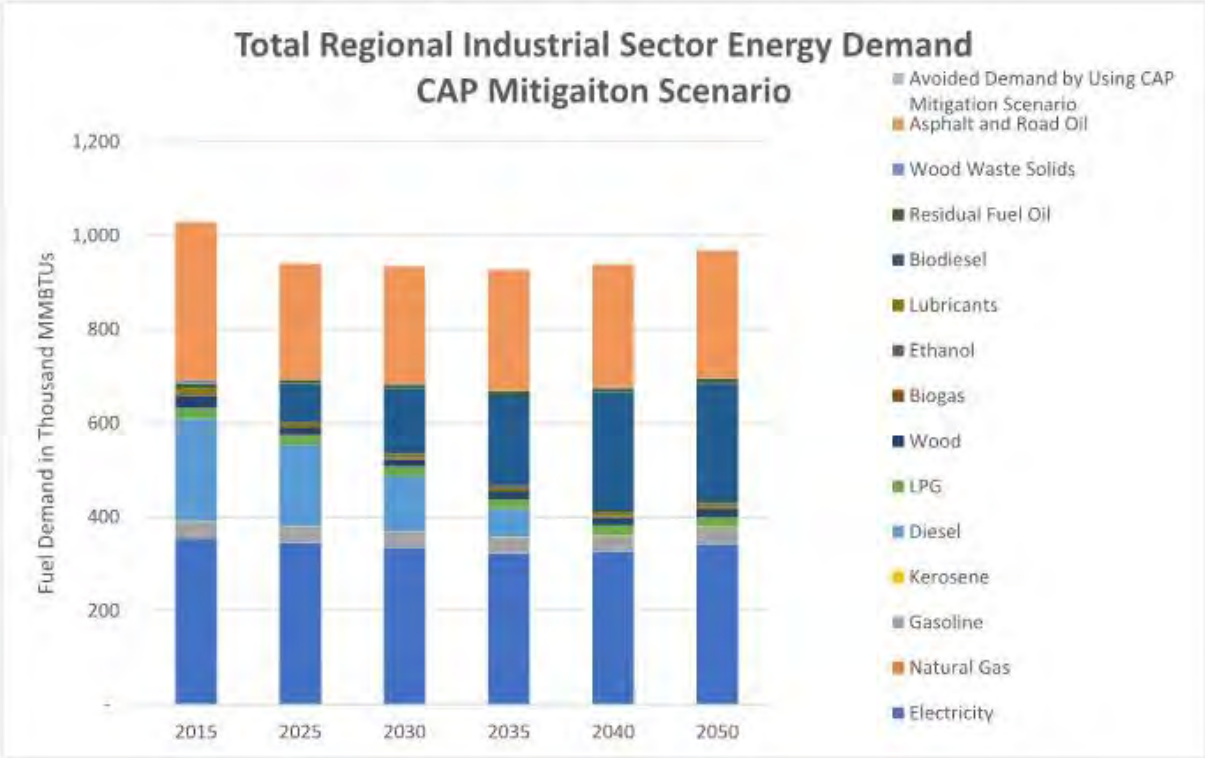
The underlying assumptions in the CAP Mitigation Scenario are similar to those in the Baseline Scenario. In Figure 16, a notable trend is that most of the fuels decrease in volume by 2050. This is where efficiency plays a substantial role in statewide progress on energy. Although the volume of these sources is decreasing, that decrease assumes weatherization and building envelope conservation measures. Therefore, a decreasing volume of fuel is assumed to be capable of heating more space, overall. The two fuel types that show increasing volume are electricity and

biodiesel. Second homes account for approximately 35% of the Windham Region's housing stock. The LEAP model assumes that second homes use 15% of the heating fuel of year-round homes.

COMMERCIAL AND INDUSTRIAL

The Vermont Pathways model assumes that the least amount of change in energy consumption and fuel mix will be in the commercial and industrial sectors. This is due to an assumed growth in these sectors over time. Figure 17 illustrates industrial consumption in the region. In total energy units, there is very little difference between the Baseline and CAP Mitigation Scenarios. There are, however, two noticeable trend assumptions underlying the fuel mix ratio: that electricity consumption decreases substantially over time, and that wood is increasingly used as a fuel source. Residual fuel oil and liquid petroleum gas (LPG) both remain more or less constant over time as they are denser fuels with no efficient substitute as of yet. These results are directly from the Total Energy Study.[17]

FIGURE 17: REGIONAL INDUSTRIAL SECTION ENERGY DEMAND

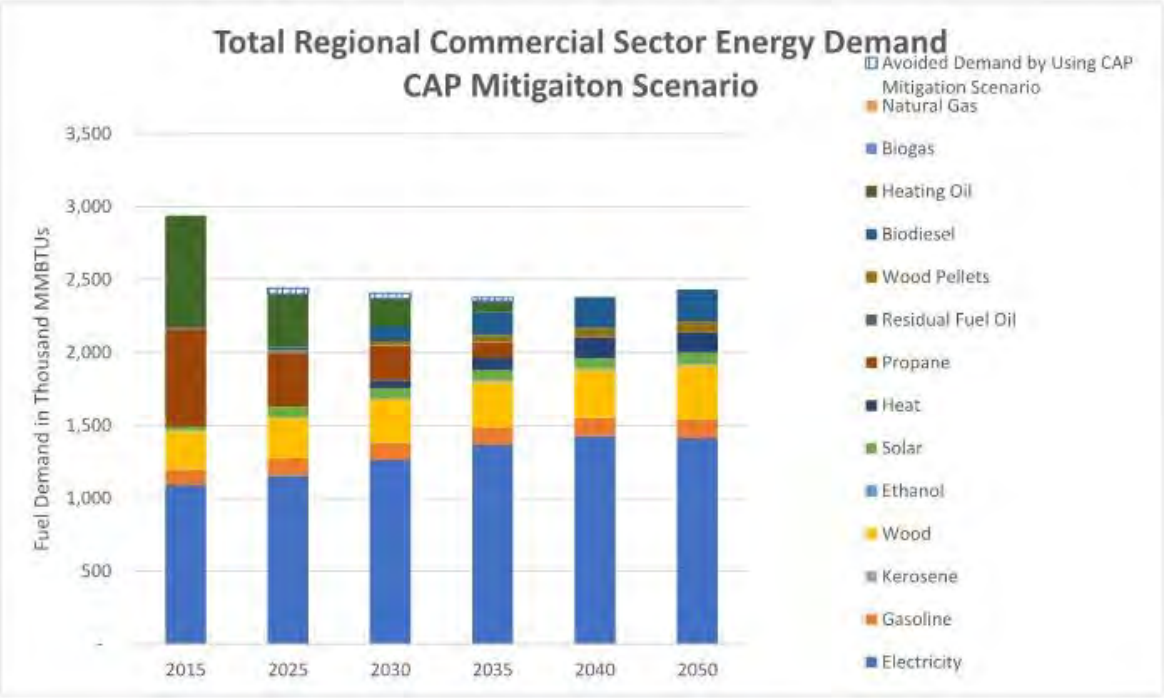


Commercial Energy Demand portrayed in Figure 18 also varies little between the Reference and 90x50 CAP Scenarios. However, the 90x50 scenario assumes that heating oil and propane are replaced by an increase in

[17] We note that when heating oil prices were rising, the Region saw a significant switch towards compressed natural gas by some of the major industrial facilities in the area. It is possible that if natural gas remains competitive, that the Region will see an increase in natural gas consumption. This gas is trucked into the region.

electricity, biodiesel and biogas, and that overall energy consumption decreases by 17%. The commercial sector is assumed to grow over time, accounting for only moderate decline in total energy consumption.

FIGURE 18: REGIONAL COMMERCIAL SECTOR ENERGY DEMAND



TARGETS AND CURRENT STATUS COMPARISONS

The projections from the Vermont Pathways model indicate how much change is needed in Vermont's energy and emissions profile to achieve the greenhouse gas emissions reduction requirements of the GWSA. Though the actual pathway is likely to divert from what is presented, the model allows the Windham Region to plan for the future by establishing targets for energy efficiency, conservation, and fuel-switching across the various sectors.

The following sections present these energy targets and discuss their implications for the Region. Targets for thermal efficiency, conservation, and fuel-switching for heating and transportation were derived from the Vermont Pathways model and its regionalized outputs. Some adjustments were made to the outputs of the Vermont Pathways model following guidance from the Public Service Department. The 2022 EEU Market Potential Study was used to produce targets for electrical efficiency and conservation. For a full description of the methods used to derive these targets, refer to Appendix B of the Energy Chapter.

Targets were developed for the years 2025, 2035, and 2050. It is important to note that the Vermont Pathways model does not perfectly capture the realities of the Region's energy profile and that targets are intended to be aspirational by nature–they are not requirements. Unless otherwise noted, regional energy targets embody the rate of progress needed to meet the CAP Mitigation Scenario objectives. Wherever possible, the following sections compare current

data to the projected rate of progress embedded in the Vermont Pathways model. For full Windham Region Vermont Pathways results, please refer to Appendix A of the Energy Chapter.

In addition to developing regional energy targets, WRC broke this analysis out to each of the Region's 27 municipalities. These expanded and disaggregated municipal-level targets are available in Appendix C of the Energy Chapter.

THERMAL SECTOR: CONSERVATION AND EFFICIENCY TARGETS

The most approachable strategy that residents and businesses can take to help the Region meet its 90x50 targets is pursue thermal efficiency and conservation upgrades to residential and commercial structures. Outputs from the Vermont Pathways model indicate that the Windham Region must rapidly increase the number of weatherizations in the thermal sector to work toward this end.[18]

About a third of the Region's housing stock was built before 1940. The relative age of the housing stock means that many homes fail to meet a high standard of thermal efficiency. Even homes in the Region built after 1940 often lack insulation in certain areas of the building envelope, or the existing insulation is inadequate for the space. Weatherizing the Region's residential and commercial building stock is vital to increase the efficiency of building envelopes so they can retain indoor temperatures instead of leak warm (or cool) air through roofs, doors, windows, and walls.

TABLE 4: REGIONAL RESIDENTIAL WEATHERIZATION TARGETS AND CURRENT STATUS

Weatherizations (EVT, 2023)	2025 Target	2035 Target	2050 Target
397 Households: 1% of households in the Region	4,478 Households: 22% of households in the Region	9,678 Households: 44% of households in the Region	15,656 Households: 67% of households in the Region

[18] WRC assumes a 6% growth rate in the number of households in the Region between each target year.

Table 4 highlights how the Windham Region needs to greatly increase the number of household weatherizations. Efficiency Vermont (EVT) tracks data (see above) on residential building efficiency projects, however, it only tracks efficiency measures installed through the "Home Performance with ENERGY STAR" program. EVT's data does not capture residential projects where weatherization work is being completed as part of a home renovation where the owner might not utilize program incentives, or for smaller weatherization projects that homeowners might accomplish, such as having window inserts installed through the Window Dressers program. One way to increase the number of residential weatherization projects is to work with regional organizations such as SEVCA and Window Dressers to provide information and education on programs and incentives available to homeowners. Other related actions include working with municipal energy committees to implement municipal weatherization programs that benefit homeowners and allow municipalities to document their progress and share it on a broader regional scale.

THERMAL SECTOR: FUEL SWITCHING TARGETS

The heating sector is the largest source of regional energy consumption (see "Windham Region Current Use and the cost of Energy" section). For the 90x50 goal to be attainable, thermal sector fuel conversion must be actively pursued to accompany efficiency and conservation improvements, reduce greenhouse gas emissions, enhance resilience, and achieve long-term cost savings.

The data in Table 5 illustrate the extent to which the fuel sources in the residential sector are anticipated to shift in the Vermont Pathway model's CAP Mitigation scenario. Many of the targets from the model reflect the state's priorities for thermal sector fuel conversion and renewable heat. For example, the Vermont Pathways model indicates that a rapid increase in the number of cold climate heat pumps is necessary to achieve state energy and climate goals. These targets embody policy objectives articulated by the 2022 CEP and the 2021 CAP, which emphasize rapid electrification of thermal sector energy sources. As a result, electrical heating energy is projected to increase significantly in the Vermont Pathways model. One area of the CAP Mitigation scenario in the Vermont Pathways model that may not accurately reflect the dynamics of the Windham Region is wood heat. According to the Census, 17.5% of homes in the area use wood for home heating, making it the third most widely used fuel source in the Region, and most common renewable heating option. Windham County has the largest volume of hardwoods and softwoods of any county in the state, and residents of Southern Vermont have a long history of harnessing these resources for fuel and warmth. As a result, wood heat has a distinct cultural significance for our Region. For these reasons, wood heat energy is not anticipated to decrease as the Vermont Pathways model suggests–if anything, it will likely increase over time. Other notable trends from the Vermont Pathways model are a complete abandonment of oil for heating by 2050, and the incorporation of biofuel blended alternatives to supplement this decrease. Propane heating energy is also modeled to decrease over time.

TABLE 5: REGIONAL RESIDENTIAL FUEL SWITCHING TARGETS

Fuel Type	2025 Targets	2035 Targets	2050 Targets
Electricity (Thousand MMBtu)	152	281	365
Wood/Wood Pellets (Thousand MMBtu)	463	260	129
Propane (Thousand MMBtu)	217	106	39
Heating Oil (Thousand MMBtu)	478	81	0
Biodiesel (Thousand MMBtu)	29	164	102
Percentage of Renewables in the Heating Sector	48%	79%	94%

For the Region to meet its 90x50 objectives, a substantial number of cold climate heat pumps (CCPs) need to be installed in area homes and businesses. Towns have already made notable progress toward the 2050 residential heat pump goal, however. According to Efficiency Vermont, there have been 2,614 residential CCHP installations as of 2023. While there is still a significant amount of progress to be made here, the trajectory is hopeful. Heat pump water heater instillation targets indicate a need for **18,583 units by 2050**, with current Efficiency Vermont estimates showing 650 in our Region as of 2023.

For commercial buildings, the Vermont Pathway model's projected rate of heat pump adoption is even steeper. By 2050, there should be **31,144 commercial CCHP installs** in the Region according to the CAP Mitigation Scenario. It is difficult to estimate how many area businesses will be electrified based on this information, since commercial buildings vary wildly, and the number of heat pumps required for each commercial space will be different from building to building. However, with 293 commercial CCHP installs as of 2023, there will need to be a sharp uptick in the number of electrified businesses regardless.

TABLE 6: REGIONAL COLD CLIMATE HEAT PUMP AND WATER HEATER INSTALLATION TARGETS FOR RESIDENTIAL AND COMMERCIAL ESTABLISHMENTS

	CCHP Installations (EVT, 2023)	2025 Targets	2035 Targets	2050 Targets
Residential Cold Climate Heat Pumps	2,614	6,187	16,635	24,515
Residential Heat Pump Water Heaters	650	4,067	13,544	18,583
Commercial Cold Climate Heat Pumps	293	8,052	24,352	31,144

TRANSPORTATION SECTOR: FUEL SWITCHING TARGETS

The Vermont Pathways model indicates that the Region's light duty vehicle fleet (LDV) will need to transform radically by 2050. By 2050, the Region's LDV traffic is targeted to be fueled predominantly by electricity, while gasoline-powered transportation is significantly curbed. To meet transportation electrification goals, the Vermont Pathways model demonstrates that **970 EVs and plug-in hybrid electric vehicles** (PHEVs) will be necessary by 2025 (Table 7). The light duty truck target is 937 vehicles by 2025. EV registration data from Drive Electric for all categories of vehicles show that in 2023, there were a total of 933 EV and PHEV vehicles registered in the Windham Region.[19] The EV registrations need to maintain this rate of growth in order to meet our 2025 target.

While electric vehicles have zero tailpipe emissions (assuming a net-zero electricity source), they still have lifecycle carbon costs associated with their manufacturing and use. From a climate pollution and land use planning perspective, incentivizing a shift away from private automobile use is the most effective way to link climate, energy, and transportation planning goals. However, the Windham Region is highly rural, and pursuing strategies to encourage the adoption of electric vehicles is necessary, given the ubiquity of car ownership. Education, outreach, regional collaboration, and public-private partnership are critical here. Many organizations provide incentives and rebates to residents looking to adopt an electric vehicle or install charging equipment, including VTrans, Green Mountain Power, and Charge Vermont. Organizations like Drive Electric play a crucial role in educating citizens about electric vehicle technology while connecting residents, business owners, and municipalities with financing options.

[19] Drive Electric: Vermont EV Registrations by Municipality as of Jan 2024, 2024. https://veic.maps.arcgis.com/apps/mapviewer/index.html?webmap=7a62de8f69954804889c86a12a9640c8

To achieve the ambitious targets outlined below, the programs mentioned above must be broadly advertised through continuous public outreach and inter-organizational collaboration.

TABLE 7: REGIONAL TRANSPORTATION TARGETS FOR USE OF RENEWABLES

	2025 Targets	2035 Targets	2050 Targets
Regional Passenger Car EV and PHEV Stock	970	8,524	19,821
Regional Light Duty Truck EV and PHEV Stock	937	11,994	24,250
Percentage of LDV Transportation Energy from Renewable Resources	9%	33%	84%

ELECTRICAL SECTOR: EFFICIENCY AND CONSERVATION TARGETS

It is challenging to derive electrical efficiency targets because the Vermont Pathways model assumes a rapid increase in electrical demand from fuel-switching in the thermal and transportation sectors. As a result, targets for electrical efficiency and conservation are determined separately using projections from the Public Service Department. PSD periodically publishes a Market Potential Study that estimates the potential for Vermont's Energy Efficiency Utilities (EEU) to achieve efficiency savings in the electrical and natural gas sectors. The study also helps inform targets for the EEUs, which is relevant to the development of regional electrical efficiency targets and enhanced energy planning. The Public Service Department's electrical efficiency data supplements the Vermont Pathways model and provides a proxy estimate for the amount of electrical demand embedded in it. Since the estimates are not from the model directly, there are not separate targets for the Baseline and CAP Mitigation Scenarios.

Electrical efficiency targets are expressed as the amount of cumulative electrical energy saved energy from EEU programs, or the total amount of MWh savings expected by a given target year. The 2022 EEU Market Potential Study provides targets focused from the saving from energy efficiency in appliances and equipment. These are then, disaggregated to the regional-level based on county population and the EEU's geographic performance target.

TABLE 8: REGIONAL ELECTRICAL EFFICIENCY TARGETS FOR RESIDENTIAL AND NON-RESIDENTIAL BUILDINGS

	2025 Targets	2035 Targets	2050 Targets
Residential Cumulative Annual Energy Efficiency Savings (MWh)	4,847	27,815	51,312
Non-Residential Cumulative Annual Energy Efficiency Savings (MWh)	8,715	43,771	39,470

ELECTRICAL SECTOR: RENEWABLE GENERATION TARGETS

The final set of targets for the electric sector are those for renewable generation. Renewable generation targets help quantify the rate of progress needed in the Region to support state climate goals and foster energy security and independence through the adoption of distributed generation technologies. In addition, target-setting presents an opportunity to plan for the deployment of renewable resources while critically assessing regional conditions, opportunities, and constraints related to renewable development.

Renewable generation targets come from the Public Service Department's Generation Scenarios Tool. The tool uses electrical demand data from the Vermont Pathways model as an input into the target-setting exercise. From here, the statewide projected electrical demand for a given future year (like 2050) is disaggregated to the regional level based on an equal proportion of regional land area and population. Regions are then responsible for determining the percentage of this future electrical demand that should be met with renewable resources. Table 9 shows the renewable generation targets for the Windham Region for 2025, 2035, and 2050. These targets represent the amount of in-region renewable energy needed to meet 25% of forecasted electrical energy demand, according to the Generation Scenarios Tool.

TABLE 9: REGIONAL RENEWABLE ENERGY GENERATION TARGETS

	2025 Targets	2035 Targets	2050 Targets
Renewable Generation Capacity Targets (MW)	96.6	143.3	186.9
Annual Renewable Electricity Production Targets (MWh)	135,786	201,407	262,763

The Windham Region's **25% in-region capacity target for 2050 is 186.9 MW**, and its annual electricity production target is **262,763 MWh**. As of 2024, the Windham Region has an **installed renewable generation capacity of 189.4 MW** and is estimated to **generate 623,819 MWh** of renewable energy annually. Given this, it is fair to say that the Windham Region is already meeting its baseline renewable generation target for 2050. Nevertheless, the Region supports the continued siting and deployment of renewable technologies to further contribute to state energy goals and encourage the numerous localized benefits of distributed renewable generation.

Much of the energy currently generated in the Region comes from hydroelectric dams on the Connecticut and Deerfield Rivers. The Windham Region is fortunate to benefit from powerful hydrologic resources that allow for substantial in-region energy generation. Very few regions have a similar abundance of these same resources, meaning that the Windham Region has a distinct obligation to support other areas of Vermont that lack the same renewable resource endowment. More coordination between energy planning partners, including utilities, regional planning commissions, and the Public Service Department, should be pursued to organize efforts across and between regions on this front.

GENERATION POTENTIAL

The Region's potential for new energy generation was determined using resource availability data from the Act 174 mapping exercise. The mapping analysis identified areas with sufficient resource abundance (like solar radiation or wind speed) to accommodate generation, and precluded areas that have known or possible environmental constraints (see "Land Use and Siting" section below for further context). According to the mapping exercise, the Region has **45,816 acres with prime resource availability** for solar (no known siting constraints) and **136,971 acres with secondary resource availability** (no known constraints but at least one possible constraint). For wind, WRC maps indicate that there are **59,327 acres of prime resource lands** available for 30 meter hub height wind, with an additional **204,875 acres of secondary resource lands.**

The acreage values from the mapping exercise were then used to determine generation potential, which is the maximum build-out of renewables under environmental constraints and conditions. Table 10 shows the energy generation potential of every town in the Region in MWh. The results from this exercise indicate that there is significant land available for the development of renewable resources in the Region. Even though the Region is currently exceeding its baseline 2050 generation target, the generation potential analysis shows the extent to which further progress can be made in this area.

For a full description of the of the methods used to determine generation potential, refer to Appendix B of the Energy Chapter.

TABLE 10: REGIONAL RENEWABLE ENERGY GENERATION POTENTIAL

Town	Rooftop Solar (MWh)	Ground-Mounted Solar (MWh)	Wind (MWh)
Athens	1,316	51,608	288,802
Brattleboro	95,338	315,600	241,969
Brookline	2,071	63,754	180,169
Dover	27,052	599,528	1,199,801
Dummerston	11,239	269,497	125,763
Grafton	5,938	156,668	855,760
Guilford	10,035	214,867	479,011
Halifax	5,338	609,157	1,079,067
Jamaica	6,444	543,304	985,012
Londonderry	15,707	855,542	262,931
Marlboro	6,150	775,282	1,548,342
Newfane	6,698	265,462	540,946
Putney	13,966	278,289	125,067
Readsboro	5,121	280,452	1,365,759
Rockingham	27,015	249,483	209,818
Searsburg	958	81,769	764,553
Somerset	71	187,774	892,050
Stratton	12,321	436,892	1,773,192
Townshend	7,548	171,854	730,775
Vernon	15,713	113,831	26,426
Wardsboro	4,702	375,646	892,318
Westminster	22,592	394,582	410,248
Weston	6,255	739,539	628,010
Whitingham	10,320	907,575	1,397,482
Wilmington	23,048	1,025,608	1,615,344
Windham	2,728	153,533	921,120
Winhall	15,695	407,986	1,289,990
REGIONAL TOTAL	361,379	10,525,080	20,829,724

BIOGENERATION

Biomass is unique from other renewable energy generation technologies as the generation capacity is not inextricably linked to the site. Biomass resources are harvested from a location and then transported to a generation facility. There are no electricity generating wood fired plants in the Windham Region. As of January 2024, there are 4 biomass generation projects that produce 15,220 MWh annually.

BULK PELLET STORAGE FOR ADVANCED HEAT SYSTEM, DUMMERSTON ELEMENTARY
Photo Credit: WRC

Approximately 472,000 acres (82%) of the Windham Region is forested. The region's forestry industry is one of the state's leading producers, especially of high-quality northern hardwoods and white pine. Windham County also has the most standing timber, 3.46 billion board feet, in the State. This yields well over 100,000 green tons of low-grade wood material. With the forests producing significantly more than what is being harvested, this number is projected to increase in the future. Seventy-two percent of the region's forests are in private, non-industrial ownership, with industrial firms and Federal, State and local governments sharing the rest.

The Region could be ideal as a hub for biomass usage and generation by tapping into this abundant resource and applying it to the heating sector. Through incentives offered by the State of Vermont, and a program called Windham Wood Heat that was administered through WRC between 2015 – 2022, many schools and public serving institutions converted to advanced wood heating.

Environmental impacts must also be considered with biomass power. The combustion of wood produces heat and emissions including hazardous air pollutants (HAPs), fine particle pollution (ash), and volatile organic compounds (VOC). The pollutant of greatest concern to human health is fine particles (10 microns or less in diameter), which may be inhaled and cause a number of respiratory illnesses. Several other emissions are also of concern to air and water quality, including carbon monoxide (CO), carbon dioxide (CO2), sulfur oxides (SOx), and nitrogen oxides (NOx). Emissions of NOx (if kept below 1,300 Celsius) and SOx from burning wood are significantly lower than coal and petroleum and are comparable to those of natural gas. Particulate levels in wood emissions are similar to those from burning coal and petroleum and substantially higher than the levels in the emissions from natural gas. Particulate emissions can be controlled to acceptable levels with smoke stack equipment such as scrubbers, bag filters, and electrostatic precipitators; however, this equipment is only cost effective on large commercial-sized combustion systems. Particulate emissions from smaller equipment, especially residential-sized units can be a

concern.[20]

The CO2 in wood combustion emissions is considered by some to be "carbon-neutral" because it is basically equivalent to the amount of CO2 trees need to grow the same quantity of wood. Hence the combustion of wood does not contribute to the net increase in atmospheric levels of CO2 (a greenhouse gas) as does the combustion of fossil fuels. However, because this concept is not universally accepted, the impacts of this power source must be considered as carefully as those of other combustion fuel sources.

In addition to biomass, there are 4 methane sites in the Windham Region. These include the Brattleboro Waste Water Treatment Plant, the Windham Solid Waste Management District landfill, Westminster Farms, and Miller Farm. One of the nation's first commercial landfill gas-to-electricity projects was constructed in Brattleboro in 1982. Vermont Energy Recovery Systems uses the methane produced at the Windham Solid Waste Management District's Brattleboro landfill to generate and sell electricity to Green Mountain Power.

Methane is also emitted from volatile solids or animal waste. Anaerobic digesters produce electricity from the methane recovered from cow manure and/or other organic matter. In addition to producing energy and reducing the amount of methane emitted into the atmosphere, this process also reduces water pollution and produces a high-quality fertilizer as a by-product. Westminster Farms, Inc. was the first of this category in the Region.

HYDRO

Hydroelectric power accounted for approximately 2.35% of the total energy consumed in Vermont in 2022.[21] Most hydropower is generated or purchased by Vermont Utilities for the Region's electricity needs. Hydropower accounts for 36% of the electricity mix and is the largest portion of the renewable energy portfolio of Vermont utilities. Hydro power is sourced from Hydro Quebec and smaller, privately owned facilities that exist around the region. In the Windham Region, there are 7 hydro facilities that produce 484,651 MWh, which means that hydropower represents the largest share of the Region's current renewable mix.

BROCKWAY MILLS DAM & SOKOKI FALLS, ROCKINGHAM
Photo Credit: Laurel Green

The major supplier of hydropower for Vermont is Hydro Québec (HQ), a Canadian company. In 2010, 20 Vermont

[20] Extension, http://www.extension.org/pages/43735/what-are-the-air-emissions-of-burning-wood

[21] US Energy Information Administration Vermont State Energy Profile. 2022 Vermont Energy Consumption Estimates. https://www.eia.gov/state/print.php?sid=VT

utilities signed a 26-year power contract with HQ to purchase up to 225 MW of electricity from January 2012 through 2038. In addition, HQ and the Vermont utilities agreed to share any future revenues related to environmental attributes of HQ power generation flowing into Vermont.[22]

In 2022 Hydro Quebec purchased the hydro-electric dams along the Connecticut and Deerfield Rivers in Vermont and New Hampshire from Great River Hydro, LLC. In the Windham Region, Hydro Quebec (still operating under the name Great River Hydro) operates hydroelectric stations and associated storage reservoirs and dams on the Connecticut and Deerfield Rivers. The Bellows Falls Dam and Vernon Dam are located on the Connecticut River. The Bellows Falls Dam and has a generating capacity of 49 MW. The Vernon Dam is the oldest dam, in service since 1909, and has a generating capacity of 37 MW. The Searsburg Dam and Station, located on the Deerfield River, is rated at 5 MW. The Harriman Dam and Station, located in Wilmington and Whitingham, includes three generating units capable of producing 41 MW of electric power. Sherman Reservoir lies mostly in Vermont but its electric generation occurs in Massachusetts, with a capacity of 6 MW.

All hydro facilities of significant size are licensed by the Federal Energy Regulatory Commission (FERC). New projects may also require a permit from the U.S. Army Corps of Engineers. These federal permits trigger state review delegated under the federal Clean Water Act. The FERC permitting process can take two to seven years to complete. Periodically these plants have to renew their licenses. Generally, the re-licensing process results in permit conditions that require plant owners to sacrifice some operating flexibility in order to mitigate the environmental impacts of their facilities. For some hydro facilities, this has resulted in a 10 to 20 percent loss of energy production.[23]

The current licenses for each of the Wilder, Bellows Falls, and the Vernon Hydroelectric Projects (TransCanada) and the Turners Falls Hydroelectric Project and Northfield Mountain Pumped Storage Project (FirstLight) expired in 2018. All projects utilize water from the Connecticut River to generate hydroelectric power. The licenses were issued by the FERC for terms of 30 to 50 years. TransCanada and FirstLight are currently working on relicensing process for these dams using FERC's Integrated Licensing Process

Downstream of Vernon Dam and Hydroelectric Facility. Photo Credit: Kathy Urffer.

22 Vermont Department of Public Service, Biennial Report July 1, 2006 - June 30, 2010, July 2011, http://publicservice.vermont.gov/sites/psd/files/Pubs_Plans_Reports/Biennial_Reports/2010%20Biennial%20-%20Publication%20Draft.pdf

23 Vermont Department of Public Service, *Biennial Report July 1, 2006 - June 30, 2010*, July 2011, http://publicservice.vermont.gov/sites/psd/files/Pubs_Plans_Reports/Biennial_Reports/2010%20Biennial%20-%20Publication%20Draft.pdf

(ILP).

According to assessments completed by the State, it is clear that the best hydropower sites have already been developed. There are very few undeveloped sites that could support capacity greater than 1 MW, and relatively few in the 500 kW to 1 MW range. There are many potential smaller community and residential-scale sites sized below 200 kW. Incentives such as net metering, group net metering, and the Standard Offer Program are necessary to facilitate the development of smaller sites.

According to the ANR, the hydro resource is already heavily developed in Vermont. Further development would likely result in intermittent manipulation of stream flows and water levels, a possible increase in flood hazards resulting from the disruption of natural river processes, some loss of riverine aquatic habitat, and barriers to movement of fish and other aquatic life. ANR's 2008 Report The Development of Small Hydroelectric Projects in Vermont identified the following criteria as necessary for any new hydroelectric generator to have acceptable environmental impacts:

- No new dam or other barrier to aquatic organism movement and sediment transport.
- Run-of-river operation.
- Bypass flows necessary to protect aquatic habitat, provide for aquatic organism passage, and support aesthetics.
- Fish passage where appropriate.
- No change in the elevation of an existing impoundment or in water level management.
- No degradation of water quality, particularly with respect to dissolved oxygen, temperature, and turbidity.
- No change in the upstream or downstream flood profile or fluvial erosion hazard.

Because there are few undeveloped sites that are candidates for new hydroelectric plants, three effective ways to increase capacity by improving efficiency and output at existing hydroelectric facilities include: installing more efficient turbines, installing small turbines at the dams that utilize bypass flows, and installing new turbines that can operate efficiently over a wider range of flows. These upgrades are often possible without changing current operating requirements, i.e., power production can be increased without additional environmental impacts. In addition, existing municipal water supply and wastewater treatment pipelines could capture the energy in these systems by installing hydro turbines to the pipelines without otherwise altering the regular operation of the system. Such in-pipe hydroelectric systems have minimal environmental impact.

SOLAR

As of 2023, the Public Service Department reports that 10.2% of the energy purchased or generated by Vermont utilities comes from photovoltaic (PV) solar (before Renewable Energy Credit retirements,) and that 4% of the State's electric power mix comes from PV solar (after Renewable Energy Credit retirements). Solar energy can be used either to generate electricity or to generate heat. For 2024, it is estimated that solar installations in the Region generate 52,870 MWh of electricity, with 36,450 MWh coming from 15 kW and larger sites.[24] The Region posses 40.2 MW of installed PV capacity, meaning that solar accounts for 21% of our capacity mix

In 1998, the Legislature enacted a Net Metering law (30 V.S.A. § 219a) requiring electric utilities to permit customers to generate their own power using small-scale renewable energy systems of 15 kW or less. The excess power generated by these systems can be fed back to the utility, basically running the electric meters backwards. The law has been amended multiple times, but still continues to be an important tool in residential solar installations. According the Vermont Public Service Department, as of January 2024 the Windham Region had a total of 1,298 net-metered sites and 24,715.47 kW of installed capacity.[25] The region also had two non-net metered sites with a capacity of 4,160 kW.

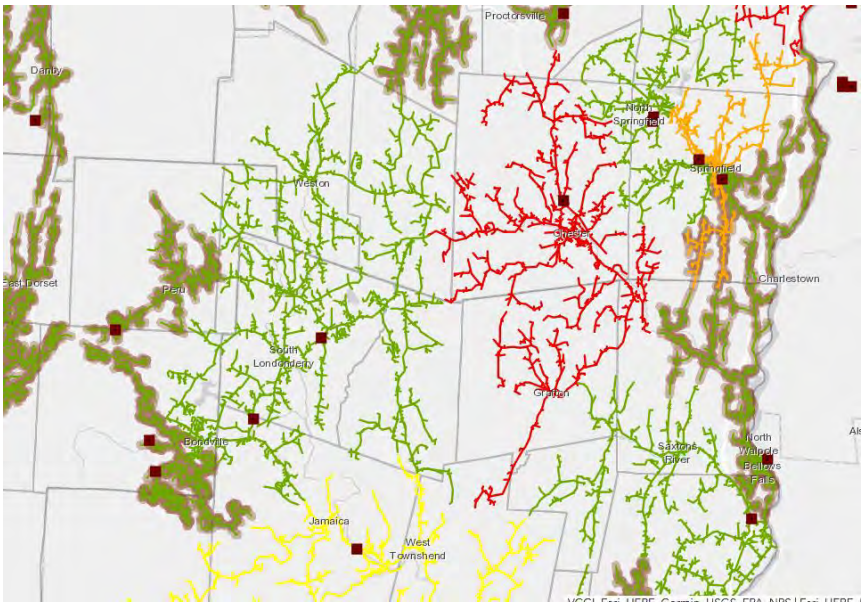
SOLAR INSTALLATION, SCHOOL OF INTERNATIONAL TRAINING, BRATTLEBORO
Photo Credit: WRC

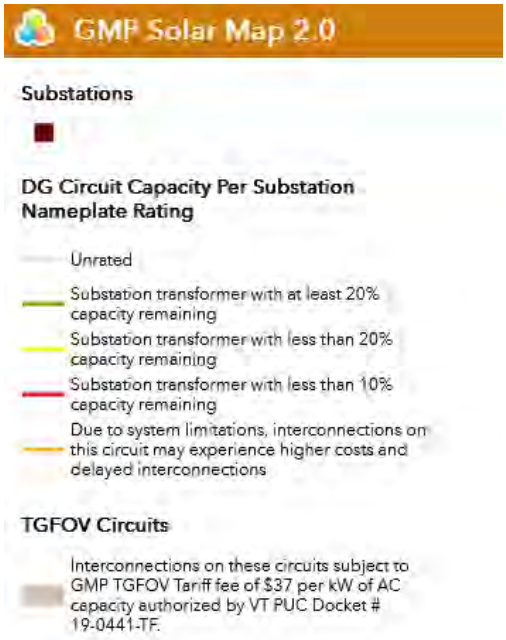
As the demand to install solar on residential and commercial properties increase, the electric grid at its current capacity can handle the increase to varying degrees depending on availability of appropriate transmission lines and the capacity of substations. Green Mountain Power created an interactive Solar Map in an effort to help Vermonters generate power closer to where it is needed to increase reliability and costs. The map allows Vermonters to see where solar energy is being generated and how it ties into the grid.

[24] Estimate derived from Public Service Department data on distributed photovoltaic solar generation in Vermont.

[25] Data Source: Public Service Department list of renewable distributed generation in Vermont (<5MW), distributed to RPCs in January 2024.

FIGURE 19: GREEN MOUNTAIN SOLAR HOSTING CAPACITY MAPS

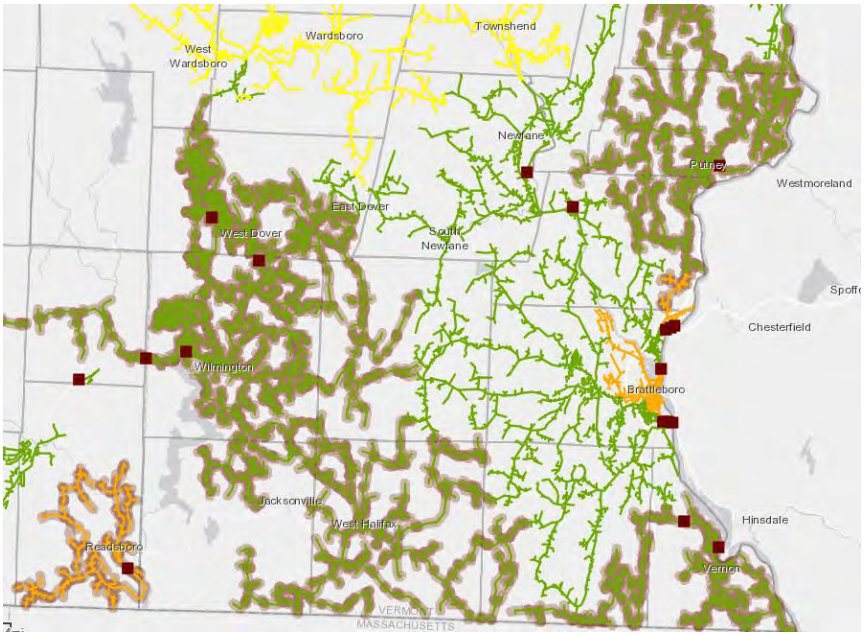




Above: Northern Portion of the Windham Region

GMP has created a color system to show Vermonters where capacity for new solar is abundant and where the grid is at or approaching capacity. The map itself is meant to help educate Vermonters about projects across the state and their impact on the grid system.

Below: Southern Portion of the Windham Region



A potential drawback of PV (solar) power is cost. When compared to the current market price forecast for electricity,

the price of PV remains high. There is data that suggests that state and federal incentives have served as major drivers in the rate of solar facilities installation. Despite cost issues, PV power has several advantages that make it a power source that the state should continue to support. PV is largely a peak electric load–following resource, meaning that during peak summer loads, the PV systems are at their highest production, resulting in peak shaving and grid reliability benefits. In addition, PV power is generated without noise, requires low levels of maintenance, emits no pollution, and is extremely distributable.

While there is currently relatively little controversy about solar energy as a source of power, potential conflicts arise with the siting of solar installations. Ground-mounted systems tend to be larger in scale that roof mounted systems, and generally are sited on undeveloped or agricultural land. Depending on placement, solar fields can have negative impacts on forest connectivity and prime agricultural fields. Complaints have arisen about aesthetics and the panels interrupting the scenic quality of an area. Installations covering large acreage should not only deem a project suitable based on solar capacity, but should evaluate the impacts that the installation has on the natural resources and historic settings of the site. In some cases, the installation should provide mitigation in the form of retained agricultural soils or forested patches on site or conserved agricultural or forest land of equal value elsewhere in the region. Roof top systems have the advantage of requiring zero additional development of open land, though conflicts can arise if these systems are installed in areas with historic district overlays, or where neighboring trees may shade out the system for a substantial period of the day. Towns should consider these issues and address them in their plans and zoning bylaws.

WIND

Wind energy is categorized by the Energy Information Administration (EIA) as an "other renewable," a category that provided about 1.7% of the energy used in Vermont in 2022[26]. Wind energy is used primarily to generate electricity, but not as a source for heat. As of 2019, the Windham Region had 14 wind generation projects with a total annual production of 71,078 MWh.

DEERFIELD WIND INSTALLATION, SEARSBURG & READSBORO
Photo Credit: WRC

In 1997, Green Mountain Power developed Vermont's first modern, commercial wind-generating station in Searsburg, consisting of 11 turbines with combined total power rating of 6 MW. The Vermont Public Service Board approved the project, despite its relatively high cost due to its perceived value as a demonstration project. In 2009, the Public

[26] US Energy Information Administration: Vermont State Energy Profile. Based on Vermont Energy Consumption Estimates for 2022. https://www.eia.gov/state/print.php?sid=VT

Service Board (now known as the Vermont Public Utility Commission) granted a Certificate of Public Good permitting Deerfield Wind to construct a 30 MW facility, consisting of 15 wind turbines, in Searsburg and Readsboro.

Small-scale, net metered installations that serve homes, businesses, and communities are also located throughout the region. Small-scale wind facilities are most often represented by a single turbine, which can generate from less than 1 kW up to 100 kW for a small commercial machine. A number of factors affect the success of a small wind project. To harness the best wind spectrum, turbine siting is absolutely critical within the microclimate of the landscape. Turbines must be positioned so they extend as high as possible above obstacles like trees. Technical expertise to maintain the system is also essential. As of January 2024, there were a total of 8 net metered wind facilities, and 1 non-net metered, in the region with a combined capacity of 2,320 kW.

Wind power is considered a complement to solar in a renewable energy portfolio. When solar power is low or unavailable, during cloudy days or at night, the wind is often more potent. For example, during Vermont's winter, when sunlight is diminished, average wind speeds measure at their annual high. Wind power is intermittent in nature, like many other renewable sources of power; thus, resource planning for effective power grid integration is essential.

Wind power is clean and renewable, but turbine placement can be difficult and controversial because of natural resource impacts, aesthetics, noise, and the need for turbine placement elevations between 2,500-3,300 feet, locations in Vermont that tend to be sensitive with thin soils and steep slopes. The windiest areas in the region are most often on the higher-elevation ridgelines that are sensitive habitats for plants and wildlife, and are the source of the region's most pristine headwaters. In areas where road access does not exist, new permanent roads must be built to service the wind facility. Other potentially negative environmental impacts include bird and bat mortality, habitat disruption and fragmentation, erosion, pollution from facility maintenance, turbine noise, and visual flicker.

PATHWAYS AND RECOMMENDED ACTIONS

This section provides a discussion on achieving goals in a just and equitable manner, as well as recommending strategies to achieve the energy targets for the Windham Region across the three main energy pathways: conservation and the efficient use of energy in buildings, land use, and transportation. The Land Use and Transportation Chapters in the Regional Plan also complement this section and contain additional policies and strategies for achieving the Region's energy goals. Several broad issues have been identified throughout the Regional Plan that will need to continued to be examined and addressed in order to achieve energy goals.

- Achieving regional goals has be accomplished in a just and equitable manner.
- The correlation between low density settlement patterns and increased energy consumption.

- The lack of adequate infrastructure to support more compact, mixed-use settlements (i.e. municipal water and wastewater systems).
- The importance of promoting and investing in walking, biking, and shared transportation options, and reducing single-occupancy vehicle use.
- The need to plan and invest in new types of infrastructure to accommodate electric and other non-fossil fuel transportation options.

EQUITY

To meet the ambitious 90x50 goals, there will need to be significant changes to the energy systems in Vermont. As the Windham Region moves towards our region's targets, now is the time to plan to address these changes in a just and equitable manner. There are numerous inequities that have been built into the current energy system that was built piecemeal over time. Some communities have a higher energy burden than others and lower and middle income residents have less access to renewable energy opportunities, despite the State programs offered to help these populations. As the Region and Vermont moves forward, we need to find ways to make the energy transition accessible to all.

ENERGY BURDEN

Efficiency Vermont has been examining energy burden for municipalities throughout the state of Vermont. Their study is a way to understand the impact of energy costs on residents, since energy expenses often compete directly with other household costs such as food, housing, and healthcare.

Energy Burden is determined by the following formula:

- Energy Spending / Household Income = Total Energy Burden

According to the 2023 Energy Burden Report, the average Vermont household energy burden is 11 percent. About half of that spending (45 percent) is for transportation. Heating, or thermal energy, accounts for another 35 percent, with 20 percent for electricity.[27] Table 11 shows the municipalities in the Windham Region and their Energy Burden as reported in the 2019 and 2023 Energy Burden Reports.

[27] Efficiency Vermont 2023 Energy Burden Report. https://www.efficiencyvermont.com/Media/Default/docs/landing-pages/energy-burden-report/2023-EfficiencyVermont-EnergyBurdenReport.pdf

TABLE 11: EFFICIENCY VERMONT ENERGY BURDEN BY TOWN IN WINDHAM REGION, 2019 AND 2023

Energy Burden by Town in the Windham Region (2019)			
Town	Median Household Income	Total Energy Burden	Total Energy Burden Rank
Readsboro	**$35,625**	**15.0%**	**Highest**
Athens	**$41,406**	**13.0%**	**High**
Brattleboro	**$44,359**	**11.0%**	**High**
Londonderry	**$52,377**	**11.0%**	**High**
Putney	**$49,506**	**11.0%**	**High**
Rockingham	**$42,596**	**13.0%**	**High**
Wardsboro	**$47,841**	**12.0%**	**High**
Wilmington	**$51,034**	**11.0%**	**High**
Winhall	**$53,750**	**11.0%**	**High**
Dover	$50,363	10.0%	Moderate
Dummerston	$62,594	9.0%	Moderate
Grafton	$52,188	10.0%	Moderate
Halifax	$50,795	11.0%	Moderate
Jamaica	$53,438	10.0%	Moderate
Newfane	$55,556	10.0%	Moderate
Searsburg	$50,000	10.0%	Moderate
Townshend	$54,716	10.0%	Moderate
Vernon	$69,500	9.0%	Moderate
Westminster	$49,471	11.0%	Moderate
Whitingham	$55,395	10.0%	Moderate
Windham	$58,750	9.0%	Moderate
Brookline	$67,292	9.0%	Low
Guilford	$62,614	9.0%	Low
Marlboro	$66,528	8.0%	Low
Weston	$72,692	8.0%	Low
Stratton	$80,750	7.0%	Lowest
Somerset			

Energy Burden by Town in the Windham Region (2023)					
Town	Median Household Income	Total Energy Burden	Total Energy Burden Rank	Delta 2019 Energy Burden	Change in Median Household Income from 2019
Dover	**$45,625**	**15.2%**	**Highest**	5.2+	(4,738.00)
Brattleboro	**$41,001**	**13.5%**	**High**	2.5+	(3,358.00)
Halifax	**$50,357**	**13.7%**	**High**	2.7+	(438.00)
Londonderry	**$55,465**	**13.3%**	**High**	2.3+	3,088.00
Searsburg	**$52,500**	**13.3%**	**High**	3.3+	2,500.00
Wilmington	**$59,821**	**12.1%**	**High**	1.1+	8,787.00
Athens	$67,656	10.1%	Moderate	-2.90	26,250.00
Brookline	$65,139	10.4%	Moderate	1.4+	(2,153.00)
Jamaica	$57,800	11.8%	Moderate	1.8+	4,362.00
Newfane	$59,792	11.5%	Moderate	1.50	4,236.00
Putney	$57,500	11.0%	Moderate	0+	7,994.00
Readsboro	$60,833	11.3%	Moderate	-3.70	25,208.00
Westminster	$64,297	10.4%	Moderate	-0.60	14,826.00
Whitingham	$62,167	10.8%	Moderate	0.8+	6,772.00
Winhall	69931	12%	Moderate	1+	16,181.00
Dummerston	$85,357	8.1%	Low	-0.90	22,763.00
Grafton	$68,125	10.0%	Low	0.00	15,937.00
Guilford	$77,431	8.9%	Low	-0.10	14,817.00
Marlboro	$80,250	8.6%	Low	0.6+	13,722.00
Rockingham	$61,514	9.7%	Low	-3.30	18,918.00
Townshend	$73,068	8.7%	Low	-1.30	18,352.00
Vernon	$78,393	8.8%	Low	-0.20	8,893.00
Wardsboro	$78,500	9.6%	Low	-2.40	30,659.00
Windham	$78,750	8.5%	Low	-0.50	20,000.00
Stratton	$107,500	7.0%	Lowest	0.00	26,750.00
Weston	$110,000	6.4%	Lowest	-1.60	37,308.00
Somerset					

Orange Delta Value indicates Towns with a different EB rank

One of the biggest factors that led to a change of a towns energy burden ranking come from the change in the Median Household Income in a community. Some of the most significant changes between the 2019 and 2023 Energy Burden Reports include:

- Dover has become the highest energy burden town at 15.2%.
- Most towns saw an increase in median income per household, some substantial. Decreases in median income were seen in Dover, Brattleboro, Halifax, and Brookline.
- 6 Highest or High energy burden towns in 2019 changed to lower burden levels in 2023: four (Readsboro, Athens, Putney and Winhall) to moderate energy burden, and two (Rockingham and Wardsboro) to low energy burden. (Somerset does not have data.)
- New High and Highest Energy Burden towns include Dover, Halifax, and Searsburg.

The Windham Region needs to fully address equity and justice as it moves forward with regional energy planning. A robust equity framework requires the consideration of equity across various topic areas, including efficiency, transportation, compact land use, and renewable generation.

Energy burden provides a compelling framework with which to identify and prioritize overburdened populations through targeted implementation work in the efficiency and conservation sector. Currently, energy burden stands as the best and most widely available indicator to pursue equitable programmatic work focused on increasing efficiency across the various energy sectors. Methods to incorporate energy burden into a broader energy efficiency program include education and outreach targeted at high energy burden towns. Activities and programs can be made additionally inclusive through grassroots public participation and the use of clear and accessible language. WRC supports the continued refinement of energy burden as an indicator of energy equity and hopes to see the report produced with higher geographic specificity to support municipal enhanced energy planning and efficiency work.

Equity can also be incorporated into various energy planning endeavors through the continuous and rigorous involvement of stakeholders (including town officials, renewable developers, contractors, frontline and impacted populations, community groups, municipal energy committees, etc.) in conversations surrounding energy efficiency, conservation, and siting of renewables. Incorporating diverse voices into energy policy and program development allows for the opportunity to bring historically marginalized populations to the table in decision-making processes.

OTHER MEASURES TO DETERMINE ENERGY INEQUITY

An additional metric to measure energy equity be an indicator that maps regional access to renewable energy, allowing for a visual representation of where environmental benefits and burdens associated with renewable development are located in the Region. Such a framework has yet to be established in Vermont, but WRC supports its working to integrate a more robust framework alongside other energy planning partners.

The concept of energy equity is intertwined with and builds on the long history of the movement for environmental and climate justice. These related concepts focus on equitable access to environmental benefits, addressing the proportional distribution of environmental burdens and benefits, fostering meaningful involvement in decision making, and recognizing that people of different racial and ethnic groups, cultures, and socioeconomic status have different needs, all the while seeking to transition to a more sustainable society.[28]

WRC is incorporating recommendations from the State Comprehensive Energy Plan to be considered in all WRC energy planning. These recommendations are included in the WRC Energy Policies and Implementation Actions.

[28] Vermont Climate Council, Just Transitions Subcommittee, August 2021. Guiding Principles for a Just Transition. https://aoa.vermont.gov/sites/aoa/files/Boards/VCC/Draft%20Guiding%20Principles%20for%20a%20Just%20Transition%20June%202021.pdf

CONSERVATION AND EFFICIENCY

Significant reductions in energy use and costs can be realized through conservation and efficiency measures. As discussed early in this section, approximately 52% of the Region's energy consumption is from building heating and cooling systems and approximately 19% is from electricity used in buildings. Vermont has implemented energy building standards for residential and commercial buildings. These standards were established to set minimum efficiency requirements for new construction and renovation project. Currently, compliance with these standards is self-certified and the CEP notes this diminishes the effectiveness of these standards. Towns can help raise awareness about the State's energy building standards through their permitting process.

Reducing the amount of energy needed to heat residential and commercial buildings can be accomplished through weatherization and making buildings more energy efficient. Examples of weatherization include improving insulation, upgrading windows and doors, and completing air sealing. These strategies are particularly helpful in older buildings that may have little or deteriorated insulation and inefficient windows and doors. Weatherization can reduce heating costs and help improve indoor air quality by keeping out pollutants and pests.

When planning for new building construction, building orientation and site design can assist with accomplishing efficiency goals. If buildings are designed and oriented to take advantage of southern exposures, they can add roof-mounted solar panels and use passive solar heating during winter months. Maintaining tree cover or planting new trees around a building provides shade and can help cool buildings during the summer months. Tree stands can also block prevailing winds during the winter months, helping to reduce drafts.

Another means of improving efficiency is installing new energy efficient appliances and heating systems. The Energy Star program administered by the U.S. Environmental Protection Agency (EPA) helps consumers and businesses choose appliances that meet energy efficiency specifications set by the EPA. There is growing support for installing electric heat pumps in place of heating systems that rely on fossil fuels. When powered by renewable-generated electricity, heat pumps can significantly reduce carbon emissions. They also have the added benefit of providing building cooling during summer months. Advanced wood heating systems that use cord wood, pellets, or wood chips offer the ability to efficiently heat buildings renewably, and also strengthen the local forestry industry.

Efficiency Vermont provides residents and businesses with energy assessments that identify cost-effective projects to improve efficiency. The organization has identified a network of certified contractors that can complete these projects for property owners. Efficiency Vermont also provides low-interest loans, rebates, and income-based assistance to help defray the costs associated with completing projects. Local organizations in the Windham Region that provide technical support for weatherization projects include Southeastern Vermont Community Action (SEVCA) and NeighborWorks, which serves homeowners in Bennington County.

Finally, though not yet developed to its full capacity, energy storage has the potential to dramatically aid the Region

in reaching the 90% renewable by 2050 State goal. Storage for renewable energy generation could boost capacity substantially while also feeding into microgrids. Increased distributive generation, storage, and microgrids will allow communities to be more resilient in the event of power outages.

LAND USE

Land use is an important indicator of energy consumption. Dispersed settlement patterns result in higher energy consumption due to the lack of efficiency in building design, inability for efficient heating distribution, increased energy input to deliver services to businesses and residents, and a reliance on single-occupancy vehicles for transportation. Land development is primarily regulated by local zoning regulations and through the Act 250 process. Many zoning bylaws allow for a dispersed settlement pattern and can make it difficult to develop in a compact manner within existing centers. In addition, many communities lack public water and wastewater systems needed to support more housing, and new and expanding businesses.

For future development, a critical strategy for the Region is to encourage compact, mixed-use settlements that result in lower overall energy consumption. This can be accomplished through zoning regulations that include provisions for smaller lot sizes, higher residential densities, and a greater variety of permitted land uses in village and town centers. Residential and commercial buildings in village centers and downtowns tend to be smaller in scale and use land more efficiently. This helps reduce energy needs for heating and cooling. Settlements with a variety of businesses, uses, and services allow residents to travel less to meet their needs. These centers are also better able to support pedestrian and bicycle infrastructure given the proximity of residences, businesses, and services, as compared to more rural settings.

In addition to providing land use regulations that support compact development, economic and community development investments are also needed to sustain the vitality of community centers. One tool is the State Village Center and Downtown Designation program, which provides tax incentives for building and façade improvements for eligible, income-producing buildings. Communities can make investments in pedestrian infrastructure and streetscape improvements to create a more welcoming environment, such as sidewalks, lighting, landscaping, seasonal plantings, and signage.

Another strategy for energy conservation through land use planning is supporting local agricultural and forestry enterprises. By putting an emphasis on locally produced food, the Region can cut the amount of fuel needed to transport products from greater distances. Supporting local forestry operations helps sustain cord wood and wood pellet production for advanced wood heating system. Conserving forestland also provides for carbon sequestration benefits. Towns can support local agriculture and forestry by identifying these land areas within their community and developing regulations to ensure these areas are not subdivided and fragmented.

LAND USE AND ENERGY SITING

In order to achieve renewable energy generation goals for the region, new infrastructure will be needed to be installed. The need for siting new energy generation assets needs to be balanced with natural resources and land use.

When siting any new energy generation infrastructure, attention must be given to areas that are considered inappropriate or potentially inappropriate for the location of energy development. This is broken down into known constraints and possible constraints. Development should be located to avoid state, regional and local known constraints, and to minimize impacts to state and local possible constraints.

- **Definitions**:
    - *Known Constraints*: Signals likely, though not absolute, unsuitability for development based on statewide, regional or local regulations or designated critical natural resources
    - *Possible Constraints*: Signals conditions that would likely require mitigation, and which may prove a site unsuitable after site-specific study, based on statewide or regional/local policies
- **State Known Constraints** (as defined in Vermont Act 174)
    - Vernal Pools from Vermont Center for Ecostudies (confirmed)
    - DEC River Corridors
    - FEMA Floodways
    - State-significant Natural Communities
    - Rare, Threatened, Endangered Species
    - National Wilderness Areas
    - Class 1 and Class 2 Wetlands
    - Regionally or Locally Identified Critical Resources
        i. Examples could be source protection area for public drinking water supply, town-designated scenic roads and viewsheds
        ii. Land use policies applicable to other forms of development in this area must be similarly restrictive
- **State Possible Constraints** (as defined in Vermont Act 174)

- Vernal Pools from Vermont Center for Ecostudies (potential and probable)
- Agricultural Soils
- FEMA Special Flood Hazard Areas
- Protected Lands (State fee lands and private conservation lands)
- Act 250 Agricultural Soil Mitigation areas
- Deer Wintering Areas
- The following features from ANR's Vermont Conservation Design:
    i. Highest Priority Interior Forest Blocks
    ii. Highest Priority Connectivity Blocks
    iii. Highest Priority Physical Landscape Blocks
    iv. Highest Priority Surface Water and Riparian Areas
- Hydric Soils
- Regionally or Locally Identified Resources

- **Regional Known Constraints**
    - Compliance with State Known Constraints
- **Regional Possible Constraints**
    - Lands over 2,500 feet in elevation
    - Vermont ANR identified bear travel corridors
    - Shore lands
    - Steep slopes over 25 percent
    - Prime Agricultural Soils or Vermont Significant Soils
    - Siting a system that would require large amounts of forest clearing
- **Town/Local Constraints**

- Any unsuitable areas as identified in a duly adopted municipal plan

Constraints are based on statewide, regional or local policies that are currently adopted. As with all maps included in Regional Plan, the map of constraints is intended to provide a general overview of existing conditions. The accuracy of information presented in the maps is limited due to scale. Errors and omissions may exist. These maps are not sufficient for delineation of features on-the-ground. To determine whether a site has constraints, surveyed information, engineering studies or other site-specific information will likely be necessary.

TRANSPORTATION

Transportation and land use are closely connected as it relates to energy use. Approximately 39% of the total energy consumed in Vermont annually is for transportation. The Region's transportation network is a result of how communities have developed over time. The primary employment and commercial centers in the Region are Brattleboro, Bellows Falls, and the Deerfield Valley towns of Wilmington and Dover. Outside of these more densely settled areas, and some village centers, most of our residents live in rural settings and need to commute long distances for work, shopping, and services. As a result, personal transportation is a necessity for most residents.

With few population and commercial hubs, supporting a public transportation system is extremely challenging. The region benefits from having the MOOver bus transit service, which has routes serving communities in the Connecticut River Valley, Deerfield Valley, and along Route 9, and an Amtrak line with stations in Brattleboro and Bellows Falls. However, bus and train schedules are still limited and not all communities in the Region have access to these services, leaving them underutilized. Supporting the continuation of service on existing bus routes and expanding the service area is critical. In particular, there is a need for bus transit on Route 30 from Brattleboro to Winhall. Improvements have been made to the Vermonter Amtrak route in recent years that have shortened the length of trips to major destinations such as New York City, Springfield, MA, and New Haven, CT. Massachusetts is seeking to make improvements to rail service between Boston and the western part of the state, which would benefit the Windham Region as well.

Alternative transportation options, such as shared transportation (carpooling, public transportation, car share) and active transportation (walking and biking), should be supported and improved to reduce energy consumption. Shared transportation is a broad term covering public transportation, carpooling, car share organizations, bike shares, and others. Access to information about shared transportation options is often a barrier to increasing their rate of use. The Vermont Agency of Transportation manages the Go! Vermont website, which provides information on local bus and train routes, and supports carpooling by providing matches for individuals with similar schedules and destinations.

Complete Streets is an approach to transportation planning that accounts for all users, including vehicles, pedestrians, bicyclists, and public transit riders. By considering different modes of travel, we can make roads safer and reduce the need for using a private vehicle. Towns can consider adopting a Complete Streets policy to consider these issues when planning for and making road improvements. Adding pedestrian infrastructure, like sidewalks, can be difficult due to high construction costs and limited space because of historic settlement patterns. Spread out development and significant elevation changes make commuting by bicycle more challenging. Many of the Region's roads are also dirt, which can be more difficult for bicyclists, especially during mud season in the Spring. The State offers several grants to help communities plan and construct sidewalks and bicycle facilities to help reduce municipal costs. Programs like bike shares and rebates for electric assist bikes also encourage use of this mode of transportation.

As single occupancy vehicles will continue as a necessity for most residents, incentivizing and encouraging the transition to electric vehicles (EVs) is important. This can be accomplished by increasing the number of charging stations, including high-speed charging stations, throughout the Region and offering free parking for charging EVs. Towns can identify preferred sites for charging stations and encourage local businesses to install charging station. The transition to EVs presents a financial barrier as well. As EVs become more affordable with increased demand and improved infrastructure, conversion to EVs will become more viable.

ENERGY POLICIES

ENERGY CONSERVATION, EFFICIENCY AND RESILIENCE

1. Support energy efficiency and conservation measures that reduce costs, usage, and emissions.
2. Encourage energy conservation in municipal buildings, businesses, and homes.
3. Support education around energy conservation and efficiency.
4. Promote decreased use of fossil fuels for heating.
5. Support utility, municipal, and property owner efforts to make our electrical power infrastructure more resilient to damage, both weather and human related.
6. Support improved energy conservation and efficiency strategies as a preferred alternative to the construction of new energy generation and transmission capacity.
7. Promote energy storage and systems that can supply energy to support critical functions in times of primary supply interruptions.

8. Support the State in achieving its Total Renewable Energy and Comprehensive Energy Plan goals.

9. Encourage new development in the region that meets the state building energy standards and exhibits best practices in terms of energy conservation and energy efficiency.

TRANSPORTATION AND LAND USE

10. Promote a shift away from single-occupancy vehicle trips through strategies appropriate to the region.

11. Promote a shift away from gas/diesel vehicles to electric or other non-fossil fuel transportation options.

RENEWABLE ENERGY DEVELOPMENT AND SITING

12. Ensure that all energy generation, transmission, and distribution projects further the regional goals for providing a reliable, sufficient, and economical energy supply to the region, promoting energy conservation and efficiency, and furthering the development of energy sources that have zero or low Green House Gas (GHG) emissions.

13. Encourage a shift toward zero and low-GHG emission energy sources.

14. Support the continued availability and increased use of net metering electrical systems, including both individual and group net metering installations.

15. Support renewable energy solutions that cross town boundaries.

16. Support efforts of the State and regional organizations to increase training for new energy contractors and provide avenues for residents and businesses to easily find approved energy contractors.

17. Support sound energy facility siting practices and ensure that new developments give adequate attention to facility siting requirements, development constraints, natural resource protection, and land use compatibility.

18. Development shall be located to avoid state, regional and local known constraints, and to minimize impacts to state and local possible constraints, as defined in the Energy Element of the Regional Plan.

19. Stormwater runoff should be identified and mitigated for all new energy facility projects.

20. WRC recommends the location of renewable energy generation facilities in accordance with the relevant guidelines below. To determine an appropriate location for a facility, first review the constraints in this Plan and then look at the guidelines below to determine how and where WRC encourages renewable energy

generation facilities. Inability to meet these guidelines does not necessarily preclude the ability to develop renewable energy generation projects:

a. Encourage the placement of facilities on previously impacted land, such as gravel pits, landfills, brownfields, former industrial land, etc.

b. Rooftop solar installations are highly encouraged whenever possible, but must comply with State, Regional, and Local historic preservation requirements.

c. Ground mounted solar installations are recommended after consideration is first given to rooftop solar.

d. Utility scale ground mounted solar arrays should be located outside of Village Centers and Downtowns to promote compact development patterns.

e. Renewable energy generation facilities are encouraged to be installed as close as possible to existing distribution and infrastructure with adequate capacity.

f. Encourage the placement of renewable energy facility sites along currently maintained town roads.

EQUITY

21. The Windham Regional Commission, in conjunction with the Department of Public Service, should develop diversity, equity, and inclusion strategies to advance the transition to a just and equitable energy system for Vermonters and to guide actions moving forward.

22. Equity should be considered as core criteria in all decision-making, alongside least-cost and environmentally sound principles.

23. The Windham Regional Commission supports the establishment and implementation of frameworks for consistently addressing issues of equity and justice across Regional and Municipal energy policies.

HOUSING

BACKGROUND

The country, the state, and the region are all facing a significant housing crisis that was exacerbated by the COVID pandemic that began in 2020. Costs associated with housing development have increased significantly and very little new housing has been built in the region for many years. This impacts the region in many ways including increased costs passed on to homeowners and renters, a lack of available housing, and employers who have difficulty attracting new employees.

An adequate supply of year-round housing that offers varieties of housing size, cost, and location is essential to the economic and social health of every town in the region. Communities benefit when employees are able to live close to their workplace, young adults can afford to buy or rent in their hometowns, and elderly residents are able to remain in the community where they have family, friends, and history. Recent demographic trends are shifting in the region's housing needs. For example, household size has decreased and aging residents may seek to downsize to smaller homes with access to services. These trends coupled with the lack of housing development is raising concerns regarding the availability of smaller, affordable homes. While the specific needs and dynamics vary from one part of the region to another based on economics, location, and demographics, there is a common need for adequate and affordable housing**.**

New housing and infill development should be located near community centers. Housing developed in existing centers is less costly because existing infrastructure for roads and utilities is in place. Services which provide a greater social and economic benefit to the community are also available.

Towns should identify areas for compact development and facilitate the kinds of densities needed to reduce per unit costs. This is especially critical since costs have increased significantly due to the COVID pandemic and inflation. Locating these areas near public services will improve affordability for residents and reduce municipal costs for services. Proper provision for adequate and safe water supply and sewage disposal will be integral to this development. Due to limited financial resources at the town level, it is essential that there is appropriate State and/or Federal funding to support community infrastructure to meet these needs. At the same time, implementing regulatory strategies that reduce development costs can help restrain per unit costs as well.

A major barrier to allowing for increased density is the availability of public sewer and water infrastructure. The WRC will seek funding to complete a village water and wastewater needs assessment and wastewater feasibility plan to identify current barriers to development.

HOUSING AND HOUSEHOLD CHARACTERISTICS

The total number of housing units in the region has remained relatively stable from 2010 to 2020. The table below provides a summary of the region's housing units in 1990, 2000, 2010, and 2020. By 2020, the number of owner-occupied units and rental units increased, while the number of seasonal units decreased slightly. Although some seasonal homes may have been converted to permanent homes during the pandemic, the overall numbers have stagnated.

The overall number of housing units has decreased for many reasons, including as a result of homes that were destroyed by fire or flooding during Tropical Storm Irene in 2011 (for example, Melrose Terrace Apartment in Brattleboro), and older homes deteriorating significantly. The number of new homes built in the region during this 10-year period was not enough to make up for those lost. This loss of homes is a significant concern and contributes to our current regional housing crisis. The decrease in the housing stock is even more significant since the region's population increased by 3.9% from 2010 to 2020.[1]

WINDHAM REGION HOUSING UNITS, 1990-2020

	1990		2000		2010		2020	
Unit Type	Housing Units	PCT	Housing Units	PCT	Housing Units	PCT	Housing Units	PCT
Owner Occupied	11,004	38.9%	13,213	44.3%	13,915	42.6%	15,006	48.1%
Renter Occupied	6,031	21.3%	6,116	20.5%	6,360	19.5%	6,802	21.8%
Seasonal	9,318	32.9%	9,290	31.1%	10,916	33.4%	9,396	30.1%
Total	28,314		29,846		32,638		31,204	
Pct Change from Previous Decade			+ 5.4%		+ 9.4%		-4.40%	

Source: 1990, 2000, 2010, and 2020 Census, U.S. Census Bureau

The rental vacancy rate for Windham County was 3.4 percent in 2021, which is down significantly from 8.4 percent in 2010.[2] Very low vacancy rates are a concern because it means that housing may not be available for people looking to move to the region and those who already live in the region and would like to change their housing situation. This is also a concern for employers because new employees may not be able to find housing.

[1] 2010 and 2020 Census, U.S. Census Bureau
[2] Rental Vacancy Rate Chart, www.housingdata.org

The Vermont Department of Housing and Community Development and the Department of Labor presented Housing Deficit Data and Demographic Trends on December 15, 2023. They broke the data out by county and partial counties. For example, Windham County was separated into Windham South and Windsor South/Windham North. Based on this information, the vacancy rates for homeownership are even smaller than for rentals. Established target vacancy rates for a healthy market are 3% for ownership and 5% for rentals.

VACANCY RATES (Seasonally Adjusted)

Location	Owned Vacancies	Owned Vacancy Rate	Rental Vacancies	Rental Vacancy Rate
Windham South	130	1.17%	155	3.41%
Windsor South & Windham North	107	1.03%	254	6.83%
Vermont Total	1,962	1.12%	2,419	4.14%

Source: 2021 U.S. Census Bureau ACS Estimates

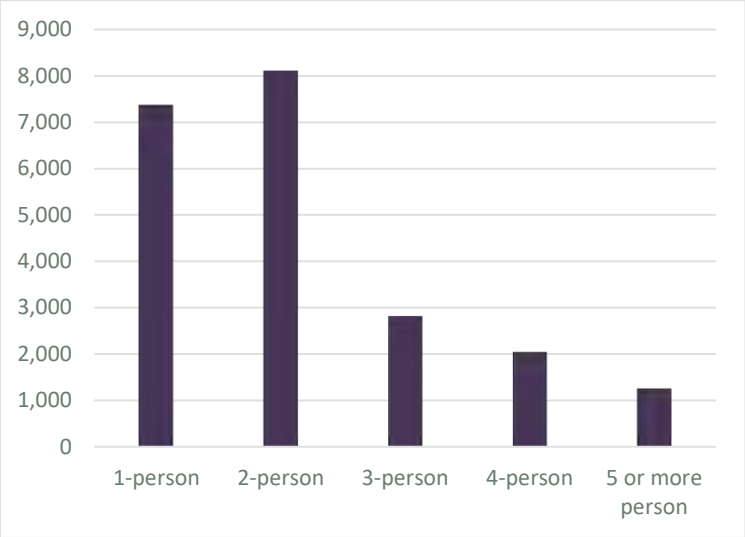
The state also looked at the unit deficit compared to average annual housing production (last five years). These figures are a snapshot in time and do not account for future needs. It also doesn't account for housing lost, which is estimated at 2,000 – 3,000 units/year (due to disrepair, flooding, etc.). The deficit to production factors are higher in Windham County than the state overall.

UNIT DEFICIT VS CURRENT ANNUAL PRODUCTION

Location	Unit Deficit	Average Annual Production	Deficit to Production Factor
Windham South	440	100	4.2
Windsor South & Windham North	280	60	4.5
Vermont Total	6,740	2,110	3.2

Another factor that has contributed to the housing crisis is that the number of people per household has decreased significantly over the years. Many of the older homes in the region were built to accommodate much larger families. The table to the right shows that most households in the region today consist of one or two individuals. This means that the types of housing in the region may not meet the needs of families today that might prefer smaller units.

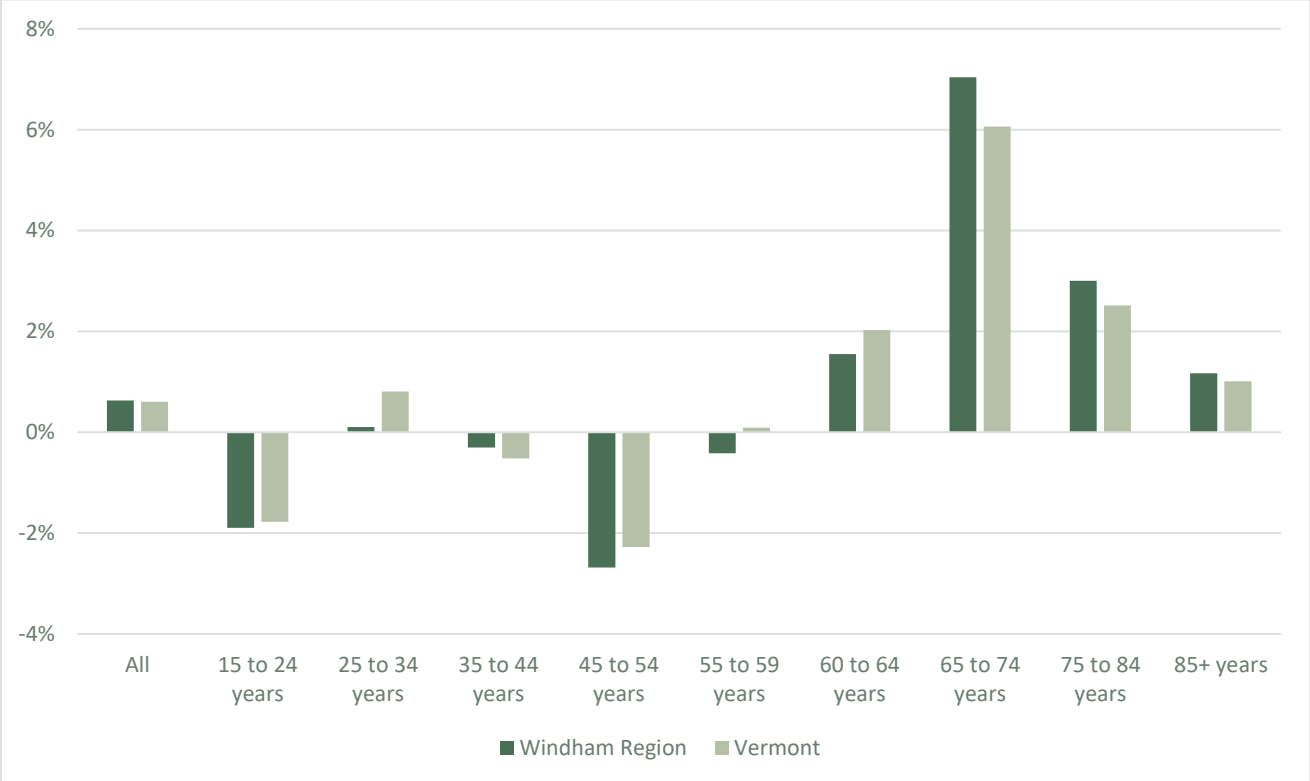
WINDHAM REGION TENURE BY HOUSEHOLD SIZE (2020)



Source: 2020 Census, U.S. Census Bureau

The region's aging population is another factor that affects housing needs. As can be seen in the chart below, households in the Windham Region are aging at a faster rate than the state overall. This trend will only increase as the population continues to age in the next 10 to 20 years. The region's aging population will impact not only the type of housing needed, but home maintenance and accessibility needs for these residents.

HOUSEHOLD GROWTH RATE BY AGE OF HOUSEHOLDER, 2010 - 20220



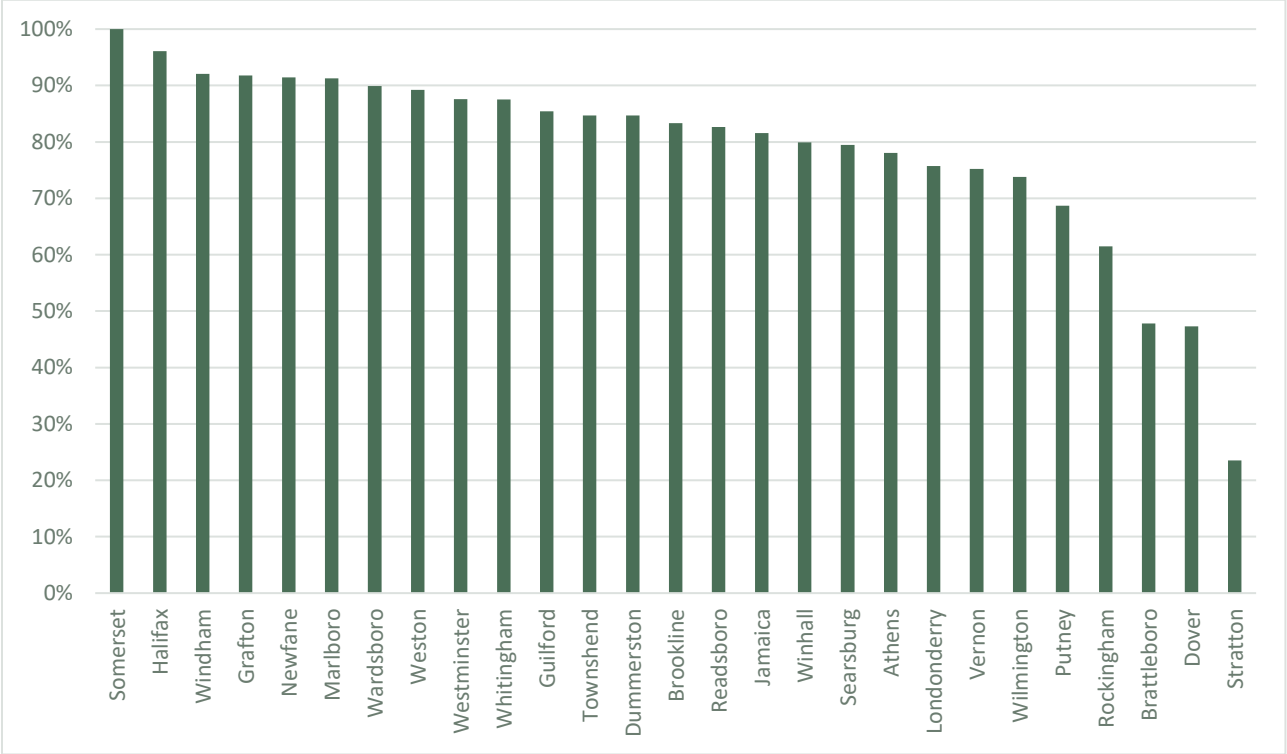
Source: 2010 and 2020 Census, U.S. Census Bureau

TYPES OF HOUSING

SINGLE-UNIT DETATCHED HOMES

Single-unit detached homes continue to be the predominant form of housing in the region. Illustrating this fact, the chart below shows that the vast majority of the region's towns have more than 70 percent of their housing units in single-unit detached homes, except for the regional centers of Brattleboro and Rockingham and the resort towns of Stratton and Dover, which have a high number of condominiums. There has not been a noticeable change in the percentage of single-unit detached homes in each town from 2010 to 2021. The lack of a variety in housing options contributes to the housing crisis because there are not enough smaller homes to meet the needs of today's smaller households and aging population. Smaller units are often accommodated in multi-family structures.

SINGLE-UNIT DETACHED HOMES AS A PERCENT OF TOTAL HOUSING STOCK IN EACH TOWN (2021)



Source: U.S. Census Bureau, American Community Survey 2017-2021 5-year Estimates

MULTI-UNIT HOUSING

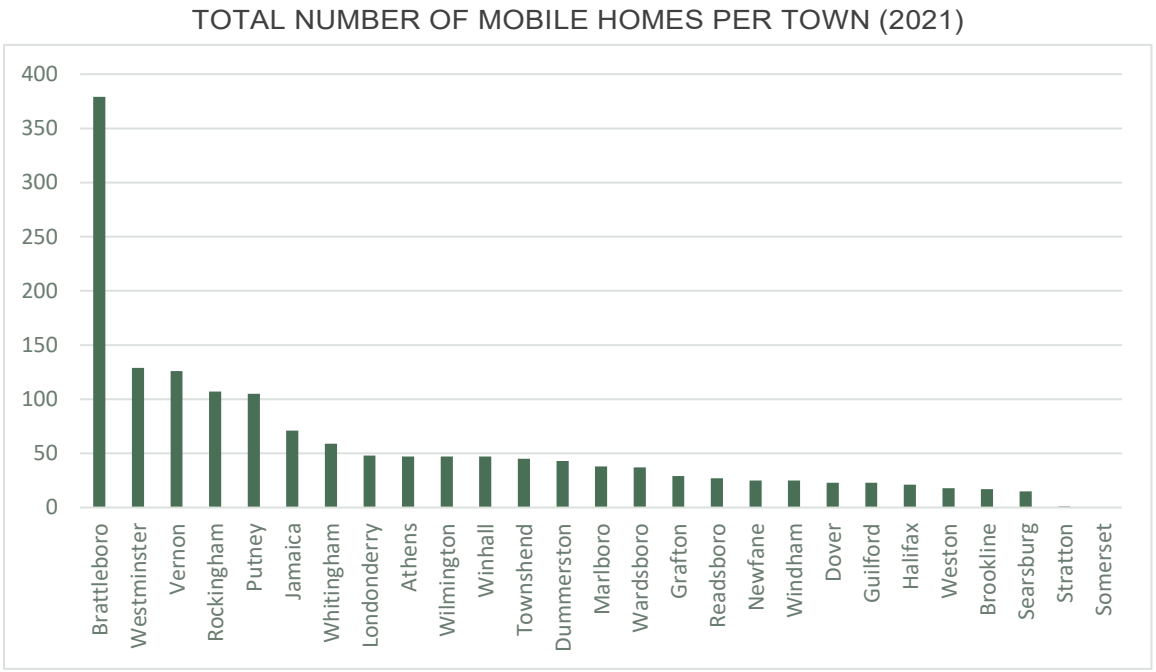
Multi-unit housing in the Windham Region can be found in a mix of different structure types. Some are found in two, three, and four family home in downtowns and village centers. The majority of units in large multi-unit structures (housing five or more units) are found in Brattleboro (1,464 units), Dover (418 units), Stratton (522 units) and Rockingham (249 units).

There has been very little construction of new multi-unit housing located outside of Brattleboro and Bellows Falls. New multifamily development in Brattleboro includes the DeWitt Block (19 units) developed by M&S Development, the Snow Block (23 units) developed by Windham Windsor Housing Trust, and Red Clover Commons (55 units), developed by the Brattleboro Housing Authority and designed to replace Melrose Terrace units lost to Tropical Storm Irene. In June 2023, Windham Windsor Housing Trust welcomed new residents to the Garage (27 units) in Bellow Falls. Many of these new developments have been supported with brownfields funding from the WRC.

While these new units have been a great step towards addressing housing needs in the region, the need for additional smaller units remains significant. The state's Housing Incentive Program has provided local property owners with funding to rehabilitate or create new units in multifamily homes. Many communities have also taken steps to facilitate the development of Accessory Dwelling Units or ADUs. These units that are smaller and secondary to primary residences and may be provided in existing structures, basements or garages, or new detached structures.

MOBILE HOME HOUSING

Mobile homes and mobile home parks continue to be one alternative to high cost housing in the region. As can be seen in the chart below Brattleboro has a significant majority of mobile homes in the region, followed by Putney, Rockingham, Vernon and Westminster.



Source: American Community Survey 2017-2021 5-year Estimates

Mobile home parks can achieve unit densities that reduce costs, however community sewer and water, whether public or private, are essential for a park's viability. The costs involved in building and maintaining such infrastructure make mobile home park ownership unattractive as a business investment. Additionally, these parks are often located in floodplains or other marginal parcel locations to save costs. This issue was highlighted when

many mobile home parks throughout the state were damaged by flooding in Tropical Storm Irene and during the July 2023 floods. TriPark in Brattleboro recently revealed plans to move additional units out of the floodplain with significant funding provided by the state and federal governments.

SEASONAL HOUSING AND SHORT-TERM RENTALS

Seasonal housing and Short-Term Rentals (STRs) impact the amount and costs of housing available to permanent year-round residents. Tourism and outdoor recreation are a critical part of the region's economy and seasonal dwellings and STRs for visitors are part of that mix, along with traditional resort lodging and hotels and motels. Providing the right balance of housing that is affordable to year-round residents and seasonal housing and lodging options for visitors is a challenge.

In Windham County, seasonal dwellings make up 32% of all homes. Communities in the Deerfield Valley, our resort towns, have the most seasonal housing. Dover is listed as number two in the state for the total number of second homes, followed by Wilmington at #6, Stratton at #7 and Winhall at #8. In these same communities, the percentage of total homes that are seasonal is also high: Dover 80%, Wilmington 62%, Stratton 92%, and Winhall 83%. During the COVID pandemic, some seasonal homeowners relocated to Vermont and lived in their second homes. Others looking to move away from urban centers purchased homes that may or may not become permanent residences. This influx of out of state buyers is one factor contributing to an increase in housing costs in the region and is especially impacting year-round residents and employees in resort communities.

STRs in their current form are a relatively new phenomenon, although there have always been vacation rentals in resort communities. Airbnb and other STR platforms have now made marketing these units much easier for homeowners. This trend began several years ago, but increased significantly since the COVID pandemic, as can be seen below. This trend has also impacted the amount and cost of housing available to permanent residents.

NUMBER OF ENTIRE HOMES LISTED AS SHORT-TERM RENTALS
WINDHAM COUNTY (2018-2023)

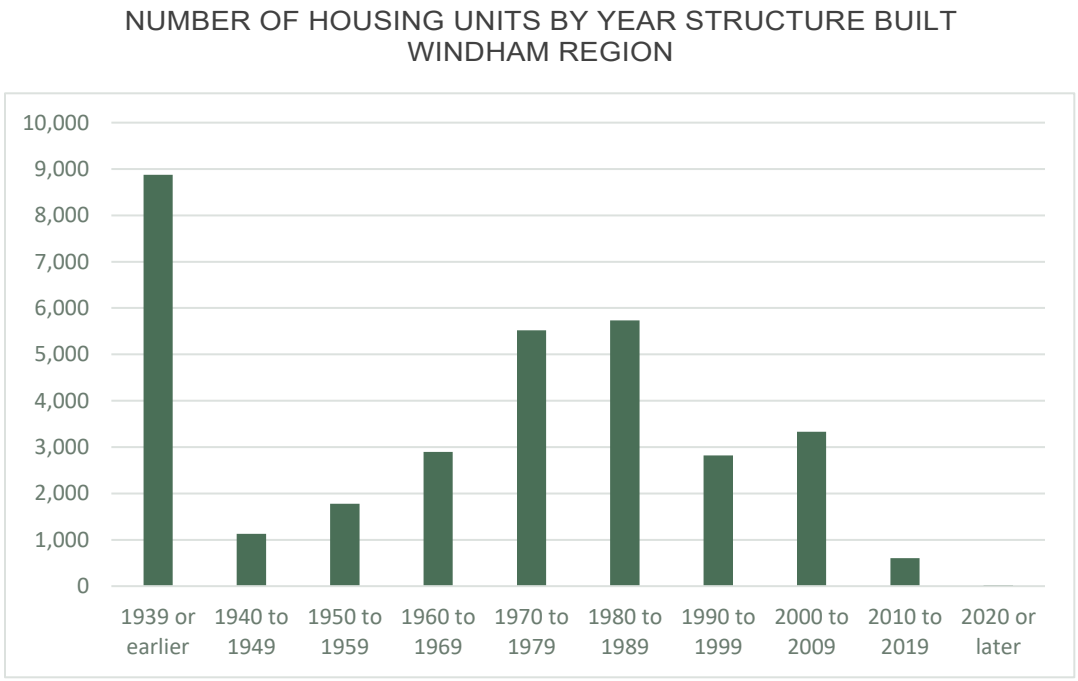
Source: www.housingdata.org

People make homes available as STRs for many different reasons. For some it is strictly a business, but others may use it as a way to afford their housing or as a way to stay in the region. There are multiple ways that communities can begin to address this issue if it is a concern, including registering STR owners/operators, regulating the number of STR units, or requiring fees to address impacts. Communities must balance their ability to provide accommodations for visitors with the need for also ensuring affordable housing to year-round residents.

AGE OF HOUSING

Almost one-third of the region's housing was constructed prior to 1940, as can be seen in the chart below. While older housing units can add to the historic character of a community, they also can present a challenge to property owners. Common problems in older housing include out dated electrical wiring, poor energy efficiency, aging septic systems, and the possibility of lead-based paint, a health issue particularly in homes with small children. Additionally, potential home-buyers may be wary of purchasing a home requiring significant investment in cosmetic and system upgrades.

Older Home, Grafton



Source: U.S. Census Bureau, American Community Survey 2017-2021 5-year Estimates

The age of the housing supply in the region also means that many existing structures were built without a building code in place. Therefore, ensuring safe housing in the Windham Region includes making life safety improvements

where necessary. These improvements include ensuring appropriate egress, fire and smoke separation, fire and smoke detection, and fire suppression systems. Encouraging these systems is a way to save lives and structures, especially historic landmarks.

HOUSING AFFORDABILITY

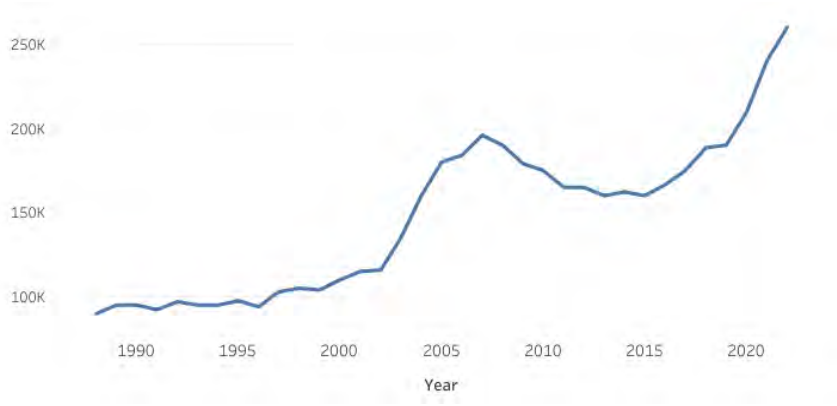
Housing affordability refers to the ability of all residents within a community to find housing that matches their level of income. Traditionally, housing is considered affordable when a household spends no more than 30 percent of its gross income on housing. As can be seen in the chart below, Windham County falls slightly behind the state overall in terms of housing affordability, with 35% of Windham County households considered cost burdened compared to 32% statewide. Cost burdened means that a household pays more than the accepted 30% of their income on housing. Renters struggle with affordability at a higher rate than home owners. In 2021, 26% of renters in Windham County were considered cost burdened, paying 30-49% of their income on housing, and 23% are considered extremely cost burdened, paying more than 50% of their income on housing. This is a significant issue since households may not have enough income to afford other necessities including food, clothing, transportation and medical care. It may also put them at a higher risk of housing instability.

HOUSEHOLDS BY HOUSING COSTS AS PERCENTAGE OF HOUSEHOLD INCOME

Source: www.housingdata.org

Housing costs have increased significantly since the last Regional Plan update when housing costs were still in decline. Home ownership costs began rising in 2015 after declining from 2007, as a result of the subprime mortgage "housing crisis." In 2022, the median home price in Windham County was $260,000, which is an increase of 62% since 2015. There are many factors that have contributed to this including the disruptions of the COVID pandemic, which increased construction costs and competition to purchase homes as people were moving out of urban centers.

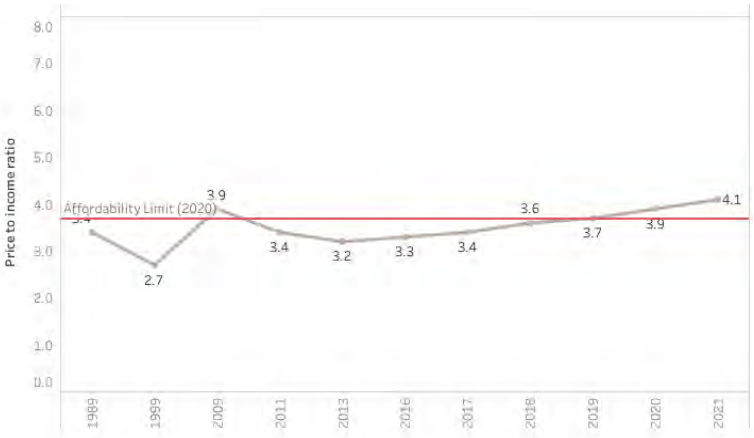
MEDIAN HOME SALE PRICE FOR WINDHAM COUNTY



Source: www.housingdata.org

Wage increases have not kept pace with the increase of home prices. The chart to the right shows the 2020 affordability limit for Windham County in red and the actual price to income ratio in grey, which has been above the affordability limit since 2019. This ratio is based on Windham County's median non-vacation home price compared to the county's median household income. The "Affordability Limit" is the price-to-income ratio when it takes 30% of a household's income to cover housing costs.

RATIO OF WINDHAM COUNTY HOME PRICES TO INCOME



Source: www.housingdata.org

The median gross rent for a two-bedroom apartment in Windham County was $947 per month in 2021.[3] This is approximately a 21 percent increase in monthly rent from 2011. As of 2023, an annual income of $37,800 was needed for a one-bedroom apartment to be affordable and $46,000 for a two-bedroom apartment.[4] In 2021, 31% of Windham County residents had an annual income below $35,000.

In the Windham Region, housing that is maintained at a price level that is affordable to a variety of income levels is

[3] www.housingdata.org
[4] www.housingdata.org

addressed through a number of local and regional programs. Windham and Windsor Housing Trust (WWHT) and Brattleboro Housing Partnerships develop and manage affordable housing that serves low and moderate income residents. WWHT provides loan funding for low and moderate income homeowners to maintain safe and affordable housing. They also provide grants to property owners to rehabilitate rental units and to develop new accessory dwelling units.

Housing subsidies come primarily from State and Federal programs. The largest federal housing subsidy, in terms of dollars, is the mortgage interest deduction. However, the mortgage interest deduction does not benefit low-income households or renter households. There are State and Federal programs specifically targeted at low and moderate income households. These include Housing Choice Vouchers, as well as the Vermont Community Development Program, Vermont Housing and Conservation Board, and US Department of Agriculture (USDA) Rural Development programs.

Snow Block, Brattleboro, WWHT

Related to housing affordability is homelessness, which continues to be a significant issue in the Windham Region. Although homelessness may have increased during the COVID pandemic due increasing housing costs and decreasing vacancies, housing was made available in the form of hotel rooms during the pandemic. The pandemic era housing program is ending, however, and it is yet to be seen how this will play out. Housing providers and homeless advocates are working with hotel residents to match them with housing but some individuals will end up back in shelters and other may be left out altogether. The primary shelter provider in the region is Groundworks, which operates two shelters in Brattleboro, as well as a drop-in center and a food shelf. Our Place Drop in Center also provides services to those experiencing homelessness in Bellows Falls.

HOUSING TRENDS FOR THE REGION

This chapter has shown several characteristic trends for housing throughout the region, and those trends will impact residents' ability to find suitable, affordable housing in this region in the future. Although single-family homes may continue to be the preferred type of housing in the region, providing a mix of housing options will help meet the needs of various households and income levels, while attracting younger populations and allowing older populations to age in place. The decrease of overall household size is also a significant factor in determining the right mix of housing types for a community. Some examples of new and creative approaches that create smaller footprint homes from other regions in New England are shown in the images below.

Tiny Home Development, Dover, NH

Townhouses, Dover, NH

The region's villages and downtown centers can provide many desired amenities and make it easier to access transit and other needs. Building new housing at higher densities and providing infill development opportunities in villages and downtowns is one way to begin to address the high costs of new housing development. Communities can prepare for new housing by updating their land use regulations to accommodate higher densities, promote adaptive reuse of historic structures, and even reduce parking requirements which impact housing costs. Other costs, including the costs of materials and labor, are beyond the control of communities. Additional information on tools towns can use can be found in the Land Use Section.

CONVERSION OF BROWNFIELDS TO HOUSING STOCK

Sites located within town and village centers are often complicated by the presence or potential presence of contamination, also known as a brownfield site. The Windham Region Brownfields Reuse Initiative has funding available to assess potential contamination on specific sites, develop remediation plans as needed, and complete cleanup actions. Programs at both the Federal and State level can also provide funding for cleanup. Where brownfield sites are appropriate locations for mixed housing and commercial services, it may be well worth the investment.

Brownfields site in the Windham Region have been cleanup and redeveloped for affordable housing by Windham Windsor Housing Trust and others. Examples include the Garage in Bellows Falls and Red Clover Commons in Brattleboro, both pictured below.

Red Clover Commons, Brattleboro

The Garage, Bellows Falls

Communities can prepare for new development, including an increase of density in existing homes that add new units, by planning for the development of water and/or wastewater infrastructure. In many of our smaller towns, the lack of sewer and water infrastructure is a significant limitation to creating new affordable housing (see also the Community Utilities, Facilities, and Services Section). Londonderry, Grafton, and Jamaica are investigating the development of new soil-based wastewater systems for their village centers.

Wilmington, Dover, Putney, Londonderry and Brattleboro all have Housing Committees and, except Putney, have developed housing needs assessments to explore what they can do as a community. Some towns may even consider development of a new town center, such as Vernon who developed new Village Center Concept Plan. A proposal for up to 300 new units at the Winston Prouty Campus in Brattleboro also has the potential to significantly address the region's needs.

Source: SE Group, 2019 – Vernon Village Center Concept Plan

Since 2020, the Southeastern Vermont Housing Coalition has taken on the role of regional convener for all organizations interested and involved in housing throughout the Windham Region. The Coalition has monthly meetings that address various issues and concerns related to housing including landlord groups, affordable housing organizations, homeless advocates, state agencies and municipalities. This group will continue to lead and facilitate the discussion around housing and to support efforts to increase housing for everyone, especially those who need it most.

HOUSING POLICIES

1. Promote and support an increase in the number of homes available and the diversity of housing stock (types of units, and rental and home ownership opportunities) within the region. This includes offering safe, adequate, accessible (universal design) and affordable housing to meet the needs of all residents across the entire income spectrum. This is policy is urgent and of high regional priority.

2. New housing should be developed in a manner that maintains the historic settlement pattern of compact village and urban centers separated by rural countryside. Support growth in and around existing centers to promote walkability and social connectivity. All new development should strive to have minimal impact on natural resources, open space, floodplains, fluvial erosion hazard zones, and important agricultural and forest lands.

3. New housing and infill housing should be encouraged throughout the region and especially where public wastewater and water infrastructure are in place and can support the density needed to promote more affordable development, including multi-family housing designed to meet the needs of the region's changing population (smaller households). Alternative housing opportunities such as condominiums, homesharing, co-housing, housing cooperatives and Accessory Dwelling Units (ADUs) should also be encouraged.

4. Promote the implementation of innovative planning, design, and construction techniques that minimize the long-term cost and energy consumption of housing, including locating housing convenient to community centers, in proximity to public transit routes, in a compact development arrangement, and employing energy efficient construction techniques. Encourage reuse of vacant or underutilized properties, including strip commercial development, for residential use.

5. Support the work of communities addressing infrastructure needs and regulatory reform that is needed to make it easier to build new and denser housing where it works best in compact centers. Provide assistance, as needed and when funding is available, to update bylaws and plan for community water and wastewater projects.

6. Provide financial support to assess and clean up brownfield sites that will be redeveloped for new housing. This should be a top priority for the Windham Region Brownfields Reuse Initiative.

7. Support the work of public and nonprofit agencies, including housing trusts, who plan for and finance affordable housing.

8. Promote the rehabilitation and maintenance of the existing housing stock and multifamily properties, as well as expanding the number of units where appropriate.

9. Support affordable housing projects and encourage waiving of fees, use of tax credits and property tax

abatement and assistance with public grants and other sources of funding.

10. Support organizations that provide shelter and support for all residents including those experiencing homelessness.

11. Pursue investigation of the impact of Short Term Rentals on the regional housing market to better understand their impact. Support the management of Short Term Rentals by towns.

12. Facilitate opportunities for housing that is affordable to the region's workforce. When appropriate, Major Act 250 applications for development that will create fifty new full-time equivalent positions shall provide evidence that there is existing available and affordable housing stock for the new employees within a thirty-mile commuter shed. If housing that meets this requirement is not available, the development shall include affordable housing within the project or a mitigation payment to be used for affordable housing in the Windham Region.

13. When reviewing the housing element in town plans, WRC will look for consideration of (not in ranked order):

    a. Consistency with future land use goals

    b. Aging in place

    c. Accessible, safe housing

    d. Low-income housing for all communities

    e. Workforce housing

    f. Fair housing that advances diversity, equity and inclusion

    g. Energy efficiency

    h. Connection to public transit routes or safe bicycling or walking connections to services

    i. Planning for wastewater and water infrastructure to support compact settlement, housing development, and community vitality.

ECONOMIC DEVELOPMENT

BACKGROUND

The regional economy provides the jobs, resources, and services that are needed to support the quality of life of residents and allow for continued investment in our communities. Without a strong and resilient economy, accomplishing many of the goals for the region will be difficult. The local economy has evolved over time as a result of changes in technology and transportation, and the impacts of larger national and global economic trends on Vermont. What was once an agricultural and forest-based economy in the early 19th century evolved into one where manufacturing activities became more prominent along the region's waterways by the end of the 19th century. Today, our economy is centered primarily around services, tourism, health and education, manufacturing, and agricultural and forestry sectors.

The intensity and type of economic activity varies greatly across the region. Brattleboro and Rockingham continue to be the job centers they historically have been. These communities also have the greatest concentration of manufacturing, retail, and professional office jobs. Many communities in more rural locations of the region have limited economic activity mostly found in small-scale retail, construction trades, forestry and agriculture, and home-based businesses. Ski resorts in the region have an outsized role in influencing the local economies of the towns where they are located and adjacent communities, providing jobs at the resorts and also supporting associated retail, restaurant, accommodations, and service-based businesses, which are often more seasonal. The Windham Region is also very connected to adjacent regions and many of the main economic hubs that provide employment opportunities and services for our residents are just beyond our region's borders.

Going forward, the region will need to continue to leverage its strengths to remain competitive in an evolving and complex global economy. The 2019 Southern Vermont Comprehensive Economic Development Strategy identifies several opportunities the region can build on to support economic development efforts. These include natural resources, recreational opportunities, educational and cultural institutions, momentum from recent planning initiatives, growing collaboration to address workforce issues, and creative and innovative residents and businesses. At the same time, the region faces numerous challenges that if left unaddressed will result in further economic decline. Some of the most pressing challenges include a declining and aging workforce, lack of housing and increasing housing costs, need for upgraded infrastructure, limited rural transportation and communication options, mismatch between available workforce and employer needs, lack of diversity, and the impact of climate change.

BRATTLEBORO DEVELOPMENT CREDIT CORPORATION

The Brattleboro Development Credit Corporation (BDCC) is a certified Regional Development Corporation that serves communities in Windham County, the towns of Readsboro, Searsburg, and Winhall in Bennington County, and the town of Weston in Windsor County. The 12 Vermont Regional Development Corporations partner with the state to implement economic development strategies in their regions. BDCC works to deliver technical assistance to develop and strengthen businesses, leads workforce development initiatives, and supports employment. BDCC also owns and manages two business parks and an industrial park in Brattleboro and offers low-cost commercial rental space. WRC regularly partners with BDCC on economic development issues that overlap both organizations' responsibility. Most often, these issues are related to land use and infrastructure planning to support business needs.

BDCC's work in workforce development has become increasingly important due to the workforce challenges discussed below. The Welcoming Communities program is aimed at helping employers attract, retain, and support new Americans. Much of the work to recruit new Americans to the region is through the Community Asylum Seekers Project and the Ethiopian Community Development Corporation. The Pipelines and Pathways Project is designed to help students prepare and find employment opportunities, which helps retain young adults in the region.

SOUTHERN VERMONT ECONOMIC DEVELOPMENT STRATEGIES

In 2007, BDCC and the Bennington Regional Commission formed the Southeastern Vermont Economic Development Strategies, a non-profit organization with legal affiliation to BDCC. The mission of SeVEDS is to reverse the economic decline of the Southeastern Vermont region. In 2014, SeVEDS completed a Comprehensive Economic Development Strategy (CEDS) for the Windham Region and Bennington County to plan for the economic impacts from the closure of the Vermont Yankee power plant. The CEDS is a five-year plan that outlines projects and actions to implement economic development goals for the region.

In 2015, the State Legislature created the Southern Vermont Economic Development Zone, which is comprised of 44 towns within the boundaries of the Windham Regional Commission and the Bennington County Regional Commission (BCRC). When the CEDS was last updated in 2019, BDCC and BCRC were awarded a planning grant from the U.S. Economic Development Administration (EDA) to develop the CEDS for the Southern Vermont Economic Development Zone.

The 2019 CEDS is incorporated into this Regional Plan by reference. This means that the WRC will refer to the CEDS in the development and implementation of its plans. However, the policies of the Windham Regional Plan supersede the CEDS. SeVEDS will be completing an update to the CEDS in 2024 and once adopted it will take the place of the 2019 CEDS. There is currently an application with the federal government to designate the Southern Vermont Economic Development Zone as an Economic Development District, which would open up additional grant and loan opportunities and administrative and technical assistance from the EDA.

The vision statement for the 2019 CEDS is that in 2030, the Southern Vermont Economic Development Zone will be home to a resilient, creative, and inclusive community in which businesses and people thrive and prosper. The plan identifies the following main objectives to reach this goal:

1. **Increase our population**: Attract more people to live in Southern Vermont to participate in the community, the workforce, and support the business and civic environment
2. **Expand our business infrastructure**: Create an environment that will encourage more jobs and opportunities in Southern Vermont
3. **Improve our physical infrastructure**: make the critical infrastructure improvements so that Southern Vermont is resident and business ready
4. **Enhance our social infrastructure**: improve quality of life and stability for residents
5. **Develop our economic development capacity**: enhance the ability for economic development professionals and partners to play a role in implementation

WORKFORCE CHARACTERISTICS

WORKFORCE SIZE

The number of workers in the region aged 16 and over has declined by approximately 7 percent since 2000. As of 2020, there were 22,280 workers in the region as compared with 24,054 in 2000. This decline has been forecasted given the large number of residents at or near retirement age. However, the economy also experienced an increase in retirement rates during the COVID-19 pandemic years, which likely accelerated this decline in the workforce. The significant housing shortage in the region has made it challenging to recruit younger workers to replace those retiring since they are not able to find a place to live.

With a smaller labor force to draw from, the region has seen a corresponding decrease in the total number of available jobs due to the challenges with filling open positions. Limited workforce availability is impacting all sectors, but the 2019 CEDS notes that the two industries most impacted are health care and manufacturing. This has ripple effects throughout the economy as there are fewer workers earning wages that in turn get reinvested in the local economy and support businesses.

WORKFORCE AGE

The region's population is becoming older and more workers are reaching retirement age and fewer young people are entering the job market. Between 2010 and 2021, the percent of the Windham County population aged 65 or

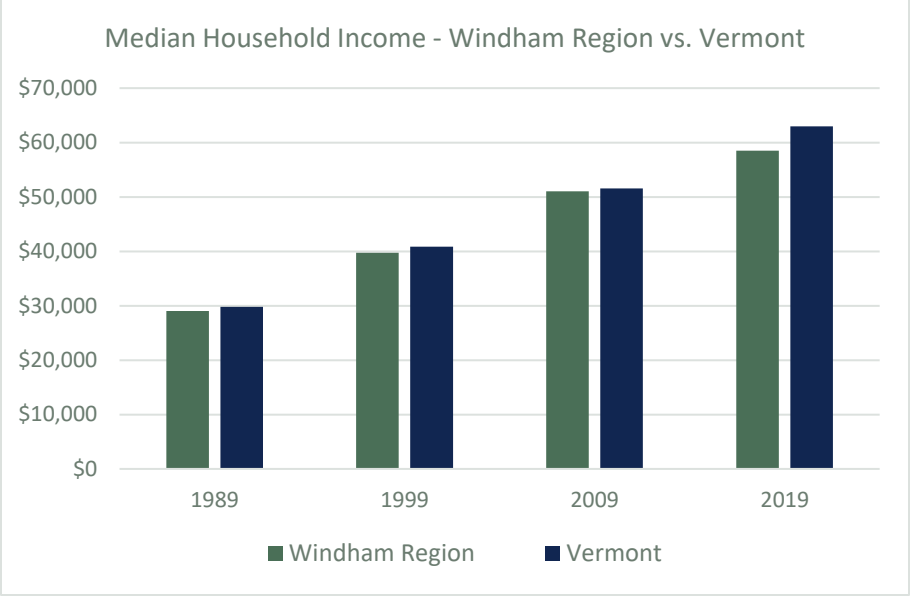
older grew from 16.2 percent to 24.6 percent. All other population age groups decreased during this time. According to the Vermont Department of Labor, the population aged 65 or older will increase by 82.3 percent between 2010 to 2030. At the same time, we will see a decrease by 17.8 percent in the 20 – 34 age range and by 20.7 percent in the 35 – 54 age range, which represents the prime working years for most people. This continued decline in the size of the workforce will negatively impact the region's human capital and economic sustainability.

EDUCATIONAL ATTAINMENT

For the population aged 25 or older, approximately 47 percent of residents hold higher education qualifications beyond a high school diploma. Roughly 23 percent of residents hold a Bachelor's Degree and 18 percent a Graduate Degree. A well-educated workforce helps retain and attract higher paying and specialized jobs for the region. It is also important to consider educational attainment of the workforce in terms of ensuring a correct match between employer's needs and the training of the workforce. As discussed early, the 2019 CEDS identified workforce development as an important goal in the years ahead. As the economy evolves and industry needs change, workforce training will need to adapt to meet the needs of businesses.

INCOME LEVEL

According the American Community Survey (ACS), the median household income for the region was $58,514 in the 2015 – 2019 5-year estimate. This compares with a median household income of $63,001 for the state. The 2015-2019 ACS also estimated that Windham County had a poverty rate of 13.4 percent, compared to 11.3 percent in neighboring Bennington County and 9.4 percent in Windsor County. Generally, growth in the median household income for the Windham Region has kept pace with the state average going back to 1989. However, between 2009 – 2019, the state median household income increased at a higher rate than the region as shown in the chart below. According to the 2019 CEDS, median household income for the region was expected to grow only 7 percent over the upcoming 5 years as compared with 11 percent for the United States.



One factor that may be contributing to the lower growth in income levels for the Windham Region is the closure of the Vermont Yankee nuclear power plant in Vernon in 2014. Vermont Yankee was formerly the largest employer in the region and many positions at the plant offered higher than average incomes. Another factor is the outsized role of tourism for the local economy, which includes accommodation and food services, retail trade, and arts, entertainment and recreation industries. These industries have lower average earnings and also higher levels of seasonality. Finally, as the population ages and residents retire more are relying on social security, which is not counted towards household income. As a result of lower income growth, there is less money circulating in the local economy which can be detrimental to businesses, especially service-based industries like retail, personal services, and restaurants.

UNEMPLOYMENT

The unemployment rate in Windham County has consistently tracked lower than Vermont and the national rate. Over the previous ten years, the highest unemployment number for Windham County was 5.8 percent towards the end of the Great Recession. Since then, the unemployment rate has declined to a low of 2.2 percent in 2018. There was an increase in unemployment in 2020 associated with the COVID-19 pandemic and its impacts on the economy, but employment numbers have since improved and are currently at 2.1 percent as of November 2023. The very low unemployment rates in Windham County and Vermont are indicative of a tight labor market where employers are facing challenges filling openings.

ECONOMIC SECTORS

The following section provides a summary of the largest job sectors in the region as well as important historical industries, like agriculture and forestry, that continue to help define the character of the region. Economic sectors

are not presented in terms of hierarchy of the number of jobs or relative importance to the regional economy. In 2022, according to the Vermont Department of Labor, the top five industries in Windham County in terms of total number of jobs were Health Care and Social Services (15%), Federal, State or Local Government (14%), Accommodation and Food Services (12%), Retail Trade (12%), and Manufacturing (12%). Federal, State or Local Government sector also includes employees at public schools in the region.

It can be helpful to compare the local labor market with the state as a whole to get a better sense of where Windham County has a higher or lower concentration of certain industries. Generally, the breakdown in jobs by industry in Windham County is comparable to the state as a whole. Sectors that are more concentrated in our region include Construction, Manufacturing, Wholesale Trade, Educational Services, Arts, Entertainment, and Recreation, and Accommodation and Food Services. Many of these industries support the sizable tourism economy in the Windham Region. Notably, there is also a larger percentage of jobs in manufacturing in the Windham County than at the state level. Sectors where there are fewer jobs compared to the state include Finance and Insurance, Professional, Scientific, and Technical Services, Health Care and Social Services, and Federal, State, and Local Government.

HEALTHCARE AND EDUCATION

The health care industry is one of the fastest growing sectors nationally and in Vermont and can offer higher-wage opportunities for certain positions. This sector is expected to grow in upcoming years to support the ageing population. Some of the largest service employers in the region are health care providers, including Brattleboro Memorial Hospital and Grace Cottage Hospital. The Brattleboro Retreat, a private psychiatric hospital in Brattleboro, is also a large employer with unique workforce needs as compared to other hospitals in the region. The region benefits from being in close proximity to other prominent health care facilities, such as Dartmouth Hitchcock in Lebanon, New Hampshire. As with other sectors, a main challenge the health care industry faces is being able to recruit employees given the limited supply of housing.

Educational Services accounted for approximately 6 percent of Windham County employment in 2022, (1,208 jobs), which is a decrease of 21 percent since 2012. This number reflects jobs in independent primary and secondary schools and post-secondary institutions only and does not include those employed in public school. Some of this decline in education jobs is likely a result of the closing of Marlboro College in 2020 and the restructuring of the School for International Training in Brattleboro into a low-residency campus. Several independent primary and secondary schools, small private colleges, and public college branch campuses continue to provide a large number of jobs for the region. Some area schools occupy unique market niches: Landmark College and Greenwood School in Putney serve students who learn differently, including students with a learning disabilities, ADHD, and executive function challenges.

Large health care and educational institutions are sometimes referred to as “anchor institutions” because of their significant role in local economies. These institutions usually have large purchasing power, workforces, and real

estate holdings and have a vested interest in seeing the communities where they're located succeed. When these institutions close, it can have a significant ripple effect on the local economy.

MANUFACTURING

From 1930 until the 1980s, manufacturing of intermediate and finished goods was the largest employment sector in the region when it fell behind both service and trade sectors. Currently, manufacturing accounts for 12 percent of the region's employment (2,196 jobs), which is an increase of approximately 2 percent since 2012. Despite the long-term decline in this sector, it has seemed to stabilized in terms of employment numbers over the last decade. Growth in the non-durable manufacturing sector in recent years has also been able to offset most of the jobs lost as a result of the closure of Vermont Yankee. Manufacturing continues to provide relatively high-paying jobs with an average annual wage of $63,819 in 2022 according to the Vermont Department of Labor.

The manufacturing sector continues to be important to the region's economy, and includes notable companies in precision manufacturing and optical filters. Large employers include G.S. Precision in Brattleboro and Chroma Technology in Rockingham. The region benefits from being in close proximity to Keene, New Hampshire, which also has a large cluster of precision manufacturing businesses. This proximity creates a larger pool of skilled workers in easy commuting distance to the region that local businesses can recruit from. The region also has several successful value-added food product companies, such as Commonwealth Dairy (Green Mountain Creamery), which is directly attributable to the strength of the region's agricultural industry and in turn helps support local farmers.

Today, manufacturing activity is concentrated in Brattleboro and Rockingham. Each town has improved land available with municipal water and sewer service and convenient access to I-91 for new or expanding manufacturing enterprises. In Brattleboro the Exit One Industrial Park offers 92 acres and in Bellows Falls the Industrial Park on Route 5 has 31 acres of land.

CHROMA TECHNOLOGY CORPORATION EXPANSION PROJECT

Chroma Technology Corporation is headquartered in Bellows Falls and is a manufacturer of optical filters. In 2016, the company announced a 40,000 square foot expansion project to its facility that was supported by a $100,000 loan from the Town of Rockingham and a $350,000 Community Development Block Grant. As part of the expansion project, Chroma anticipated adding up to 26 new jobs.

Photo credit: BDCC

The Brattleboro Development Credit Corporation and the Bellows Falls Area Development Corporation encourage and support manufacturing industries in the region. These organizations have worked with state and federal financing sources to secure aid for industrial development. In support of the manufacturing sector, the WRC recognizes the need to plan for and provide locations for new and expanding industries in appropriately-sited industrial parks and other locations that support historic settlement patterns. This is discussed in more detail in the Land Use Chapter.

TOURISM

The Windham Region has attracted tourists for generations. The three major components of the region's tourism and recreation industry are the ski resorts, summer and fall tourism, and second homes. Each affects the economy in different ways and provides different types of employment opportunities for residents. The first two are primarily seasonal industries and the last has year-round effects on the economy and cost of housing. Historically, tourism has also been an important recruitment tool for the region as many visitors and seasonal homeowners become permanent residents.

Tourism helps encourage local economic activity and brings more money into the economy from residents outside of our region. According the Vermont Agency of Commerce and Community Development, the state welcomes over 13 million visitors each year that account for roughly $3 billion in annual spending. Businesses that have benefited from growth related to tourism include arts, entertainment, lodging, restaurants, gas stations, retail and outdoor equipment shops, construction and building-related industries, and maintenance and repair services. In addition, the businesses and amenities that attract visitors also benefit year-round residents and add to a quality of life in the region that would be difficult to support without tourism.

The tourism industry cluster includes Accommodation and Food Services, Retail Trade, and Arts, Entertainment, and Recreation sectors. As of 2022, approximately 2,287 residents in Windham county were employed in Accommodation and Food Services, 2,211 in Retail Trade, and 294 in Arts, Entertainment, and Recreation. In total, these sectors account for 4,792 jobs or roughly 25% of the total jobs in Windham County. However, the average wages for these sectors are substantially lower than the county-wide average of $53,531. Generally, employment in the leisure/hospitality sector is also seasonal in nature and employees may not have a reliable source of year-round income. It is also common for service sector jobs to have non-traditional work schedules, which may include early morning, longer shifts, weekend, or evening hours.

Reduced snowfall amounts during some winters and industry changes have challenged the capital-intensive ski business and contributed to a decrease in the total number of operating ski areas. The surviving resorts, in particular Mt. Snow and Stratton, have grown in size and offerings to the point that in peak seasons, the resort area populations rival the region's two traditional centers of Brattleboro and Rockingham. There has also been an increase in development and promotion of other recreational activities during non-winter seasons to attract visitors year-

round, like golfing and mountain biking. This has an impact on the viability of tourism-related businesses and municipal facilities and services during non-winter seasons.

The region's rich heritage and culture create further tourism opportunities. Towns have the advantage of using existing assets and encouraging the preservation of the very attributes that distinguish Vermont to attract visitors. With its wealth of historic sites, traditional villages, and cultural attractions, the Windham Region is well positioned to continue to promote heritage tourism.

CREATIVE SECTOR

There is a growing recognition of the importance of arts and creative endeavors for the regional economy. This includes the arts and culture industry that gets grouped with the tourism economic cluster, but also artisan food producers, graphic designers, museum staff, and media producers. In 2021, the Vermont Creative Network issued *Create VT: Action Plan for Vermont's Creative Sector*. The plan provides a roadmap for strengthening the creative sector statewide and also looks at existing jobs in this sector in the different regions of the state. The plan estimates there are 4,158 creative sector jobs in southern Vermont (Bennington County and Windham County).

FOOD TRUCK ROUNDUP AND CONCERT AT THE RETREAT FARM, BRATTLEBORO

According to the report, investing in the creative economy has many benefits including diversifying local economies, increasing jobs, building community, and attracting tourists and new residents. It is estimated that the arts and culture sector adds $1.1 billion to Vermont's GDP, ranking this sector third in the state behind only retail and construction. Nearly 50 percent of creative sector workers in Vermont are self-employed or in microbusinesses. A stronger small businesses environment can help the economy be more resilient. For more discussion on arts and cultural resources in the region, see the Educational, Cultural, and Historical Resources Chapter.

AGRICULTURE

Agriculture plays an important role in defining the region's landscape and has long contributed to the stability and diversity of the Windham Region's economy. The trend in agriculture throughout Vermont is for new farmers to seek smaller-scale, diversified opportunities in order to remain competitive with larger operations. An exception to this trend is that conventional dairy operations are becoming fewer in number with

remaining farms becoming larger. Some of the new market opportunities for farmers are direct sales to restaurants and consumers at farmers' markets and creating value-added products. The Northeast Organic Farming Association of Vermont currently lists seasonal farmers' markets in our region in Brattleboro (including a winter market), Rockingham, Newfane, Putney, Townshend, and Londonderry. One aspect of the cultural heritage of Vermont is its long history of family-based farms and agriculture and agri-tourism attracts tourists and brings in additional revenue for farmers, for example with pick-your-own operations.

LOCAL FOOD HUB MODEL

Food Connects is a non-profit organization based in Brattleboro that has developed a food hub distribution model that better connects wholesale customers in New England with regional food producers. This model has opened up new market opportunities for smaller farms in the region.

The local agricultural industry faces several challenges, including a decrease in available farmland and the impacts of climate change on the growing season. The agricultural economy relies on having a critical mass of farms and farmland to sustain the businesses that support the agricultural industry. As the number of farms decreases, it can be challenging to sustain these associated businesses. Between 2012 – 2017 there was a decrease in the total number of farms in Windham County from 447 to 414. There was also a corresponding decline in total acreage in agricultural use from 50,765 acres to 44,844 acres, a decrease of nearly 12 percent. It is critical to support land use planning at the local level that works to protect land with prime agricultural soils from development pressure and to support conservation efforts that preserve agricultural lands. The majority of farms (76.6 percent) in 2017 had less than $20,000 in sales showing that most of the farms in the region are small-scale operations.

TABLE 5-1: WINDHAM COUNTY FARM LAND AND FARM SALES, 2012 – 2017

Windham County	2012	2017
Total Farms	447	414
Land in Agricultural Use	50,765 acres	44,844 acres
Farm Sales: Less than $20,000	341	317
Farm Sales: $20,000 - $99,999	68	62
Farm Sales: More than $100,000	38	35

Source: United States Department of Agriculture, 2012 and 2017 Census of Agriculture

FORESTRY

Forests are one of the region's most important economic resources. Approximately 86 percent of the region is forested and all but a small percentage of that land supports periodic commercial harvests. These forests provide a livelihood for many people through wood harvesting, wood products, recreation, hunting, and maple products. A more detailed description of the importance of forestlands can be found in the Natural Resources Chapter.

In 2021, Windham County ranked first in the state for total sawlog and veneer log harvest with 17.179 million board feet. This is a decline from the 22.996 million board feet harvested in Windham County in 2010. The next closest county for total harvest in 2021 was Windsor County with 10.815 million board feet. A number of secondary wood-related industries including construction materials, furniture and toy manufacture, cabinetry, boat building, and musical instruments are also located in the region.

The region's forest industry is threatened by a number of trends. The industry is becoming less economically viable due to market trends including global market competition, outsourcing of production, consolidation, and rising business costs, especially associated with establishing a new business. Similar to other industries, forestry businesses are also struggling with workforce recruitment as many long-term workers retire. The saw mill directory maintained by the Vermont Department of Forests, Parks and Recreation shows 75 mills in the state as of 2023, which is a 28 percent decline from the 105 active mills in 2008. Increasingly, hardwood is exported as a raw material causing a loss of jobs from the associated value-added milling process.

According to the Vermont Natural Resources Council, the Windham Region saw a nearly 20 percent decline in the number of woodland acres from 2010 to 2020 from 81,602 acres to 65,723 acres. There was a similar 19 percent decline in woodland acreage in parcels greater than 50 acres in size. Trends that are impacting this decline in woodland acreage include rising property values and the conversion of forested lands for development. Changing climatic conditions are also making it more difficult for some native species to survive and allowing for the spread of invasive species, such as the emerald ash borer and the hemlock woolly adelgid.

TABLE 5-2: WINDHAM REGION WOODLAND ACREAGE, 2010 - 2020

Windham Region	2010	2020	Pct. Change
Acreage in Woodland Parcels	81,602 acres	65,723 acres	-19.5%
Acreage in Woodland Parcels Greater than 50 acres in Size	65,414 acres	53,007 acres	-19%

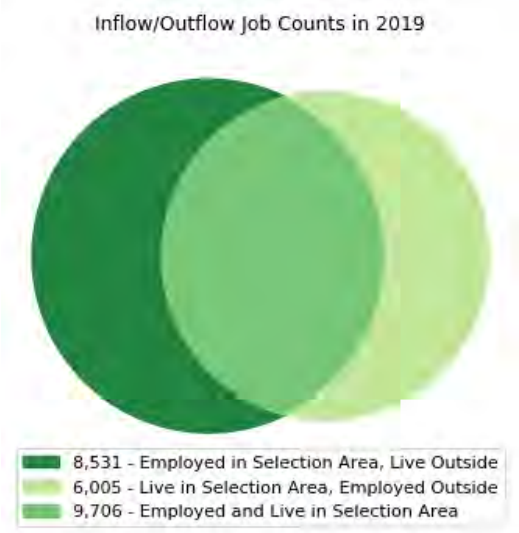
Source: Vermont Natural Resources Council Parcelization Website (https://vtforesttrends.vnrc.org/explorer)

In 2013, students at The Conway School produced a report for the WRC entitled *Our Working Landscape: Woodlands*

of the Windham Region. The Conway School is a graduate-level program in sustainable landscape planning and design located in Northampton, Massachusetts. The report explores how the working landscape may be maintained amidst recent economic, social, and environmental trends.

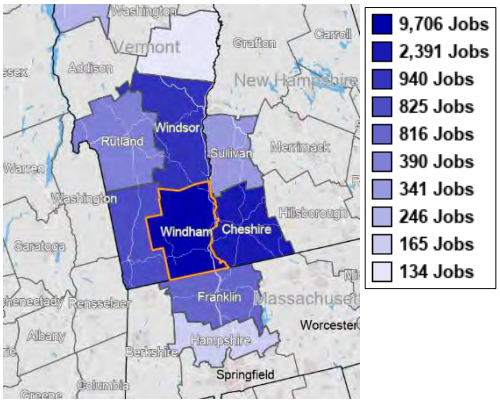
REGIONAL EMPLOYMENT CENTERS

Data on the inflow and outflow of jobs within Windham County points to the interconnectedness of the region with surrounding areas. As of 2019, 8,531 employees working in Windham County commuted from locations outside of the county. At the same time, 6,005 Windham County residents worked outside of the county. When planning for economic development, it is important to keep in mind that the strength and vitality of local economies in surrounding counties is also critical to supporting the residents of the Windham Region. This points to the need to collaborate with planning and development entities in adjacent counties to work on areas of shared interest.



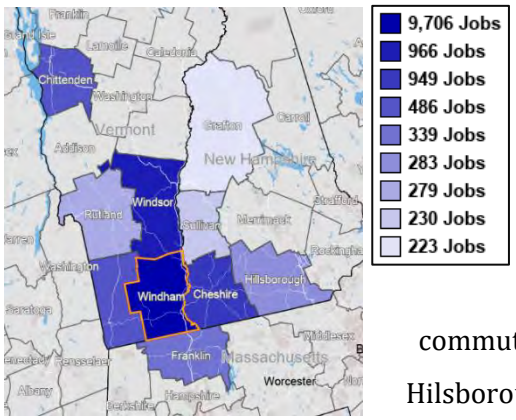
Data Source: U.S. Census Bureau, LEHD Origin- Destination Employment Statistics (2002-2019)

The map to the right shows where employees commuting into Windham County reside. The county with the largest number of residents commuting into Windham County is Cheshire County in southwest New Hampshire (2,391 workers). There are also a significant number of residents that commute from Bennington County (825) and Windsor County (940) in Vermont and from Franklin County in Massachusetts (816).



Data Source: U.S. Census Bureau, LEHD Origin-Destination Employment Statistics

The next map shows where Windham County residents commute to for employment opportunities outside of the county. The counties with the largest draw are Cheshire County, New Hampshire and Windsor and Bennington Counties. These counties include large regional employment centers, like Keene, New Hampshire, Greenfield, Massachusetts, and Springfield, White River Junction, Bennington, and Manchester in Vermont. Notably, residents are also commuting much longer distances, including to Chittenden County and Hilsborough County in central New Hampshire.



Data Source: U.S. Census Bureau, LEHD Origin-Destination Employment Statistics

ECONOMIC DEVELOPMENT POLICIES

1. Create adequate housing affordable to all income levels in order to retain and attract employees to the region.
2. Support efforts to attract and retain youth in the region by identifying and addressing barriers to their settling here, providing targeted educational and skill training opportunities, creating meaningful career options with livable wages, and encouraging social opportunities.
3. Promote activities and development that contribute to a strong and diverse economy, providing satisfying and rewarding job opportunities for citizens in all parts of the region and supporting a strong municipal tax base, while maintaining environmental standards and promoting environmental justice.
4. Support the creation of a variety of stable, year–round jobs with wages and other compensation that provide a livable income, and that include skills training programs and other benefits that contribute to the personal development and quality of life for all workers, particularly in areas with high unemployment or high numbers of workers earning less than a livable wage.
5. Utilize existing financial, physical, and technical resources to facilitate economic development, including the creative use and revitalization of suitable existing space for manufacturing and industrial activities, commerce, housing, and the arts.
6. Develop and assist the growth of small businesses including home businesses and entrepreneurial ventures that help preserve and revitalize communities.
7. Support educational programs for technical and trade skills in high wage and high demand jobs in order to improve the value of opportunities for the region's workforce.

8. Support the continued growth and development of large-scale industrial and commercial enterprises in the Industrial land use designation areas as identified in the Regional Plan and the infrastructure necessary to support those uses, including water and wastewater systems.

9. Encourage development and support of land-based industries, focusing on the production, distribution, and marketing of agricultural and forestry products and programs in a manner that maximizes the sustainable use of these resources, minimizes and repurposes waste, and promotes the economic, physical, and environmental well-being of our communities and their residents.

10. Promote the economy through tourism activities that emphasize the character of the region itself, including its beauty, culture, history, wildlife, and outdoor recreation.

11. Support efforts to invest in infrastructure and services that support existing businesses and attract new businesses in an equitable manner, including transportation, public water and wastewater systems, broadband internet, cellular service, and three-phase power.

12. Provide for adequate childcare options that meet the needs of all families in order to support a stronger workforce.

13. Encourage initiatives that provide support services for new immigrants and refugees to participate in the workforce, address quality of life needs for immigrants and refugees, and raise cultural awareness throughout the region to increase understanding of different cultures.

14. Support the arts and culture industry by encouraging increased use of community resources, improved cultural opportunities for all residents, and enhanced year-round tourism.

EDUCATIONAL, CULTURAL, AND RECREATIONAL RESOURCES

BACKGROUND

The Windham Region is fortunate to have access to a variety of educational resources, a rich and vibrant arts and cultural heritage, and a wealth of natural recreational resources. These resources are foundational to fostering strong local ties to the community, creating a high quality of life for residents, and improving the economic prosperity of our communities.

Educational resources encompass child care, elementary and secondary schools, higher education institutions, continuing education opportunities, and community libraries. A quality educational system is critical for achieving social and economic goals, including the availability of high-quality child care to support working parents and local businesses. Libraries play an important role in serving learning and information needs and providing a community center space.

Nationally recognized musicians, artists, writers, and craftspeople have chosen to make the region their home. The presence of the arts community enriches the lives of residents and visitors, and enhances the region's economic vitality and appeal as a place to live and do business. The region has an abundance of historic resources as well. Historic structures and sites are an integral part of the region’s character and quality of life. They serve as a link to the past and help strengthen the local economy by promoting investment as well as tourism.

Recreational resources in the region take many forms. Some communities have municipal recreation departments and provide a wide range of activities for various age groups. Ski resorts play an important role by providing recreation to residents and tourists, and increasingly through all four seasons. Hiking, road biking, mountain biking, horseback riding, cross-country skiing, snowmobiling, and hunting are just some of the recreational activities that also take place throughout the region’s vast forest resource areas. Residents and visitors utilize the many rivers, streams, lakes, reservoirs, and ponds for water recreation such as swimming, boating, and fishing.

EDUCATION AND LIBRARY RESOURCES

EARLY EDUCATION AND CHILD CARE

The availability of high-quality child care is a concern for many parents, employers, and communities. Affordable, high-quality child care is essential in developing a full employment economy, raising income levels, and lowering the need for public assistance. High-quality child care also has many positive benefits for a child’s social development

and preparation for elementary school.

According to a study entitled "Stalled at the Start: Vermont's Child Care Challenge" completed by Let's Grow Kids in 2022, the state has made improvements in increasing access to regulated early childhood education programs due to investments and programs over the last several years. However, there is still as significant unmet demand for Windham County families, in particular for programs that offer care for infants (6 weeks – 23 months). The primary barriers for families to accessing child care include location, hours, and ages served. The study notes that there is a particular need for programs that offer care for infant (6 weeks – 23 months) and for full-day and full-week programs that accommodate the needs of working families.

Several components need to be factored into locating additional or expanding existing child care facilities. Transportation concerns, including the rural nature of the road network and existing commuting patterns, location of employment centers, and population growth trends, all contribute to a unique environment for assessing specific child care facility location needs.

The Windham Child Care Association is a child care resource and referral agency of child care providers serving the Windham Region. Among other efforts, this association helps parents identify and locate quality child care that meets their needs, helps parents access the state child care financial assistance program, and builds partnerships with the business community and other community service agencies to support the needs of families and children. The organization manages a licensed child care center for children age 6 weeks to 5 years in Brattleboro and operates the Early Learning Express, the county's bookmobile program.

ELEMENTARY AND SECONDARY EDUCATION

There are five supervisory union districts serving towns in the Windham Region: Windham Central, Windham Northeast, Windham Southeast, Windham Southwest and Bennington Rutland (see the Educational Facilities Map). There are four public secondary schools in the region. Three are operated by union high school districts: Brattleboro Union High School District (Brattleboro), Bellows Falls Union High School District (Rockingham), and Leland and Gray Union High School District (Townshend). Wilmington and Whitingham formed the Twin Valley School District for the purpose of jointly providing secondary education for their towns. The Twin Valley High School is located in Whitingham. The region is also home to numerous independent elementary and secondary schools.

Following the adoption of Act 46 in 2015, the region has seen the consolidation of local schools with other districts which has had an impact on the governance and administrative structures of elementary and secondary schools. Many local school districts have merged in the region so that there are now school districts representing multiple towns while other school districts serve a single elementary school. School systems are governed by local school boards that provide oversight and policy guidance for school districts and supervisory districts. The supervisory unions boards are responsible for district-wide operations, such as central office administration, special education,

and transportation. School boards govern operations for specific schools.

Some towns that do not have their own elementary school pay the tuition for resident children to attend nearby public or independent elementary schools. Towns which do not have their own high school, or which do not belong to a union high school district, pay tuition for high school age students to attend nearby public or independent high schools.

School enrollment figures fell in the region over the last ten years, although not as significantly as the previous ten years. Total enrollment in the region dropped by 7 percent from 5,774 in the 2013-2014 school year to 5,349 in the 2023-2024 school year. The consolidation of schools as well as aging facilities has still led to new school construction projects in the region. The location of schools has a large impact on the community where they are located. Building new schools away from existing villages, town centers, and surrounding neighborhoods can result in a loss of vitality in these centers and increases public expenditures and vehicle trips.

In 2021, the Vermont legislature passed Act 74 requiring schools built or renovated before 1980 to test indoor air for the presences of Polychlorinated biphenyls (PCBs). Schools that were built or renovated before 1980 are more likely to have PCBs in building materials, commonly in caulk and fluorescent light ballasts. The Department of Environmental Conservation has authority to require schools to make fixes if PCB levels are high. All testing must be completed by 2027. The legislature granted funding to test for PCBs, however there are not currently funds allocated for determining the source of PCBs or to make fixes to lower elevated levels.

POST-SECONDARY EDUCATION

Three public post-secondary schools in the region offer courses or programs. The Community College of Vermont in Brattleboro offers Associates Degrees and provides a wide range of courses and workshops. Vermont Technical College has a satellite campus in downtown Brattleboro that offers Associate Degrees, career-related certificates, and training programs. In July 2023, Vermont Technical College joined Castleton University and Northern Vermont University to become Vermont State University. Lastly, the University of Vermont operates a regional Extension office and continuing education center at the Winston Prouty campus in Brattleboro.

The region hosts the campuses for two independent colleges. Landmark College in Putney offers programs designed to meet the needs of students with learning disabilities. The School for International Training has a low-residency campus in Brattleboro and offers undergraduate study abroad programs and graduate programs. Marlboro College in Marlboro was a small independent liberal arts college that closed in 2020.

ADULT EDUCATION

There are several opportunities for adult education in the region. In addition to the various programs offered through community libraries and individual groups, the Community College of Vermont has a learning center in

Brattleboro that offers associate degrees, career-related certificates, and credit and non-credit training programs. Vermont Adult Learning, which has an office in Brattleboro, provides instruction in reading, writing, speaking, listening, math, reasoning and problem solving, occupational and workplace skills and information technology to adults 16 years and older who are not enrolled in secondary school. Finally, the University of Vermont offers online continuing education courses through its Professional and Continuing Education program. Adult education programs can be important for helping out-of-work individuals re-enter the workforce. These programs are also beneficial to adults looking to change career paths.

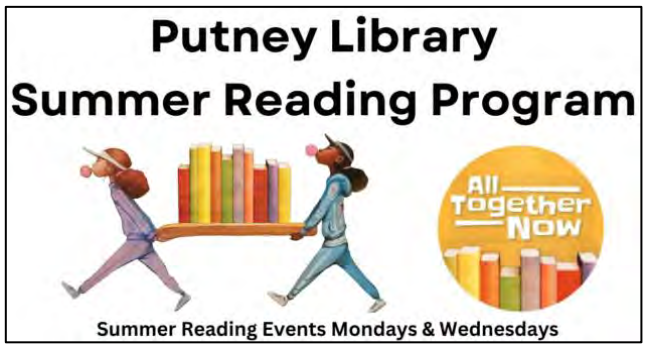
An additional piece of adult education is pairing training programs with businesses in the region so that workforce skills are being developed to meet the current and future needs of local businesses. The Brattleboro Development Credit Corporation (BDCC) has designed and implemented a number of workforce development programs through its Southern Vermont Workforce Center of Excellence that bring together private, public, and social sectors. BDCC has focused on job pathways in industries with high wages, demand, need, and opportunities.

LIBRARIES

The region's libraries play an important role in serving the learning and information needs of its citizens, as well as providing community centers for meetings and cultural events. Story times, after school programs, book discussions, lectures and films, and internet access are common programs at many of the region's libraries. Increasingly, libraries are taking on expanded roles as well, such as assisting residents with accessing social service needs.

PUTNEY LIBRARY SUMMER READING AND MEAL PROGRAM

The Putney Library offers a Summer Meal program with free pre-packaged bagged lunches for those aged 18 and younger, five days a week during the summer months. The Library also hosts a Summer Reading Program with different weekly activities and events for families throughout the summer. The Summer Reading Program receives funding from the Vermont Department of Libraries, the Vermont Community Foundation, and the Children's Literacy Foundation.



Source: Putney Library Website

There are 21 public libraries in the Windham Region with seven towns not having any libraries within their borders. Brooks Memorial Library in Brattleboro and Rockingham Library are the region's largest libraries. Most libraries in the region are linked in an electronic network designed and supported by the Vermont Department of Libraries to bring the entire state's resources, state library holdings, college, university and public libraries, to citizens of the region.

Adequate funding is a struggle for libraries in the region. Federal and state funds do not pay for basic local public library services. Many towns in the region depend on volunteers to operate the town library. Collaborations between local libraries and educational institutions may aid in providing other avenues for support.

CULTURAL AND HISTORIC RESOURCES

ARTS

The Windham Region is home to nationally recognized musicians, artists, writers and craftspeople. The presence of the arts community enriches the lives of residents and visitors, helps define the region, and adds to the local quality of life. The strength of the region's cultural resources also has a direct link to the well-being of our economy through spending by arts organizations and by audiences attending events. As noted in the Economic Development Chapter, the arts and cultural sector adds approximately $1.1 billion to Vermont's GDP, ranking it third in the state only behind retail and construction.

The Windham Region hosts many concerts, festivals, and performances. Summer concerts are held by the Yellow Barn in Putney, Friends of Music at Guilford, and Marlboro Music. The Brattleboro Music Center also hosts a series of choral, symphonic, and chamber works. Mount Snow and Stratton resorts also sponsor summer musical festivals. The Weston Theater Company is well known for their summer theater productions, but was significantly impacted by flooding in July 2023 and is working on reopening the Playhouse.

Several other theater companies, such as the New England Youth Theater and Sandglass Theater, offer workshops and perform in the region. The Brattleboro Museum and Art Center offers exhibits of work in a variety of media, often coupled with lectures or performances. Bellows Falls and Brattleboro have instituted popular monthly events in their downtowns with open art galleries and other community activities, known as Gallery Walk in Brattleboro and 3rd Friday in Bellows Falls. Finally, many artists region-wide also hold open studio events.

DOVER SUMMER CONCERT SERIES

The Town of Dover hosts an annual Summer Concert Series at the Dover Park in West Dover. These events are funded entirely from the Local Option Meals and Rooms Tax the Town collects. Concerts are offered on Sunday afternoons and Wednesday evenings throughout the summer months.

SUMMER CONCERT AT DOVER PARK
Photo Credit: Town of Dover Facebook Page

The Stone Church in Brattleboro, Next Stage in Putney, Latchis Theater in Brattleboro, Opera House in Bellows Falls, and Memorial Hall in Wilmington are all exceptional historic facilities that have undergone restoration and have been developed as performing art centers. There are several other small performance venues through the region including the Hooker Dunham Theater in Brattleboro and the Windham Hotel in Bellows Falls.

Craftspeople form a significant segment of the region's culture and economy, and play a major role in the heritage tourism that continues to grow in the region. A number of art and craft festivals are held annually that help support local artisans. The region also sustains professional storytellers, mimes, puppeteers, traditional and folk musicians, and folk, contra and Morris dancers. The Arts Council of Windham County is a volunteer organization that works to foster an inclusive, connected, and dynamic creative community in Windham County. The Arts Council provides targeted resources, services, and connections to help growth and strengthen the local arts community. One example of their work is the Brattleboro Arts Fund that received funding from the Town of Brattleboro and offers small grants for individuals and organizations for creative projects that contribute to the greater Brattleboro community.

HISTORIC RESOURCES

Historic structures and sites are an integral part of the Windham Region's character and quality of life. They serve as a link to the past and through preservation and rehab efforts can help strengthen the local economy by promoting investment in other properties and tourism. It is in the public interest to preserve and enhance these historic resources. One way this is done is through support of local historic societies in the region, and collaborating with these societies on town projects when it is appropriate. There is also an opportunity to take advantage of the adaptive reuse of historic structures to put them back into productive use and reduce the need for new construction.

BROAD BROOK COMMUNITY CENTER, GUILFORD CENTER

There are several examples of towns that have invested in rehabilitating historic structures within village centers to host community functions, meetings, and events. One example of this is the Broad Brook Community Center in Guilford Center, which was a Grange Hall and now is used for community events, concerts, classes, and meetings. There are a variety of preservation tools are available at the local, state and federal level. The following are just a sampling of tools available to towns in Vermont:

NATIONAL REGISTER OF HISTORIC PLACES

The National Register of Historic Places is the official list of the nation's resources worthy of preservation. Resources may be nominated individually, or in groups, as districts or as multiple resource areas and must generally be older than 50 years. Over 100 of the region's historic structures and districts are listed on the National Register of Historic Places. Inclusion on the National Register affords the property special recognition of its contribution to local resources, provides a review of effects which any federally funded project may have on the property (most notably highway projects), and may enable property owners to receive federal tax advantages for historically appropriate improvements. These tax advantages are critical for supporting the costly improvements to bring historic structures up to current codes.

VERMONT STATE REGISTER OF HISTORIC PLACES

Sites listed on the State Register of Historic Places are given due consideration during Act 250 reviews. During the permit process, the Vermont Division of Historic Preservation will make recommendations to the District Environmental Commission on the impact to the historic resource. In addition to the sites listed on the National Register, there are numerous other sites and structures are recognized in the State Register.

VERMONT DESIGNATED DOWNTOWN AND VILLAGE CENTER PROGRAM

This program is managed by the State Agency of Commerce and Community Development and seeks to recognize and protect the cultural and economic investments in villages and downtowns by offering technical assistance and tax credits. Currently, there are three designated downtowns (Brattleboro, Bellows Falls and Wilmington) and 27 designated village centers in the Windham Region.

LOCAL HISTORIC DISTRICTS

Vermont State law (24 V.S.A. § 4414) allows towns to create and administer a local historic district (see the Historic District Map). The purpose of a historic district is to protect and preserve areas of outstanding architectural and historic value from inappropriate alterations and additions which might otherwise detract from the character. Towns may also designate historic landmarks and enact Design Review Districts. Wilmington is an example of a town that has adopted a Design Review District for its historic downtown area.

PRESERVATION TRUST OF VERMONT

The Preservation Trust of Vermont is a charitable, non-profit organization that initiates and assists local and statewide efforts to preserve Vermont's historic, architectural, and community resources. Through educational programs and technical and financial assistance, the Preservation Trust works to protect and restore significant

historic properties, downtowns and community centers.

CERTIFIED LOCAL GOVERNMENT (CLG) PROGRAM

The CLG Program is a federally funded program administered by the state. A local government can participate in the program once the Vermont Division for Historic Preservation certifies the municipality. Matching grants are made each year to CLGs for survey and planning projects, including National Register nominations and education and advocacy projects. Rockingham is the only CLG in the Windham Region.

RECREATION RESOURCES

The State of Vermont completed an update to the Statewide Comprehensive Outdoor Recreation Plan (SCORP) in 2019. The SCORP outlines the state's priorities and goals to guide outdoor recreation planning, policies, programs, and investments for the 2019-2023 period. In the public survey completed for the plan, 93 percent of respondents ranked outdoor recreation as essential or very important in their households and 92 percent of respondents indicated they recreated outdoors 2 or more times per week. Hiking was ranked the highest for favorite activities (17%) followed by hunting (15%), mountain biking (11%) and walking (9%).

Within the towns of the Windham Region, there are varying levels of community facilities for recreation. Some communities, such as Brattleboro and Rockingham, have municipal recreation departments and provide a wide range of recreational activities for various ages. Other towns rely on volunteer groups to organize recreational leagues. In 2023, the towns of Landgrove, Londonderry, Peru, Weston, and Winhall created a new Mountain Towns Recreation Director position that is responsible for administering youth sports programs, overseeing Londonderry's 4 town parks, and expanding and coordinating recreational opportunities for all residents in these towns. Many of the region's athletic fields are public and are located at school properties.

DOVER TRAILS & RECREATION MASTER PLAN

The Town of Dover completed a Trails & Recreation Master Plan in 2020. The Plan notes how climate change has made consistent and adequate snowfall less predictable and the Town of Dover has recognized a need to offer a greater variety of recreational activities to make their winter recreation economy more resilient. Dover depends heavily on visitors coming to the Mount Snow Resort to support the local economy. The Plan calls for exploring new and building on existing opportunities, including a disc golf course, mountain biking, and hiking trails.

Ski resorts play an important role in the Windham Region by providing recreational opportunities for residents and visitors. The ski resorts have become a destination for all four seasons, marketing sports such as mountain biking and golf, in addition to traditional winter activities, to attract visitors. The region is seeing the impacts of climate change on annual snowfall amounts which is influencing ski resort operations including an increased reliance on snowmaking.

An important recreational resource to the Windham Region is its trail network. A wide variety of trails exists for a variety of recreational use. Long distance trails include the Appalachian Trail/Long Trail (hiking) and Catamount Trail (cross country skiing), which pass through the western part of the region, largely through the Green Mountain National Forest. The Velomont Trail is currently under development and would be a long distance mountain bike trail.

New trails designed to meet the needs of various recreation users are being created, in large part by municipalities and non-profit groups. Examples of this include the Putney Mountain Association's preservation and trail development work in Putney, Dummerston, and Brookline and the Windmill Hill Pinnacle Association's work in Westminster, Brookline, Athens, and Grafton.

PUTNEY MOUNTAIN TRAILHEAD

The Windham Region is also home to five state parks with developed visitor facilities: Fort Dummer State Park (Brattleboro), Molly Stark State Park (Marlboro), Townshend State Park, Jamaica State Park, and Lowell Lake State Park (Londonderry). The state parks offer opportunities for hiking, bike riding, swimming, canoeing, fishing, and camping. Sweet Pond State Park in Guilford and Dutton Pines State Park in Dummerston have trails and picnic shelters.

Bicycling and walking are expected to continue to grow in popularity along with support for multi-use paths and trails. Several efforts are underway to expand or create trails and paths including the Valley Trail along the North Branch of the Deerfield River connecting West Dover and Wilmington and the West River Trail which connects 4,500 acres of public land in Jamaica, Townshend, and Londonderry. Class IV roads and legal town trails provide important recreational resources throughout the region's communities, although these facilities are often unmanaged. Hiking, biking, mountain biking, horseback riding, cross-country skiing and snowmobiling are just some of the recreational activities that take place on these roads and trails.

The Windham Region is rich in water resources. Residents and visitors utilize the many rivers, streams, lakes, reservoirs, and ponds for water recreation such as swimming, boating, and fishing. Thirty-three lakes and ponds in the Windham Region are over 20 acres; among these major water bodies, there are a total of 102.1 miles of shoreline (half of which are on just 2 lakes). Approximately 80 percent of this shoreline, 81.4 miles, is public or conserved. Nearly all of these water bodies have public access or road frontage, and many of them have developed public fishing

access sites or boat launches. Water quality and shoreland protection must be maintained and enhanced as the demand for water recreation increases.

As the region continues to invest in its trail networks, there is an opportunity to make connections between these different trails to increase accessibility. An additional need is to improve wayfinding and signage to enhance the user experience at recreational areas and increase participation rates. Lastly, more recreational opportunities are needed for people with mobility issues and the elderly population. A component of this is promoting and improving existing recreational facilities that may be suitable for these groups.

EDUCATIONAL, CULTURAL, AND RECREATIONAL RESOURCES POLICIES

EDUCATION AND LIBRARY RESOURCES

1. Support efforts to increase the availability, affordability, and accessibility of childcare, and in particular for infant programs.

2. Encourage school renovation and building projects in existing developed areas such as downtowns, village centers, and surrounding neighborhoods in order to take advantage of existing infrastructure, encourage walking and bicycling to school where appropriate, and to enhance revitalization of communities.

3. Facilitate town discussions around school consolidation and reuse of former school buildings as requested.

4. Support efforts to provide sufficient funding to modernize school facilities and complete remediation work at schools to address the presence of contaminants, such as PCBs and PFAS.

5. Support efforts to retain the public and private libraries in our towns. Libraries are important pieces of social infrastructure, they provide free and open access to materials and technology , they offer safe, welcoming spaces that foster independent and community-based learning, they nurture public trust and support life-long education, and they empower diverse communities.

6. Support BDCC's workforce development programs which work with educational organizations and employers and are designed to train young people for employment opportunities and to attract others, including new Americans, to the region.

CULTURAL AND HISTORICAL RESOURCES

7. Foster and encourage a vibrant local arts and cultural community through assistance and support for local arts and cultural facilities, organizations, education, art marketing, and distribution efforts.

8. Protect places of outstanding educational, aesthetic, archeological, or historical value from adverse impacts and require mitigation measures when they cannot be avoided. Encourage preservation of significant historic sites or structures through support of ownership, protective easements, and/or other regulatory options.

9. Support local, regional, and State non-profit historic preservation trusts and private property owners' efforts in the rehabilitation and adaptive reuse of significant historic sites and structures.

RECREATIONAL RESOURCES

10. Provide varied and accessible opportunities for outdoor recreation.

11. Facilitate the orderly development of public and private recreational facilities and resorts.

12. Recognize the recreational potential of watercourses and shorelines and encourage provision of facilities for sustainable water-oriented day use that does not impair the resource or related habitat.

13. Protect existing trail corridors with a focus on sustainable trail systems.

14. Work with towns to manage and utilize Class 4 roads and other public rights-of-way for future trail development and public access.

15. Support federal, state, and local acquisition and management of land and facilities well-suited for outdoor recreation.

16. Support increasing public opportunities for multiple-use recreation and for public access to recreation lands. Ensure provision of separate areas or facilities for conflicting uses of recreational resources when such conflicts create safety hazards or significantly impair the use or enjoyment of the resource.

17. Encourage the development of wayfinding signage and other ways to increase access of recreational resources and equity of access.

18. Promote expanding accessibility of recreation resources for people with mobility issues and our aging population.

IMPLEMENTATION

BACKGROUND

The Regional Plan provides a vision for the region's future and offers guidelines, policies, and programs that together can serve as a roadmap for growth and development. This chapter describes methods the Windham Regional Commission will use to implement these guidelines, policies, and programs. There are three main mechanisms for Regional Plan implementation: (1) providing member towns with technical assistance to implement policies and recommendations from this plan at the local level; (2) managing regional programs and studies that benefit the region as a whole; and (3) cooperative engagement and partnership with state, federal, and regional agencies and non-profit and private entities that carryout the plan's goals and policies.

The plan also functions as the foundation for the Commission's annual Work Program. Programs identified in this plan and the implementation strategies will be reviewed each year in preparing the Work Program. Consideration should be given to identifying the highest priority needs in formulation of the document. In addition, this chapter discusses the project review process for Act 250 and Section 248 applications that are considered by the WRC for compliance with the Regional Plan, and the Plan's relationship to development trends, needs, and the plans for local municipalities and adjacent regions.

The WRC relies on a variety of different revenue sources to fund its work, which are described in the summaries of the implementation mechanisms. In addition, the Implementation Matrix identifies funding sources for the different action steps. Most of the WRC's revenue sources are tied to contracts with different State agencies and have scopes of work, guidelines, and performance measures. This means that the WRC has limited control over how it chooses to use the majority of its funding. Funding received through town assessments is particularly important as that revenue source provides us with the greatest latitude to respond to WRC-identified needs in the region. The WRC also receives funding from federal agency and non-profit organization grants and contracts for the provision of technical services with its member towns.

PUTTING THE REGIONAL PLAN INTO ACTION

MUNICIPAL PLANNING ASSISTANCE

The established municipal plans of member towns provide important vehicles to further Regional Plan policies. The Regional Plan also provides a framework to guide member towns when developing or amending their own town plans, pursuant to 24 V.S.A. § 4349a. The WRC will consult with member towns prior to the expiration of their town

plans, or at any other time when requested. This consultation includes a review of the municipalities' planning efforts, understanding the municipalities' planning needs, and identifying assistance that can be provided by the WRC. In addition, the WRC will review the current town plan and provides recommendations on necessary updates to the plan to ensure compliance with the required plan elements under 24 V.S.A. §4382 and consistency with Statewide planning goals under 24 V.S.A. §4302.

After a town plan has been adopted, a municipality may request that the WRC approve the plan and confirm the local planning process under §24 V.S.A. 4350. The approval and confirmation process is completed by the Planning Coordination Committee. Currently, all member towns with an adopted town plan have received approval of their plans and confirmation of the planning process from the WRC. This has the benefit of making towns eligible for funding under the State Municipal Planning Grant program.

The WRC will provide towns with technical assistances in terms of planning, zoning and subdivision bylaw adoption and revisions, ordinances, and other implementation tools, such as capital budgeting and programming. It is the policy of the WRC to offer the maximum level of basic services to all of its town under the core funding received from the Vermont Agency of Commerce and Community Development. Municipalities may also obtain special technical assistance services to meet local needs beyond these basic services. Furthermore, the WRC can assist member towns with inter-municipal coordination efforts to address regional issues and pooling resources for services such as administrative assistance and for purchasing equipment and materials.

The WRC will organize and provide regular trainings for town officials on topics related to land use planning and regulations as well as other relevant topics that would be beneficial for municipalities in the region. The WRC will continue to maintain a website that serves as a forum for distributing news and information and providing access to Town Plans and maps. The Commission maintains a Geographic Information System (GIS) Service Center to offer data and mapping analysis to support our member towns, our own programs, and other projects.

The WRC will assist municipalities in identifying grant opportunities and preparing grant applications for projects that support planning efforts, housing and economic development projects, and transportation and other public infrastructure improvements projects. As requested, the WRC will also provide project management services to administer grants and contract with towns to complete grants for projects such as town plan and bylaw updates.

REGIONAL PROGRAMS

The WRC manages several regional programs that implement a variety of goals and policies in the Regional Plan. These programs are discussed in greater detail throughout the Plan. Regional programs benefit our whole region and also can provide additional technical support and assistance to member towns that supplements the general municipal planning assistance described above. Funding is received from various state and federal grant sources and

programs are dependent on the continuation of these funding streams. The WRC also regularly manages and implements other special projects that may be funded by the State to support different priorities and initiatives. These are usually shorter term, running for up to several years, and entail coordinating with municipalities.

BROWNFIELD PROGRAM

The WRC manages the Windham Region Brownfields Reuse Initiative (WRBRI) with funding from the Federal Environmental Protection Agency to facilitate brownfields redevelopment in the region's towns. The program conducts site assessments, cleanups, and related activities at brownfield sites. The WRBRI also provides landowners with a better understanding of the funding sources, benefits, and tax incentives available to redevelop such sites.

TRANSPORTATION PLANNING

The Transportation Planning Initiative (TPI) is a partnership between VTrans and WRC that provides transportation planning support and resources to the region's towns. Local communities are represented through a regional Transportation Advisory Committee (TAC). The TAC prioritizes projects, identifies local and regional transportation needs, and provides a platform for public involvement in the planning and development of the state's transportation system in the Windham Region. The WRC serves as the point of delivery for the statewide transportation planning process to support local, regional, state, and federal transportation network advancement. Specific tasks completed by WRC staff include assisting towns with transportation-related grants, conducting transportation inventories, assisting with the transportation element for town plan updates, conducting road erosion inventories, and serving as a Municipal Project Manager for transportation projects.

WATER QUALITY PLANNING

The WRC works with the Agency of Natural Resources to implement the State's Clean Water Initiative through basin planning and assistance to towns to meet statutory and regulatory requirements. This work includes engaging with municipalities to develop tactical basin plans, providing technical assistance and data collection activities, assisting with prioritizing water quality improvement projects, and supporting municipal planning and adoption of regulations to better meet State water quality policies.

EMERGENCY PLANNING

The WRC works with its member towns, Vermont Emergency Management, local emergency responders and emergency management directors (EMDs), mutual aid organizations, the Red Cross, Vermont Agency of Transportation, and the State Emergency Response Commission to promote better emergency planning and disaster resilient communities. One example is holding regular Roundtables with EMDs and Fire Chiefs that cover relevant topics. The WRC also works or has worked with the vast majority of member towns to develop or update Local

Hazard Mitigation Plans.

ENERGY PLANNING

The WRC works with its member towns on a variety of energy-related projects. Following the passage of Act 174 in 2016, the WRC received funding from the State to support towns in developing Enhanced Energy Plans that give municipal plans greater weight in the Section 248 process. Currently, the WRC is working with the State Agency of Administration on the Municipal Energy Resilience Program. This program provides staff support, technical assistance, and funding to increase energy resilience, reduce energy use and costs, and curb greenhouse gas emissions by promoting weatherization, fuel switching, renewable energy, and other improvements in municipal buildings.

REGIONAL PLANNING STUDIES

The WRC will complete studies or projects with regional interest that will be beneficial for member towns. In some cases, these studies will be undertaken because there are efficiencies in the WRC managing a project that includes specific plans and recommendations for individual municipalities versus separate towns completing projects on their own. For example, a recommendation in this Plan is for the WRC to hire a consultant to complete a regional village water and wastewater needs assessment and feasibility plan.

Other studies will focus more on issues that span municipal boundaries and benefit from taking a regional approach, such as the recommendation of completing a regional open space and recreation plan and a region-wide housing needs assessment. Specific studies or projects identified in the Regional Plan are listed out in the Implementation Matrix. The WRC may identify and pursue other priority regional projects before completing the next update to this Regional Plan. The WRC's ability to complete these types of regional planning studies and projects is limited by the availability of funding.

COORDINATION WITH STATE, REGIONAL, AND PRIVATE/NON-PROFIT ENTITIES

Much of the work to implement the Regional Plan needs to be done in collaboration with state agencies, regional organizations, and private and non-profit entities. An important role that WRC plays is to coordinate efforts between these groups and local municipalities to help carry out common goals and priorities. There are also efficiencies in these partnerships that can secure more resources for the region. The core funding received from the Vermont Agency of Commerce and Community Development is the main revenue source for supporting the WRC's staff time on these efforts.

At the state level, the WRC regularly works with the Department of Transportation, Agency of Natural Resources, Department of Health, and Department of Housing and Community Development on a variety of efforts and projects that impact and benefit member towns and the region. The WRC also participates in the state legislative policy

process when requested to provide expert opinion on deficiencies and possible improvements to existing state laws, in particular related to land use, development, natural resources, and municipal governance. The WRC is an active participant in the Vermont Association of Planning and Development Agencies, the statewide association of regional planning commissions.

Under state law, towns are able to create agreements, compacts, and districts amongst themselves to undertake certain types of projects or provide services to residents that address goals and policies in the Regional Plan. Examples in the Windham Region include solid waste districts, union school districts, and fire and water districts. WRC staff also regularly collaborates and participates in regional groups and initiatives that help further the Plan's goals and policies, the Brattleboro Development Credit Corporation, Southeastern Vermont Economic Development Strategies, Southeast Vermont Transit, and the Housing Coalition of Southeast Vermont.

Finally, the non-profit and private sectors play an important role in the implementation of the Plan. There are numerous non-profit organization that provide social services, health care, and affordable housing for Windham Region residents and WRC staff will coordinate with these different entities as needed. Conservation groups, such as the Vermont Land Trust and the Putney Mountain Association, work on preserving lands in the region with important natural resources and often provide recreational opportunities as well. The Vermont Housing and Conservation Board and Vermont Preservation Trust also provide funding for farmland preservation, land conservation, and historic property preservation and rehabilitation.

IMPLEMENTATION MATRIX

The *Putting the Regional Plan into Action* section of the Implementation Chapter describes a variety of different mechanisms for how the Windham Regional Commission will implement the Regional Plan. The Regional Plan also includes numerous recommended action steps throughout meant to implement the goals and policies of the plan. To help organize these different recommended actions, WRC has created the below Implementation Matrix that includes all of these action steps in one location. The Implementation Matrix identifies a lead entity primarily responsible for each action step and any partners, a general priority level, and potential funding sources. The Implementation Matrix is meant to provide towns and members of the public with a better sense of the projects and efforts the WRC will be working on to implement the plan, and will allow the WRC to monitor progress on these implementation steps.

Windham Regional Plan: Implementation Matrix

Land Use			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Provide towns with technical assistance on planning, zoning and subdivison bylaws, and ordinances to support compact settlements and protect important forest and agricutural lands	WRC	High	State Funds, Municipal Planning Grants, Town Funds
Provide trainings for town officials on topics related to land use planning	WRC	High	State Funds
Conduct conslutations with member towns and provide recommendations on necessary updates to Town Plan to ensure compliance with statute requirements	WRC	High	State Funds
Review and comments on applications submitted under Act 250 based on conformance with the Regional Plan.	WRC Project Review Committee	High	State Funds
Work with towns to strenghten Flood Hazard and Fluvial Erosion Hazard Bylaws to mitigate risks to public safety, critical infrastructure, historic structures, and municipal facilitie from inundation and erosion.	WRC/ANR	High	ANR/VEM
Assist member towns with inter-municipal coordination to address regional issues and to combine resources for municipal services	WRC/Municipalities	High	State Funds, Town Funds
Work with towns, state and federal agencies, and conservation organizations to identify and conserve important agricultural and forest land	WRC/ANR/Dept of Ag/Muncipalities/ NGOs	High	Various
Work with adjacent Regional Planning Commissions in Vermont, New Hampshire, and Massachussets on land use-related issues that span regional boundaries	WRC	Medium	State Funds

Windham Regional Plan: Implementation Matrix

Educational, Cultural, and Recreational Resources			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Work with towns to review zoning bylaws to ensure regulations allow for childcare providers to be located in the community	Municipalities/WRC	Medium	State Funds, Municipal Planning Grants, Town Funds
Provide town and school officials with assistance on grant applications that support students walking and bicylcing to schools	Municipalities/ School Districts/WRC	Medium	VTrans, Town Funds
Support the development of an arts and cultural plan for the Windham Region	Municipalities/ NGOs/WRC	Medium	Grants
Participate in efforts to design and install consistent wayfinding signage for regional recreational trails	Municipalities/ NGOs/WRC	Medium	State Funds, Grants
Participate in efforts involving federal and state land acquisition in the region for outdoor recreation and conservation purposes	Municipalities/ State/ Dept of Ag/WRC	Medium	Various
Provide technical support to town Conservation Commissions and Recreation Committees working on improving local recreational opportunities	Municipalities/WRC	High	State Funds
Develop a Regional Recreational Plan	WRC	High	Grants
Work with the State, Connecticute River Conservacy, and towns to increase river access	WRC/ANR/ Municipalities/CRC	Medium	State Funds, Town Funds, Grants
Work with the Vermont Arts Council and the Agent for the Southern Vermont Creative Zone to support the arts and cultural sectors	WRC/NGOs/ Municipalities	Medium	State Funds

Windham Regional Plan: Implementation Matrix

Community Utilities, Facilities, and Services			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Work with towns to develop capital improvement plans to budget for the development, maintence, and expansion of water and wastewater systems	WRC/Municipalities	High	Municipal Planning Grant, Town Funds
Work with towns to develop shared services and supplies agreements to reduce municipal costs	WRC/Municipalities	High	Town Funds
Complete a regional municipal wastewater and water assessment	WRC/Municipalities	High	Grants
Assist towns with identifying and applying for grants for municipal water and wastewater improvement projects	WRC/Municipalities	High	State Funds
Assist towns with maintaining and updating solid waste implementation plans	WRC/Municipalities	Medium	
Review and comments on applications submitted under Section 248 based on conformance with the Regional Plan.	WRC Project Review Committee	High	State Funds
Work with towns to annually update Local Emergency Operations Plans	WRC/Municipalities	High	State Funds
Work with towns on hazard mitigation efforts, including updating hazard mitigation plans and assisting with grant applications for road, bridge, and culvert improvements	WRC/Municipalities	High	FEMA, State Funds
Hold regular meetings and trainings for town EMDs and Fire Chiefs to cover emergency management issues impacting the region	WRC/Municipalities	High	State Funds
Support towns in updating zoning bylaws to ensure that nursing homes and residential care facilities can be developed in village and town centers to take advantage of existing infrastructure, services, and facilities	WRC/Municipalities	Medium	State Funds, Municipal Planning Grants, Town Funds

Windham Regional Plan: Implementation Matrix

Economic Development			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Assist towns with grant applications for community facility and public infrastructure improvements that will support and enhance economic development opportunities	WRC/Municipalities	High	State and Federal Grants
Work with towns and property owners to utilize the Windham Region Brownfields Reuse Initiative to facilitate the redevelopment of former industrial and commercial sites	WRC/Municipalities/Property Owners	High	WRC/EPA/State
Participate in regional planning efforts and partner with organizations addressing economic development, including BDCC, the Comperehensive Economic Development Strategy, and SeVEDS	WRC	High	State Funds
Assist towns with completing applications for dowtown and village center designations with the Department of Housing and Community Development	WRC/Municipalities	High	State Funds
Work with towns to update zoning bylaws to support growth and investment in village centers and downtowns, including infill development, adaptive reuse of buildings, and height/density bonuses	WRC/Municipalities	High	State Funds, Municipal Planning Grants, Town Funds

Windham Regional Plan: Implementation Matrix

Housing			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Provide towns with assistance updating town plans and bylaws to promote and allow more housing that meets the needs of all residents.	WRC/Municipalities	High	Municipal Planning Grants, Town Funds
Support housing development and rehabilitation in centers, especially where infrastructure is in place and there is minimal impact to natural resources.	WRC	High	VT Housing and Conservation Board, ACCD & Windham Windsor Housing Trust
Work with towns to ensure that new housing is not built in flood plains, fluvial hazard areas or other areas of concern. Update bylaws accordingly.	WRC/Municipalities	High	Municipal Planning Grants & Local Hazard Mitigation Plans
Promote alternative housing opportunities such as condominiums, homesharing, co-housing, housing cooperatives and Accessory Dwelling Units (ADUs) .	WRC/Housing nonprofits	Medium	Windham Windsor Housing Trust & Sharing Housing Inc.
Provide technical assistance to towns pursuing infrastructure (water and wastewater) development that supports housing needs.	WRC/Municipalities	High	VT Village Wastewater Program & Northern Borders Regional Commission
Through the Windham Region Brownfields Reuse Initiative, provide funding to assess and cleanup contaminated sites to be redeveloped for housing.	WRC Brownfields Committee/ Property owners	High	WRC/EPA/State
Provide towns with information about innovative planning, design, and construction techniques that minimize long term costs and energy consumption of housing.	WRC	Medium	State Funds
Participate in the Housing Coalition of Southeastern Vermont, who addresses housing needs and homelessneess throughout the region.	WRC	High	State Funds
Investigate the impacts of Short Term Rentals on the local housing market and support town management of STR's.	WRC	Medium	State Funds, Grants

Windham Regional Plan: Implementation Matrix

Natural Resources			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Provide education materials and sponsorship of workshops on invasive species and best management practices.	WRC/ SE VT CISMA	High	VT Urban & Community Forestry Program
Partner with regional and State organizations to identify and manage invasive species	WRC/SE VT CISMA/State Agencies	Medium	NRCS/VT Urban & Community Forestry Program
Develop conservation plans at the regional level to support regional forest and wildlife connectivity.	WRC/Land Trusts	High	Private Foundations
Develop a steering committee of representatives from various stakeholder groups to maintain important forest vitality and resources across town boundaries.	WRC/Municipalities/Land Trusts	Medium	State Funds
Assist Towns in identifying and mapping local and regional forest blocks and connectors, and in developing policies and actions which will protect them from fragmentation.	WRC/Municipalities	High	State Funds
In support of the state initiative and values of the 30x30 and 50x50 conservation of land targets, work with State and regional organizations to identify potential priority conservation parcels in the region.	WRC/ State Agencies/ Land Trusts	High	Private Foundations
Support municipalities with FEMA buyouts in special flood hazard areas and provide information and resources on how to manage the land for flood resiliency.	WRC/Municipalities	High	State Funds
Work with municipalities, other organizations and the State of Vermont in identifying and supporting residential and commercial customers to improve leaking septic systems.	WRC/State Agencies/ Municipalities	Medium	State Funds
Work with municipalities, the State, and regaional non-profit partners to identify potential floodplain access projects.	WRC/State Agencies/ Municipalities/NGOs	High	State Funds
Send Federal Energy Regulatory Commission (FERC) updated regional plans, town plans, and flood hazard by-laws when they are updated	WRC	Medium	State Funds

Windham Regional Plan: Implementation Matrix

Natural Resources (Cont.)			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Work with municipalities and other organizations to identify and reclassify qualifying waters to more protected classification levels.	WRC/Municipalities	High	Tactical Basin Funding/ 604b Funds
Work with municipalities and other organizations to identify and protect surface waters that qualify for Outstanding Resource Waters.	WRC/Municipalities	High	Tactical Basin Funding/ 604b Funds
Assist municipalities in developing and adopting Floodplain By-laws.	WRC/Municipalities	High	Tactical Basin Funding/ VEM
Work with Municipalities and FEMA to update the FEMA floodplain maps for the WRC region.	WRC/Municipalities/FEMA	High	VEM Funding
Assist towns in developing regulations related to development on steep slopes so that streams and wetlands are adequately protected from runoff and sedimentation.	WRC/Municipalities	Medium	State Funds
Support towns in implementing the procedures contained in the Vermont Better Backroads Manual and encourage them to implement Best Management Practices (BMPs) on hydrologically connected road segments to comply with the Municipal Roads General Permit.	WRC/Municipalities/VTrans	High	ANR
Encourage municipalities to have road crew staff attend the River and Roads Training offered through Vermont DEC and Vtrans.	WRC	High	ANR
Work with solid waste districts to educate households in the proper disposal of hazardous wastes.	WRC/Solid Waste Districts	Medium	State Funds
Coordinate with the Agency of Natural Resources, other state agencies, and local officials in the assessment, cleanup, and redevelopment of contaminated (brownfield) sites.	WRC/Municipalities/Property Owners	High	WRC/EPA/State
Assist municipalities in developing municipal water supplies to better allocate resources and reduce the likelihood of individual well contamination from the surface.	WRC/Municipalities/State Agencies	Medium	State Funds
Assist municipalities in adopting zoning or ordinances to limit development on steep slopes.	WRC/Municipalities	High	State Funds, Municipal Planning Grants, Town Funds

Windham Regional Plan: Implementation Matrix

Natural Resources (Cont.)			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Work with municipalities and other organizations to identify unique habitats of local significance, rare, threatened and endangered species and fragile areas.	WRC/Municipalities/ NGOs	High	State Funds
Work with Town Conservation Commissions to ground-truth local habitats of importance.	WRC/Municipalities	Medium	State Funds
Assist municipalities in identifying important wildlife corridors in their communities.	WRC/Municipalities	Medium	State Funds
Develop a regional map identifying regionally significant wildlife corridors and wildlife crossings on regionally important roads.	WRC	High	State Funds
Coordinate multi-town scenic resources for towns to consider.	WRC/Municipalities	Medium	State Funds
Provide suggestions to municipalities to consider higher elevation ridgelines, historic structures and areas, ponds, lakes and wetlands, and town level scenic roads as scenic resources.	WRC/Municipalities	Medium	State Funds
Provide information to municipalities on how to assess and mitigate human/beaver interactions.	WRC/BEEC	High	VT DEC Grants
Promote awareness and regular use of available wetland site screening tools to help people who are planning to develop a parcel of land.	WRC/VT DEC Wetlands	High	Tactical Basin Funding
Work with conservation groups in the region to develop a collaborative group, such as a Regional Conservation Partnership, that addresses connectivity on the regional level.	WRC/Conservation Groups	High	Private Foundations
Work with municipalities to update language and actions in town plans to promote forest connectivity	WRC/VT Fish & Wildlife Community Wildlife Program	High	Private Foundations

Windham Regional Plan: Implementation Matrix

Energy			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Work with organizations on the state and regional level to connect and educate municipalities, businesses and individuals to energy conservation and efficiency practices.	WRC/VECAN/VEIC/ Efficiency Vermont	High	State Funds
Promote the activities of organizations such as SEVCA, NeighborWorks and Heat Squad that provide technical support for weatherization.	WRC	High	State Funds
Support the establishment of Municipal Energy Committees and work with existing committees to advance energy programs in their communities	WRC/Municipalities	High	State Funds
Work with utilities and municipalities to identify and install energy resiliency measures	WRC/ Green Mountain Power/ Municipalities	High	Energy Resiliency Program
Support utilities in their advancement of smart grid technologies to allow energy consumers to make informed choices about their energy usage and expenditures by monitoring when they are using energy, how much they are using, and how much it costs.	WRC/Green Mountain Power	Medium	State Funds
Support requirements that utilities improve the efficiency of procedures and infrastructure and assist customers to conserve energy and reduce costs.	WRC/Public Service Department	Medium	State Funds
Promote programs which support a regional push to perform energy audits for all public buildings.	WRC/VT Building and Gerneral Services	High	MERP
Provide educational materials and workshops to inform towns, businesses, and residents on energy conservation practices and programs. These efforts can include tours of efficient buildings, hand-on conservation projects, and workshops on Vermont's Energy Building Codes.	WRC	High	State Funds

Windham Regional Plan: Implementation Matrix

Energy (Cont.)			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Organize regular regional-wide knowledge sharing forums where organizations, towns, and individuals can bring strategies, innovations, and information about conservation and efficiency.	WRC	Medium	State Funds
Organize gatherings of Energy Committees in the region to promote sharing, collaboration and inspiration.	WRC	High	State Funds
Distribute educational information on: Energy conservation techniques; Energy-efficient products and weatherization programs; Available energy options and their respective impacts and costs; and Opportunities for energy diversification and locally based energy sources.	WRC/Efficiency Vermont	Medium	State Funds
Provide education to municipalities on state incentives for switching from fossil fuel to renewable, resilient and stable energy heating systems	WRC/Efficiency Vermont	High	State Funds
Work with BDCC to promote the benefits of energy conversion to renewable energy sources for businesses	WRC/BDCC	Medium	State Funds
Work with utility companies to harden existing utility lines, develop micro-grids and install battery back-up systems.	WRC/Green Mountain Power	High	Resiliency Zones Project
Encourage the State and Municipalities to enforce the State of Vermont Energy Building Codes for new construction.	WRC	Medium	State Funds
Work with municipalities to adopt language in Town Plans requiring new construction to adhere to Vermont Energy Building Codes.	WRC	High	State Funds
Encourage new development and the repurposing of existing structures to utilize strategies to increase energy efficiency, including consideration of transportation energy use, on-site generation and heating systems, and reuse/repurposing of existing structures.	WRC	Medium	State Funds

Windham Regional Plan: Implementation Matrix

Energy (Cont.)			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Bring together government leaders at the local and state level as well as business leaders to discuss how to decrease the reliance on single-occupancy vehicle trips on the local level.	WRC/Vtrans	High	VTrans
Encourage the increased use of public transit and ride sharing/carpooling.	WRC/MOOver/ VTrans	High	VTrans
Facilitate the development of walking and biking infrastructure	WRC/VTrans	High	VTrans
Assist municipalities in amending zoning by-laws to include EV charging stations as an acceptable use.	WRC	High	Municipal Planning Grants/State Funds
Give developers an incentive for installing EV Chargers by scoring a project more favorably in the WRC Project Review process.	WRC	Medium	State Funds
WRC will assist Town Energy Committees in identifying potential solar sites within their community.	WRC	High	State Funds
Bring together stakeholders (such as Town Energy Committees, PUC, Solar Developers) to discuss how to encourage more renewable energy generation in the region.	WRC	High	State Funds
Work with the State, utility companies, and other energy suppliers to create a regional energy profile as a foundation for planning to meet future regional energy needs and to provide guidance on energy development in our member towns.	WRC	High	State Funds
Facilitate inter-town conversations about appropriately scaled and sited generation sources, which include consideration of the wishes of residents regarding the meaning of “appropriate” as expressed in their town plans. The WRC recognizes that host towns and abutting towns may have different goals in this area, and will use its best efforts to gain consensus and/or cooperation among them	WRC/Municipalities	Medium	State Funds

Windham Regional Plan: Implementation Matrix

Energy (Cont.)			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Suggest to the State to create an At-the-Ready process for energy contractors.	WRC/State	Medium	State Funds
With regard to all energy generation, transmission, and distribution projects that come before WRC: Ask developers to conduct thorough and proper studies and analyses of all anticipated socioeconomic and environmental impacts, both positive and negative; Adequately address all areas of concern regarding proposed developments; effectively and adequately address all issues related to facility operation and reliability; and adhere to a high environmental standard that includes avoiding negative environmental impacts to the extent possible and adequately minimizing and mitigating those that cannot be avoided.	WRC	High	State Funds
Facilitate public participation as an integral part of the decision-making process for siting, evaluating, and relicensing energy generation, transmission, and distribution facilities and for electric utility deregulation.	WRC	High	State Funds
Pursue staff training opportunities in diversity, equity, and inclusion to enhance capacity to understand, analyze, and integrate equity considerations in all policies and programs.	WRC	High	State Funds
WRC will work towards creating a framework for consistently addressing issues of equity and justice across Regional and Municipal energy policies and plans	WRC	High	State Funds
Work with the State to collect the robust and reliable data required to better understand baseline and historical inequities, and to measure progress towards remediating them.	WRC/Public Service Department	Medium	State Funds

Windham Regional Plan: Implementation Matrix

Transportation			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Assist towns with compliance and administration of the Municpal Roads General Permit to minimize stormater runoff and road erosion	WRC/Municipalities	High	State Funds
Provide assistance to towns considering reclassification of state highways to Class 1 in downtowns and village centers	WRC/Municipalities	Medium	State Funds
Host Windham Region Road Formean meetings or traninings on local areas of concern on a regular basis	WRC	High	State Funds
Assist towns to develop capital improvement plans that address maintenance needs for paved and gravel roads, bridges, and culverts and to identify potential funding sources	WRC/Municipalities	High	State Funds
Advocate for a more equitable distribution of bridge funding for small, rural towns in the region	WRC/Municipalities	High	State Funds
Provide technical assistance to towns to identify pedestrian and bicycle improvement projects and potential fundings sources	WRC/Municipalities	High	State Funds
Advocate for the continued operation and expansion, where appropriate, of sand and gravel resources in the region to support town road infrastructure needs	WRC	Medium	State Funds
Assist Southeast Vermont Transit with developing strategies to increase ridership and advocate for the expansion of bus routes where feasible	WRC/SEVT	Medium	State Funds
Coordinate with regional planning agencies in adjacent states on transportation issues that span the state boundaries, including the Southwest Region Planning Commission in New Hampshire and Franklin Regional Council of Governments in Massachusetts	WRC	Medium	State Funds
Support the WRC Transportation Advisory Committee and hold regular meetings	WRC	High	State Funds
Support transportation planning studies and the completion of construction projects in member towns by serving in a Municipal Project Management, as requested	WRC/Municipalities	High	VTrans/Federal Grants, Town Funds
Complete traffic and speed counts for member towns to support local transportation planning	WRC/Municipalities	High	State Funds

Windham Regional Plan: Implementation Matrix

Transportation (Cont.)			
Action	**Lead/ Partners**	**Priority**	**Potential Funding/Resources**
Maintain and updated town highway maps and culvert inventories for member towns	WRC	High	State Funds
Coordinate with local officials, regional partners, and local, state, and federal agenceis on transportation projects and intiatives	WRC	High	State Funds
Assist towns with addressing transportation management issues in local bylaws and ordinances, including access managmeent and Class 4 road policies	WRC/Municipalities	High	State Funds, Town Funds
Collect data on the levels of bicycling and walking in downtowns and villages, shared use paths, and on-road locations to support local planning efforts	WRC/Municipalities	High	State Funds
Provide technical assistance to town to plan and implement temporary deomonstration project to evaluate improvements such as walking, bicycling, transit acess, and traffic flow	WRC/Municipalities	Medium	State Funds
Support efforts to incorporate electric vehicle charging infrastrucutre into park and ride lots, public parking lots, and other appropirate locations	WRC	Medium	State Funds

PROJECT REVIEW: ACT 250 AND SECTION 248

STATUTORY ROLE

The State of Vermont and various federal agencies have a number of proceedings where town plans and the Regional Plan are used in making land use and resource decisions. In the process of development review and permitting, the WRC will assist decision-makers regarding regional issues addressed in this Plan. For Act 250 and Section 248 proceedings, this assistance is statutorily required under 24 V.S.A. § 4345a (13 and 14). The WRC has the right to appear before the District Environmental Commission for Act 250 proceedings and the Public Utility Commission for Section 248 proceedings and aid these Commissions in making determinations under the relevant statutes. State law provides that regional plans are relevant to permit applications as well, as provided under 24 V.S.A. § 4348.

SUBSTANTIAL REGIONAL IMPACT

The Project Review Committee ("Committee") is the body within the WRC that reviews applications submitted under, but not limited, to Act 250, Section 248, and the Federal Energy Regulatory Commission. With staff support, the Committee reviews proposals and project applications that have potential Substantial Regional Impact or are potentially precedent-setting. Reviews are based on conformance to the Regional Plan. Projects of Substantial Regional Impact are those that require regional resources, services, facilities, or that because of their size, location, or type will:

- Benefit the region as a whole;
- Be necessary to the well-being of the region;
- Be responsible for impacts to regional resources, services or facilities;
- Be located outside the region but affect it in some manner;
- Affect more than one town;
- Continue to cause ongoing concern to the region or its communities; or
- Have cumulative regional impacts as the result of multiple projects or ongoing development.

PROJECT REVIEW COMMITTEE PROCESS

Some proposed projects may be directed to the Committee for review by WRC staff or accepted for review at the request of a member town. Also, prior to filing an application or other project proposal, a developer contemplating a project of potential Substantial Regional Impact may request a meeting with WRC staff, the Committee Chair and, upon recommendation, with the full Committee, for the purpose of discussing the project's concept, potential regional impacts and issues related to project conformance to the Windham Regional Plan and any applicable

municipal plan(s).

Once an application or proposal is filed, staff and the Committee will rely on the information included in the application to conduct the review and will notify the applicant, permitting entity, and any other statutory party, if additional information is needed in order to complete the review process. The review process is as follows:

1. Staff makes an initial determination of potential Substantial Regional Impact and works with the Committee Chair to finalize projects to be placed on an upcoming Committee agenda.

2. In preparation for meetings, the Committee or its staff may solicit comments and information from: WRC Commissioners and other officials from the town(s) where the project is proposed, officials from other potentially affected town(s), the applicant, regulatory agencies, and other statutory parties.

3. The Committee will then formally review and deliberate on all agenda projects at their regularly scheduled meetings. Staff is responsible for presenting their analysis and any information they deem important for the Committee's understanding of the project. A primary focus of the Committee's review will be to consider the provisions of town plans and the Regional Plan. The Committee will identify information needs, issues and areas of non-conformance with the Regional Plan and town plans as necessary. Time permitting, and at the discretion of the Committee Chair, members of the public may comment.

4. The Committee may make site inspections during the course of its work.

5. The Committee may request further information or studies from the applicant in order to be able to fully deliberate on impacts of a project. The scope of these requests should address impacts to both the natural and human environment and offer measures to avoid and/or mitigate adverse impacts. The costs of such studies should be borne by the applicant.

6. The Committee takes action on projects once they have determined that they have the information they need to make their decisions. The Committee will operate by consensus unless a Committee member calls for a formal vote. In such cases, voting will be by those Regional Commissioners in attendance, who have annual appointments to the Committee. Staff will proceed per the Committee's direction.

7. WRC comment or testimony on all applications shall be presented by the Executive Director or the staff person designated by the Executive Director.

RESOLVING CONFLICTS BETWEEN PLANS

In the event the Project Review Committee discovers a conflict between provisions of the applicable town plan and the Regional Plan with respect to a development under consideration, then it shall, with the assistance of WRC staff, prepare a Substantial Regional Impact report that addresses the following:

1. Is the alleged conflict both clear and distinct? Is the conflict significant? What elements of the proposal appear to conflict with the provisions of one or more applicable plan(s)? Do the provisions of the applicable plan(s) specifically and clearly address the conflicting element(s) of the proposal?

2. If permitted to proceed under the auspices of one plan, would this process have a significant detrimental impact on the relevance or application of those applicable provisions in the conflicting plan?

3. Would the issues upon which the associated plans appear to conflict have significant negative or positive effects on more than one town? Would the issues have significant negative or positive effects upon regionally important resources, facilities, infrastructure, services, or other factors?

4. Have reasonable efforts been exhausted to resolve the conflicting issues, such as, but not limited to, amendment of the development proposal?

5. Will the development proposal, if constructed, cause the implementation of one plan to significantly reduce the desired effect of the implementation of the other plan?

6. What other factors or information, if any, does the committee deem relevant to determine if a "substantial regional impact" exists?

The WRC shall review the Project Review Committee's report, with interim action taken by the Executive Board if necessary (as provided by Article VI.H.3 in WRC Bylaws); the report may be amended. Thereafter, the Board or Commission shall vote to determine whether or not the provisions of the Regional Plan, conflicting with those of the town plan, shall be given precedence. The outcome of this vote, a copy of the Project Review Committee's report, and any amendments shall be transmitted to the regulatory body conducting the review and to the town involved. The Committee's report, and the result of the Executive Board's or Commission's voting shall provide the basis for determining whether Substantial Regional Impact exists as required by 24 V.S.A., § 4345a (17), and shall be given "due consideration, where relevant, in state regulatory proceedings" as provided therein.

THE REGIONAL PLAN IN CONTEXT

Statute requires that the Regional Plan include a statement indicating how the regional plan relates to development trends, needs, and the plans for local municipalities and adjacent regions. The Windham Regional Profile includes a discussion on development trends and changes in regional demographics since the last Plan update was completed. This data was analyzed and the findings incorporated into the separate chapters within the Plan and their respective policies.

MUNICIPAL PLANS IN THE WINDHAM REGION

In terms of the relationship between the Regional Plan and plans for towns in the Windham Region, 24 of the 27 member towns have adopted town plans, all of which have been approved by WRC as being compatible with the Regional Plan. Each of these 24 towns has an appointed Planning Commission charged with planning for the future growth and development of their communities. WRC maintains an on-going consultation process with our towns regarding the town plan update process and consistency with the Regional Plan and state planning goals.

RELATIONSHIP TO PLANS OF ADJACENT REGIONS

The three Vermont regional planning commissions that adjoin the Windham Region are Mount Ascutney Regional Commission, Bennington County Regional Commission, and Rutland Regional Planning Commission. The Windham Region also borders the Southwest Regional Planning Commission and Upper Valley Lake Sunapee Regional Planning Commission in New Hampshire and the Franklin Regional Council of Governments in Massachusetts. The WRC regulars coordinates and collaborates with adjoining regional planning commissions on a host of issues that impact our respective regions.

The WRC reviewed the regional plans for each of the adjoining regional planning commissions for consistency with the Windham Regional Plan with a focus on planning areas that span the regional boundaries, such as land use, transportation, economic development, and watershed planning. Similar to the Windham Regional Plan, the plans for the other Vermont RPCs are required to be consistent with the statewide planning goals in 24 V.S.A., § 4302. Therefore, the adjoining RPC plans are consistent and compatible with the goals established in the Windham Regional Plan.

MOUNT ASCUTNEY REGIONAL PLANNING COMMISSION

The most current Mount Ascutney Regional Plan was adopted on October 14, 2022. The Mount Ascutney Region borders the Windham Region to the north. Communities that border towns in our region include Springfield, Chester, Andover, and Ludlow. The Future Land Use map shows the lands bordering the Windham Region are guided for Rural Residential, Working Land, and Conservation uses, which is consistent with the future land use plan for adjacent towns in the Windham Region.

Springfield is a large regional employment center in Windsor County that many Windham Region residents commute to for work. In addition, the communities of Chester and Ludlow are home to numerous businesses, including the Okemo ski resort in Ludlow, that residents commute to for work. All three communities also offer retail and personal services that Windham Region residents rely on and that may be in closer proximity than services located in towns within our region. The economic vitality of these communities is important for the health of the Windham Region as well.

Major state highways that connect our two regions include Route 5, Route 103, Route 11, and Route 100. The WRC and MARC collaborate on VTrans corridor studies for these highways that span our two regions. There are no major transportation improvements discussed in the Mount Ascutney Regional Plan that would negatively impact towns in the Windham Region. Finally, the WRC and MARC are both located within the West-Williams-Saxton River Basin. The MARC plan also emphasizes the importance of water quality and there were no conflicts between the plans in terms of water quality and watershed planning.

RUTLAND REGIONAL PLANNING COMMISSION

The most current Rutland Regional Plan was adopted on June 19, 2018. The Rutland Region borders the Windham Region to the northwest. Communities that border towns within our region include Mount Tabor and Mount Holly. The future land use map shows the area along the border of these towns with Weston as Development Constraint Areas that have significant limitations upon development because of public ownership, conservation easements, or natural limitations. Much of the area bordering Mount Holly and Mount Tabor and Weston is within the Green Mountain National Forest. The only state highway directly connecting the two regions is Route 155 that runs north through Weston into Mount Holly. It is important to note that the city of Rutland is only approximately 25 miles away from Weston in the northwest corner of our region and there are likely Windham Region residents that commute or travel to Rutland for job opportunities and services.

BENNINGTON COUNTY REGIONAL COMMISSION

The most current Bennington County Regional Plan was adopted on March 19, 2015. The Bennington Region borders the Windham Region along its western side. The following communities border towns in our region: Stamford, Woodford, Glastenbury, Sunderland, Manchester, Dorset, Peru, and Landgrove. Much of the land area along the border between the regions falls within the Green Mountain National Forest. Generally, the Bennington Regional Plan guides these bordering areas for Upland Forests and Rural Areas. This is consistent with future land use planning in the WRC Plan. Manchester and Bennington are the largest population and employment centers in Bennington County and a large number of Windham Region residents commute to these towns for jobs and shopping, in particular communities in the western part of our region.

Major state highways that connect our two regions include Route 9, Route 30, and Route 11. Route 9 in particular is an important highway that provides a critical east-west connection between New York and New Hampshire. The WRC and BCRC collaborate on VTrans corridor studies for these highways that span our two regions. There are no major transportation improvements discussed in the Plan that would negatively impact towns in the Windham Region.

UPPER VALLEY LAKE SUNAPEE REGIONAL PLANNING COMMISSION

The most current Upper Valley Lake Sunapee Regional Plan was adopted on June 17, 2015. The Windham Region adjoins only the town of Charlestown, New Hampshire in this region. Charlestown is located on the eastern side of the Connecticut River across from the town of Rockingham. Currently, much of the development in Charlestown is concentrated around the historic town center on Route 12A and further north and not along Route 12A towards the bridge connecting to Rockingham. The vision for Land Use in the Region is to build upon its historic, traditional settlement patterns by focusing new residential and non-residential development in village and city centers. The region's rural landscape will support traditional uses like housing, farming, forestry, and recreation.

SOUTHWEST REGIONAL PLANNING COMMISSION

The most current Southwest Region Planning Commission Regional Plan was adopted in 2015. The Windham Region borders the following towns across the Connecticut River in the Southwest Region: Hinsdale, Chesterfield, Westmoreland, and Walpole. Both Hinsdale and Chesterfield have commercial areas in close proximity to the Windham Region just across the Connecticut River. These areas draw a large number of residents from our region for shopping and employment purposes and future growth and development may impact traffic patterns and economic development in our region. There are also large number of residents in Hinsdale, Chesterfield, Westmoreland, and Walpole that commute and travel into our region on a daily basis for jobs and services. The WRC and the SWRPC are currently working in partnership with VTrans and NHDOT on the construction of the new Brattleboro-Hinsdale Bridge (Route 119).

FRANKLIN REGIONAL COUNCIL OF GOVERNMENTS

The Franklin Regional Council of Governments has adopted several regional planning documents that address transportation, housing, economic development, and other planning areas. The Windham Region borders the following towns located in Franklin County, Massachusetts: Northfield, Bernardston, Leyden, Colrain, Heath, Rowe, and Monroe. The area bordering the two regions is generally rural and mostly defined by low-density residential development and forestland. The main highways connecting the region are Routes 142, 5, and 112, as well as Interstate 91. The two regions are also both located in the Deerfield River Watershed and work collaboratively on water quality-related issues and projects. Greenfield is also a major employment and commercial center in Franklin County and many residents from the Windham Region, in particular in the southern area, commute and travel to Greenfield for employment and services.

Windham Regional Plan
Energy Chapter: Appendix A
Regional LEAP Targets

Below are the original targets provided by the Department of Public Service for the region serviced by WRC. These regional targets were disaggregated from the State targets based on the assumptions in the table below.

Overview - LEAP Regionalization for Regional Planning Commission Enhanced Energy Planning

As part of the development of Vermont's Comprehensive Energy Plan (CEP) and Climate Action Plan (CAP), Stockholm Environment Institute (SEI) and Northeast States for Coordinated Air Use Management (NESCAUM) developed a scenario model of Vermont's energy consumption and emissions and used the model to construct pathways to meet statutory greenhouse gas (GHG) reduction obligations under the state's Global Warming Solutions Act (GWSA). The model was built using SEI's Low Emissions Analysis Platform (LEAP), a software tool for energy system modeling and emissions accounting. The model contains a representation of residential, commercial, industrial and transport energy use at a state level.

In order to support enhanced energy planning at the regional and municipal levels, the Department has undertaken an effort to "regionalize" final energy demand outputs from the statewide LEAP modeling for four core sectors: residential, commercial, industrial, and transportation. This workbook includes a simple disaggregation of those results for each of the regions based on key drivers of energy demand. This has been done for:

1. The **Baseline (business-as-usual)** scenario developed to estimate Vermont/regional energy demand under normal policy and programmatic conditions and
2. The **Central GWSA Mitigation ("CAP Mitigation")** scenario developed to meet the state's GHG reduction requirements.

Categories	WRC Share of Statewide Total	Source	Used for:
Population	7.5%	Generation Scenario Tool (for consistency)	Share of non-road transportation. Note: All transportation related natural gas demand was allocated to CCRPC
Housing Units	6.4%	Data submitted via RPCs in data template - almost all from the American Community Survey	Residential non-natural gas energy demand & technology adoption (total and thermal energy use, new CCHPs)
Commercial Floorspace	15.9%	Data submitted via RPCs in data template - almost all used SQ FT / Employee * Number of Employees Method; SQFT/Employee from Jim Sullivan (BCRC), Number of Employees from VDOL and/or Census	Commercial non-natural gas energy demand & technology adoption (total consumption, new CCHPs)
Passenger Cars	7.5%	DMV Registration Database	On-Road Transportation Energy Use (Passenger Car, Light Trucks, Medium and Heavy Duty). Note: All transportation related natural gas demand was allocated to CCRPC
Light Trucks	7.7%		
Medium Duty Vehicles	9.5%		
Heavy Duty Vehicles	8.6%		
NAICS Codes	7.3%	Census Data on NAICS Manufacturing Codes (31-33)	Industrial Data
Natural Gas - Residential	0.0%	VGS Historical Usage Data	Residential, Commercial, and Industrial Sector Natural Gas Usage
Natural Gas - Commercial	0.0%		
Natural Gas - Industrial	0.0%		

Resources

Full details of the LEAP Model methods, data sources and assumptions may be found as Appendix D to the 2022 Comprehensive Energy Plan.

Summary slides on the LEAP Modeling Report can be found as Appendix E to the 2022 Comprehensive Energy Plan . Please note that some assumptions in the modelling were revised following the issuing the of the Comprehensive Energy Plan.

The Vermont Pathways Report, prepared for the Agency of Natural Resources, also provides information on the analysis done using the model, including some of the revisions made after the CEP was published (see Table 1 pg 1).

WRC Region LEAP Targets

Key:

- Residential Energy Demand by Fuel
- Commercial Energy Demand by Fuel
- Industrial Energy Demand by Fuel
- Transportation: Vehicle Energy Demand by Fuel
- Gross GHG Emissions for Each Sector

Totals Row

- Gray — Baseline
- Table Color — CAP Total

Baseline Total Regional **Residential** Sector Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	460	367	399	419	429	438
Wood	525	503	434	395	379	367
Propane	403	358	335	322	319	319
Wood Pellets	130	44	38	35	34	34
Biodiesel	-	-	-	-	-	-
Heating Oil	701	644	567	523	504	490
Biogas	-	-	-	-	-	-
Natural Gas	-	-	-	-	-	-
Total	**2,219**	**1,915**	**1,772**	**1,694**	**1,665**	**1,646**

CAP Mitigation Total Regional **Residential** Sector Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	460	415	483	551	618	643
Wood	525	423	309	231	165	105
Propane	403	300	218	143	72	53
Wood Pellets	130	40	33	29	26	24
Biodiesel	-	32	145	194	186	146
Heating Oil	701	518	262	95	-	-
Biogas	-	-	-	-	-	-
Natural Gas	-	-	-	-	-	-
Total	**2,219**	**1,728**	**1,450**	**1,243**	**1,067**	**972**

Windham Regional Plan
Energy Chapter Appendix B
Methodology: Regional Energy Use and Targets

Please refer to the Department of Public Service's Act 174 landing page, which has guidance for regions and municipalities and a host of tools used in the analyses that support this plan. This supplement provides additional, not comprehensive, methodological information so as not to duplicate that which is already laid out by the State.

As of September 2024, WRC is working on breaking out the regional energy consumption estimates into municipal energy use estimates and targets. Once completed, the municipal data will appear as Appendix C to the 2022 Windham Regional Plan. Unless explicitly stated otherwise, municipal energy data methodologies follow the steps, calculations, and assumptions detailed in the following paragraphs.

Vermont's regional planning commissions (RPCs) have been tasked with developing reasonable estimates for energy consumption across the transportation, heating, and electric energy sectors. While these estimates use the best available data, they should not be considered a unit-by-unit audit of energy use. Rather, they serve as a starting point for better understanding regional energy use patterns, cost drivers, and what we need to do to achieve long-range energy goals. Note that estimates and targets are frequently given in kilowatt-hours (kWh), megawatt-hours (MWh), British thermal units (Btu), and millions of British thermal units (MMBtu) to allow for comparison between different energy types.

Residential, commercial, and industrial electricity usage data was provided by Efficiency Vermont, while transportation and thermal sector data was estimated via the Municipal Consumption Tool, which pulls from a variety of sources, including the Vermont Public Service Department (PSD), American Community Survey (ACS), Vermont Department of Labor (DOL), the Vermont Department of Motor Vehicles (DMV), and DriveElectric (VEIC) (see below for specifics).

Estimating Use

The following explains the series of steps that WRC has taken to calculate estimates of energy use for the Region across all three energy sectors.

Residential Heating Energy Use

Residential thermal energy use was estimated using several generic assumptions and region-specific considerations. ACS data was the primary information source for this sector's analysis–several caveats are worth mentioning:

- ACS data is based on random sampling over a multi-year period with large margins of error, especially for rural communities like the ones in the Windham Region. As the writing of this plan, it remains the most consistent and comprehensive data source on residential heating.
- ACS data identifies only one primary source of heating. In reality, many residents use two or more sources.

According to the PSD, residences in New England use approximately 45,000 to 80,000 BTU of heat energy per square foot annually, averaging statewide at about 110 MMBtu per residence per year for space and

water heating. Space heating is by far the biggest use, and older building stock can require significantly more energy to heat.

Windham Regional Commission (WRC) used the statewide average of 110 MMBtu to establish a baseline estimate for thermal energy use in primary residences. Then, ACS data was used to determine the number of households that use electricity as a primary heating source in the Region. Efficiency Vermont's residential electricity data (see above) accounts for the electricity used to heat homes. So, to avoid double counting this category of consumption, the number of electrically heated homes was subtracted from the total number of occupied housing units:

Total year-round residential thermal energy use = 110 MMBtu * (# of occupied housing units - # of electrically-heated units).

Seasonal homes account for a significant percentage of the Region's housing stock. The Vermont Pathways model estimates that seasonal homes use 15% of the energy of year-round homes. This assumption does not quite fit the Windham Region, where seasonal properties are occupied for long periods and during winter months. As a result, seasonal homes on the Western half of the Region (with closer proximity to the Region's winter recreation areas) were estimated to use 25% of the heating energy of year-round homes; seasonal homes on the Eastern half of the Region were assumed to use 15%. Here is the formula for calculating MMBtu for seasonal units:

Total seasonal residential thermal energy use = 110 MMBtu * ((# of Western seasonal units * 0.25) + (# of Eastern seasonal units * 0.15)).

Commercial Heating Energy Use

Commercial heating consumption was calculated using the Municipal Consumption Tool. Information on commercial establishment counts was sourced from the VT DOL's Economic and Labor Information (ELMI) website. ELMI data was inputted into the Municipal Consumption Tool, which calculated the Region's share of commercial floorspace by industry and outputted total commercial thermal energy use.

Transportation Energy Use

Transportation energy use was also estimated using the Public Service Department's Municipal Consumption Tool. WRC used a calculation identical to the one outlined in the tool, but an adjustment was made to regional accuracy. The State of Vermont estimates that the average annual number of vehicle miles traveled (VMTs) for passenger vehicles is 12,500 VMTs. According to VTrans, drivers in the Windham Region contribute to a large share of total statewide VMTs due to the Region's rural nature. WRC adjusted for this by using a higher value for the regional average number of VMTs (13,250 VMTs rather than 12,500 VMTs). This change resulted in a larger estimate for the number of gallons of gasoline consumed and a higher amount of transportation-related energy use. Similar to the heating sector, the amount of electricity used to power vehicles needed to be discounted from the above calculation because it was already represented in Efficiency Vermont's electrical consumption data (the Municipal consumption Tool does this automatically).

Establishing Targets

WRC derived regional targets for each of the three energy sectors. These targets represent various goals for energy efficiency, conservation, fuel-switching, and renewable generation, and quantify progress for the years 2025, 2035, and 2050. These milestones are intended to help the Region measure progress towards Vermont's overall goals, and are not requirements.

Thermal and Transportation Targets: Energy Efficiency & Conservation and Fuel-Switching Progress

Regional energy targets for the thermal and transportation sectors were derived from the Vermont Pathways model developed in the Low Emissions Analysis Platform (LEAP). The Public Service Department provided RPCs with regionalized Vermont Pathways outputs that became the basis for these targets (see Appendix A for further information). The Vermont Pathways model includes both a Baseline (business as usual) and CAP (Climate Action Plan) Mitigation scenario, representing two different pathways for Vermont's energy transition (one under "normal" policy and programmatic conditions, the other matching the rate of change necessary to meet the 90x50 requirements). WRC opted to use the more ambitious CAP Mitigation scenario in the target-setting exercise for the Region.

WRC borrowed additional information from the Public Service Department's Analysis and Targets Tool to supplement insights gathered from the Vermont Pathways model. Some of the information includes the following:

- The number of residential households, commercial establishments, and passenger vehicles was assumed to increase by 6% over each target year period.
- Average annual residential and commercial heating load was assumed to decrease gradually due to improved thermal efficiency of Vermont's building stock
- Residential structures were assumed to need an average of 1.3 heat pumps/household.

A full walkthrough of the methods, data sources, interim steps, accompanying tools, and supporting resources are hosted by the Department of Public Service. Furthermore, full details of the Vermont Pathways model methods, data sources, and assumptions can be found in Appendix D to Vermont's 2022 Comprehensive Energy Plan.

Electric Sector Targets: Efficiency and Renewable Generation

The Vermont Pathways model does not provide targets for electrical efficiency and conservation. WRC used a separate tool to derive these targets, the 2022 Energy Efficiency Utility (EEU) Market Potential Study. The EEU Market Potential Study does not present two pathways like the Vermont Pathways model does. Rather, it takes the demand information embedded in the Vermont Pathways model, and applies it to electric sector resources to produce targets for electric efficiency in the Region.

Renewable generation targets were determined using PSD's Generation Scenarios Tool. WRC opted to establish baseline renewable generation targets for the years 2025, 2035, and 2050. Targets for renewable generation can be adjusted based on the percentage of future electrical demand regions choose to meet through localized generation. WRC opted to meet 25% of demand with in-region resources. It should be noted that estimates for existing in-region renewable generation (as of 2024) exceed the baseline generation targets that result from the Generation Scenarios Tool.

Generation Potential

Generation potential is the estimate of the maximum build out of renewables under existing conditions and constraints in the Region. These figures were calculated using land availability data as an initial input. WRC conducted a spatial analysis of the Region to determine areas with known or possible constraints restricting the development of renewable resources. These areas included FEMA special flood hazards areas, river corridors, and highest priority forest blocks, among other natural resources areas. For a full list of the factors considered in this spatial analysis, refer to the Energy Chapter of the 2022 Windham Regional Plan.

After determining the number of acres with no known or possible constraints, a minimum number of acres for each type of renewable resource needed to be determined. Following guidance from PSD, WRC assumed that 8 acres would be required for each MW of solar for areas with no known constraints, and 60 acres would be required for each MW of solar in areas with possible constraints (to account for potential siting limitations that "possible constraint areas" might have). A similar method was used for wind, where 4 acres/MW was assumed in areas with no known constraints, and 60 MW/acre was used for areas with possible constraints. Acreage values were multiplied by the number of hours in a year (8,760) and a capacity factor (0.15 for solar, 0.35 for wind), then divided by the number of acres required for each megawatt. This resulted in a value for MWh indicating the Region's generation capacity. Here is the formula:

Generation potential for solar (MWh) = ((acres with no know constraints * 8,760 hours * 0.15)/ 8 MW/acre) + ((acres with possible constraints * 8,760 hours * 0.15)/ 60 MW/acre).

Generation potential for wind (MWh) = ((acres with no know constraints * 8,760 hours * 0.35)/ 4 MW/acre) + ((acres with possible constraints * 8,760 hours * 0.35)/ 60 MW/acre).

Baseline Regional **Residential** Thermal Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	69	106	136	155	164	169
HP	1	41	72	89	98	101
HPWH	1	1	1	1	1	1
Electric Resistance	23	20	17	16	15	15
Wood	525	503	434	395	379	367
Propane	274	255	232	219	215	215
Wood Pellets	130	44	38	35	34	34
Biodiesel	-	-	-	-	-	-
Heating Oil	658	600	523	479	460	445
Biogas	-	-	-	-	-	-
Natural Gas	-	-	-	-	-	-
Total	**1,657**	**1,509**	**1,364**	**1,284**	**1,253**	**1,229**

CAP Mitigation Regional **Residential** Thermal Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	69	152	217	281	343	365
HP	*1*	*79*	*133*	*186*	*239*	*261*
HPWH	*1*	*13*	*28*	*44*	*59*	*60*
Electric Resistance	*23*	*17*	*12*	*8*	*5*	*4*
Wood	525	423	309	231	165	105
Propane	274	217	157	106	58	39
Wood Pellets	130	40	33	29	26	24
Biodiesel	-	29	129	164	141	102
Heating Oil	658	478	233	81	-	-
Biogas	-	-	-	-	-	-
Natural Gas	-	-	-	-	-	-
Total	**1,657**	**1,338**	**1,079**	**891**	**734**	**635**

Baseline Regional **Residential** New Cold Climate Heat Pumps						
Technology	**2020**	**2025**	**2030**	**2035**	**2040**	**2050**
ASHP 2 Head	229	693	1,315	1,680	1,857	1,951
ASHP Central	350	1,059	2,011	2,569	2,840	2,983
ASHP HE	336	1,018	1,931	2,468	2,727	2,865
GSHP HE	42	126	239	305	337	354
Total	**957**	**2,896**	**5,495**	**7,022**	**7,761**	**8,154**

CAP Mitigation Regional **Residential** New Cold Climate Heat Pumps						
Technology	**2020**	**2025**	**2030**	**2035**	**2040**	**2050**
ASHP 2 Head	244	1,471	2,705	3,946	5,192	5,825
ASHP Central	380	2,288	4,220	6,179	8,170	9,078
ASHP HE	359	2,161	3,972	5,794	7,625	8,555
GSHP HE	44	267	491	716	942	1,057
Total	**1,027**	**6,187**	**11,388**	**16,635**	**21,929**	**24,515**

Regional **Residential** New Retrofits (Number of Housing Units)						
Scenario	**2020**	**2025**	**2030**	**2035**	**2040**	**2050**
Baseline Scenario	796	1,643	2,427	3,172	3,944	5,575
CAP Mitigation	1,271	4,478	7,685	9,678	11,671	15,656

Regional **Residential** New Heat Pump Water Heaters (Number of Units)						
Scenario	**2020**	**2025**	**2030**	**2035**	**2040**	**2050**
Baseline Scenario	279	329	331	334	335	342
CAP Mitigation	279	4,067	8,781	13,544	18,360	18,583

Baseline Total Regional **Commercial** Sector Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	1,093	1,061	1,072	1,075	1,070	1,058
Gasoline	106	117	120	123	125	130
Kerosene	2	1	1	1	1	1
Wood	261	274	292	310	326	371
Ethanol	7	8	8	8	9	9
Solar	27	70	72	74	76	78
Heat	-	-	-	-	-	-
Propane	669	466	453	448	467	491
Residual Fuel	17	7	7	7	7	7
Wood Pellets	-	-	-	-	-	-
Biodiesel	-	-	-	-	-	-
Heating Oil	758	437	380	330	288	228
Biogas	-	-	-	-	-	-
Natural Gas	-	-	-	-	-	-
Total	**2,938**	**2,443**	**2,406**	**2,377**	**2,370**	**2,375**

CAP Mitigation Total Regional **Commercial** Sector Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	1,093	1,157	1,262	1,365	1,428	1,411
Gasoline	106	117	120	123	125	130
Kerosene	2	1	1	0	-	-
Wood	261	274	292	310	326	371
Ethanol	7	8	8	8	9	9
Solar	27	70	72	74	76	78
Heat	-	-	54	81	135	135
Propane	669	366	233	105	6	2
Residual Fuel	17	7	7	7	7	7
Wood Pellets	-	14	29	42	55	66
Biodiesel	-	22	105	158	213	222
Heating Oil	758	364	189	78	-	-
Biogas	-	-	-	-	-	-
Natural Gas	-	-	-	-	-	-
Total	**2,938**	**2,400**	**2,371**	**2,352**	**2,380**	**2,432**

Baseline Regional **Commercial** New Cold Climate Heat Pumps						
	2020	**2025**	**2030**	**2035**	**2040**	**2050**
New CCHP	448	1,361	2,590	3,306	3,656	3,841

CAP Mitigation Regional **Commercial** New Cold Climate Heat Pumps						
	2020	**2025**	**2030**	**2035**	**2040**	**2050**
New CCHP	448	8,052	16,011	24,352	29,930	31,144

Baseline Total Regional **Industrial** Sector Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	355	345	335	322	326	342
Natural Gas	-	-	-	-	-	-
Gasoline	35	34	34	35	36	37
Kerosene	1	1	2	2	2	2
Diesel	219	242	236	234	235	238
LPG	21	21	21	20	20	20
Wood	26	14	15	15	15	16
Biogas	-	-	-	-	-	-
Ethanol	2	3	3	3	3	4
Lubricants	12	9	9	9	9	10
Biodiesel	-	16	20	20	21	18
Residual Fuel Oil	12	8	8	8	8	8
Wood Waste Solids	6	1	1	1	1	1
Asphalt and Road Oil	337	247	252	257	262	273
Total	**1,029**	**941**	**935**	**927**	**939**	**968**

CAP Mitigation Total Regional **Industrial** Sector Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	355	345	335	322	326	342
Natural Gas	-	-	-	-	-	-
Gasoline	35	33	34	34	35	36
Kerosene	1	1	2	2	2	2
Diesel	219	174	117	59	-	-
LPG	21	21	21	20	20	20
Wood	26	14	15	15	15	16
Biogas	-	-	-	-	-	-
Ethanol	2	3	3	4	4	4
Lubricants	12	9	9	9	9	10
Biodiesel	-	84	139	195	256	256
Residual Fuel Oil	12	8	8	8	8	8
Wood Waste Solids	6	1	1	1	1	1
Asphalt and Road Oil	337	247	252	257	262	273
Total	**1,029**	**941**	**935**	**927**	**939**	**968**

Baseline Total Regional **Passenger Car** Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	1	11	21	45	86	170
Gasoline	789	583	525	473	406	280
Diesel	6	3	1	1	1	1
Ethanol	53	45	42	39	35	25
CNG	-	-	-	-	-	-
Biodiesel	0	0	0	0	0	0
Total	**849**	**642**	**589**	**558**	**528**	**476**

CAP Mitigation Total Regional **Passenger Car** Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	1	14	55	125	192	259
Gasoline	789	560	429	272	146	35
Diesel	6	2	1	1	0	0
Ethanol	53	48	41	29	17	4
CNG	-	-	-	-	-	-
Biodiesel	0	0	0	0	0	0
Total	**849**	**625**	**525**	**427**	**355**	**298**

Baseline Total Regional **Light Truck** Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	0	3	7	16	35	82
Natural Gas	-	-	-	-	-	-
Gasoline	1,681	1,506	1,327	1,185	1,051	869
Diesel	32	31	33	34	31	28
Ethanol	115	117	106	98	90	79
CNG	-	-	-	-	-	-
Biodiesel	1	2	3	3	3	2
Total	**1,829**	**1,659**	**1,476**	**1,336**	**1,210**	**1,059**

CAP Mitigation Total Regional **Light Truck** Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	0	19	101	228	331	403
Natural Gas	-	-	-	-	-	-
Gasoline	1,681	1,433	1,060	650	332	87
Diesel	32	28	23	16	7	2
Ethanol	115	123	101	69	39	10
CNG	1	0	0	0	0	0
Biodiesel	1	2	2	2	1	0
Total	**1,830**	**1,604**	**1,288**	**965**	**711**	**502**

Baseline Total Regional **Medium Duty** Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	-	0	0	1	1	1
Natural Gas	-	-	-	-	-	-
Gasoline	112	215	241	270	304	353
Diesel	170	281	305	329	350	383
LPG	1	3	4	5	6	8
Ethanol	8	17	19	23	26	32
Biodiesel	6	18	26	29	31	28
Total	**297**	**534**	**597**	**656**	**718**	**806**

CAP Mitigation Regional **Medium Duty** Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	-	26	102	219	333	468
Natural Gas	-	-	-	-	-	-
Gasoline	112	195	174	130	87	34
Diesel	170	252	213	143	83	29
LPG	1	3	3	2	1	0
Ethanol	8	17	17	14	10	4
Biodiesel	6	18	21	18	13	7
Total	**297**	**510**	**529**	**526**	**528**	**542**

Baseline Regional **Heavy Duty** Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	-	0	0	0	0	0
Natural Gas	-	-	-	-	-	-
Gasoline	0	0	0	0	0	0
Diesel	630	325	236	188	168	143
Ethanol	0	0	0	0	0	0
Biodiesel	21	21	20	16	15	11
Total	**651**	**346**	**256**	**205**	**183**	**154**

CAP Mitigation Regional **Heavy Duty** Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Electricity	-	10	41	87	127	159
Natural Gas	-	-	-	-	-	-
Gasoline	0	0	0	0	0	0
Diesel	630	305	184	98	50	119
Ethanol	0	0	0	0	0	0
Biodiesel	21	22	18	13	8	2
Total	**651**	**337**	**244**	**197**	**185**	**1,965**

Baseline Regional **Non-Road** Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Diesel	85	80	81	81	81	82
Biodiesel	3	5	7	7	7	6
Avgas	3	3	4	4	4	4
Jet Kerosene	110	110	111	111	112	113
Sustainable Aviation Fuel	-	-	-	-	-	-
Gasoline	29	27	27	27	27	28
Ethanol	2	2	2	2	2	3
Lubricants	23	18	18	18	18	18
Natural Gas	-	-	-	-	-	-
Total	**255**	**246**	**249**	**251**	**252**	**254**

CAP Mitigation Regional **Non-Road** Final Energy Demand (Thousand MMBTUs)						
Fuel	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Diesel	85	80	81	81	81	82
Biodiesel	3	6	8	10	13	19
Avgas	3	3	4	4	4	4
Jet Kerosene	110	108	99	91	82	64
Sustainable Aviation Fuel	-	2	11	21	30	49
Gasoline	29	27	27	27	27	28
Ethanol	2	2	3	3	3	3
Lubricants	23	18	18	18	18	18
Natural Gas	-	-	-	-	-	-
Total	**255**	**247**	**251**	**255**	**259**	**268**

Baseline Regional **Passenger Car EV and PHEV Stock** (Number of Vehicles)						
Vehicle Type	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Battery Electric	17	594	1,280	2,750	5,274	10,947
Plug In Hybrid	41	160	182	274	449	825
Total	**58**	**755**	**1,462**	**3,024**	**5,723**	**11,772**

CAP Mitigation Regional **Passenger Car EV and PHEV Stock** (Number of Vehicles)						
Vehicle Type	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Battery Electric	17	815	3,518	8,405	13,341	19,794
Plug In Hybrid	41	155	145	119	76	27
Total	**58**	**970**	**3,664**	**8,524**	**13,417**	**19,821**

Baseline Regional **Light Duty Truck EV and PHEV Stock** (Number of Vehicles)						
Vehicle Type	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Battery Electric	2	126	274	634	1,413	3,551
Plug In Hybrid	24	94	190	384	745	1,759
Total	**26**	**219**	**463**	**1,019**	**2,157**	**5,311**

CAP Mitigation Regional **Light Duty Truck EV and PHEV Stock** (Number of Vehicles)						
Vehicle Type	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Battery Electric	2	848	5,050	11,877	17,986	24,221
Plug In Hybrid	24	89	123	118	78	29
Total	**26**	**937**	**5,173**	**11,994**	**18,064**	**24,250**

Baseline Regional **Greenhouse Gas Emissions** (Thousand Metric Tonnes CO2e)						
Sector	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Transportation	275	240	220	207	194	175
Residential	80	72	65	60	59	58
Commercial	109	73	68	64	63	61
Industrial	22	23	23	23	23	23
Electricity	27	28	22	18	27	48
Total	512	436	397	372	365	364

CAP Mitigation Regional **Greenhouse Gas Emissions** (Thousand Metric Tonnes CO2e)						
Sector	**2015**	**2025**	**2030**	**2035**	**2040**	**2050**
Transportation	275	227	175	116	69	29
Residential	80	59	35	17	5	4
Commercial	109	61	40	24	13	13
Industrial	22	18	14	10	5	5
Electricity	27	30	37	45	30	9
Total	512	395	300	211	123	60

Appendix C: Municipal Energy Data Analysis & Targets

The following Appendix provides towns in the Windham Region with energy consumption data and targets for the thermal, transportation, and electrical energy sectors.

Below, towns will find all of the information necessary to meet the "Analysis and Targets" section of the Public Service Department's (PSD) enhanced energy planning determination standards and meet the requirements of Act 174 (24 V.S.A. § 4352). Data is organized in tables that provide each estimate or target required for municipal enhanced energy planning.

Town energy data is intended to serve as a basis for informed energy planning and local decision-making. As Vermont transforms its energy landscape under the 90x50 framework (the state's commitment to obtaining 90% of its energy from renewable resources by 2050), it is critical that communities understand their energy needs, use patterns, challenges, and opportunities. This knowledge directly translates to community-driven goals and strategic policies and programs surrounding energy.

Estimates for current energy use were developed using PSD's Municipal Consumption Tool. The Municipal Consumption Tool uses data inputs from the American Community Survey (ACS), Vermont Agency of Transportation (VTrans), Vermont Department of Labor (DOL), and other sources to calculate estimates of energy consumption in the heating and transportation sectors. Efficiency Vermont (EVT) directly provided data on electrical energy consumption to the Windham Regional Commission (WRC).

Targets for energy efficiency, conservation, and fuel-switching in the heating and transportation sectors were derived from the Vermont Pathways Model created in the Low Emissions Analysis Platform (LEAP) software. Additional modifications were made following guidance from PSD's Analysis and Targets Tool. Electrical efficiency targets were developed using PSD's Energy Efficiency Utility (EEU) Market Potential Study. Renewable Generation Targets were developed using PSD's Generation Scenarios Tool.

Targets represent one possible pathway for communities to contribute to the 90x50 goal, but alternative approaches may be more reflective of a town's individual needs and energy profile. It should be noted that energy targets are not requirements– they are tools to support analysis, discussion, and decision-making.

To learn more about the methodologies used to derive the forthcoming analyses, refer to PSD's Guidance for Regional & Municipal Enhanced Energy Planning Standards or, consult Appendix B of the Energy Element of the 2025 Windham Regional Plan (WRP). Contact afedele@windhamregional.org with further questions.

Current Use Estimates: Thermal Sector

Town	Residential (MMBtu)		Commercial (MMBtu)	Total (MMBtu)
	Year-Round (MMBtu)	Seasonal (MMBtu)		
Athens	19,360	644	263	20,267
Brattleboro	555,830	6,732	799,159	1,361,721
Brookline	20,240	1,138	7,428	28,806
Dover	59,730	65,175	91,011	215,916
Dummerston	80,300	2,376	43,445	126,121
Grafton	30,470	2,954	17,917	51,341
Guilford	108,460	2,145	20,217	130,822
Halifax	28,490	3,911	2,980	35,381
Jamaica	44,880	18,095	11,207	74,182
Londonderry	90,750	16,858	87,893	195,501
Marlboro	38,830	2,607	34,763	76,200
Newfane	77,880	5,907	64,280	148,067
Putney	92,400	1,667	115,915	209,982
Readsboro	36,080	5,308	13,038	54,426
Rockingham	233,420	7,243	166,233	406,896
Searsburg	6,600	633	928	8,161
Somerset	0	0	0	0
Stratton	10,560	39,298	30,403	80,261
Townshend	66,000	3,927	44,019	113,946
Vernon	103,620	495	38,292	142,407
Wardsboro	38,830	13,860	9,898	62,588
Westminster	130,790	2,838	64,344	197,972
Weston	30,140	7,205	21,805	59,150
Whitingham	52,800	11,385	20,601	84,786
Wilmington	105,380	42,350	99,372	247,102
Windham	21,780	5,885	12,872	40,537
Winhall	30,690	37,758	31,241	99,689
REGIONAL TOTAL	2,114,310	308,394	1,849,524	4,272,228

Estimates for thermal energy consumption were determined using PSD's Municipal Consumption Tool and data from the 2023 American Community Survey (ACS 5-year data profile, table DP04). Information from the VT DOL was used to develop commercial thermal consumption estimates.

Thermal Sector: Residential Heating Sources

Town	Bottled, tank, or LP gas	Electricity	Fuel oil, kerosene, etc.	Coal or coke	Wood	Solar energy	Other fuel	Total Occupied Units
Athens	20	8	81	4	67	0	2	184
Brattleboro	936	537	3,696	0	321	20	72	5,590
Brookline	40	5	52	0	88	0	4	189
Dover	156	90	247	0	117	0	23	633
Dummerston	124	223	416	0	186	0	2	951
Grafton	57	8	161	0	59	0	0	285
Guilford	288	60	355	16	305	15	0	1,046
Halifax	44	9	117	0	95	3	0	268
Jamaica	73	20	201	7	102	0	25	428
Londonderry	204	79	425	0	171	0	25	904
Marlboro	72	13	126	0	144	9	2	366
Newfane	151	41	307	0	195	0	55	749
Putney	172	37	388	17	237	12	12	877
Readsboro	98	34	123	6	87	0	96	362
Rockingham	180	71	1,612	0	260	0	59	2,235
Searsburg	25	2	21	0	12	0	2	62
Somerset	0	0	0	0	0	0	0	0
Stratton	53	9	37	0	6	0	0	105
Townshend	214	22	194	0	180	0	12	622
Vernon	75	5	658	0	199	0	5	947
Wardsboro	136	40	100	0	77	0	0	353
Westminster	217	48	615	0	292	10	55	1,237
Weston	0	92	14	134	0	36	12	288
Whitingham	66	0	284	0	121	0	9	480
Wilmington	391	42	414	0	112	4	16	1,000
Windham	60	13	65	0	73	0	0	211
Winhall	0	94	29	105	0	60	0	308
TOTAL	3,852	1,602	10,738	289	3,506	169	488	20,680

The above table provides data on the heating fuels used by households in the Region. This data comes from the 2023 ACS (ACS 5-year data profile, table DP04). Data is presented as the number of households that use each fuel source as a primary heating fuel.

Current Use Estimates: Transportation Sector

Town	Number of Internal Combustion Engine (ICE) Vehicles	Number of All-Electric Vehicles (AEVs)	Number of Plug-In Hybrid Electric Vehicles (PHEVs)	Fossil Fuels Consumed (gallons)	ICE Energy Consumption (MMBtu)	EV Energy Consumption (MMBtu)
Athens	361	4	1	197,853	25,649	51
Brattleboro	7,391	131	145	4,050,772	525,128	2,825
Brookline	357	3	2	195,660	25,365	51
Dover	1,077	21	12	590,269	76,520	338
Dummerston	1,728	24	30	947,062	122,774	563
Grafton	530	7	4	290,476	37,656	113
Guilford	1,968	33	30	1,078,598	139,826	645
Halifax	450	3	2	246,631	31,972	51
Jamaica	769	8	6	421,464	54,637	143
Londonderry	1,680	30	14	920,755	119,363	450
Marlboro	612	25	17	335,418	43,482	430
Newfane	1,335	19	20	731,671	94,851	399
Putney	1,588	44	51	870,332	112,827	972
Readsboro	544	3	4	298,149	38,651	41
Rockingham	3,672	26	25	2,012,506	260,894	522
Searsburg	115	0	1	63,028	8,171	10
Somerset	0	0	0	0	0	0
Stratton	240	4	3	131,536	17,052	72
Townshend	1,104	9	7	605,067	78,439	164
Vernon	1,743	9	11	955,283	123,839	205
Wardsboro	736	12	5	403,378	52,293	174
Westminster	2,258	12	9	1,237,538	160,430	215
Weston	558	15	7	224,270	29,073	225`
Whitingham	917	8	4	502,579	65,152	123
Wilmington	1,695	23	15	928,976	120,429	389
Windham	390	3	1	213,747	27,709	41
Winhall	606	20	10	332,129	43,056	307
TOTAL	34,424	496	436	18,785,147	2,435,239	9,519

Estimates for transportation energy use were developed using PSD's Municipal Consumption Tool. Estimates for the number of ICE vehicles were made using ACS data from 2023. Information on electric vehicle registrations was provided by Drive Electric Vermont, which sources data from multiple agencies, including the Vermont Department of Environmental Conservation, the Vermont Department of Motor Vehicles, the US Energy Information Administration, the US Department of Energy, and the U.S. Census.

Current Use Estimates: Electrical Sector

Town	Residential (kWh)	Average Residential Usage (kWh)	Commercial & Industrial (kWh)	Total (kWh)
Athens	1,664,108	7,634	65,586	1,729,694
Brattleboro	34,269,543	6,164	107,148,399	141,417,942
Brookline	2,287,032	7,573	194,533	2,481,565
Dover	20,244,696	6,374	20,932,701	41,177,397
Dummerston	7,612,628	7,930	3,062,048	10,674,676
Grafton	4,179,578	7,384	1,338,380	5,517,958
Guilford	8,548,314	7,857	1,438,156	9,986,470
Halifax	3,430,693	6,461	289,255	3,719,948
Jamaica	7,457,918	7,096	1,086,094	8,544,012
Londonderry	12,479,102	8,438	6,147,396	18,626,498
Marlboro	3,383,780	6,635	1,106,830	4,490,610
Newfane	7,180,608	6,781	1,576,443	8,757,051
Putney	8,706,919	7,137	25,851,238	34,558,157
Readsboro	3,050,942	5,959	562,106	3,613,048
Rockingham	16,581,539	6,872	16,584,863	33,166,402
Searsburg	534,103	6,069	561,114	1,095,217
Somerset	0	0	0	0
Stratton	8,967,581	6,851	16,784,129	25,751,710
Townshend	5,321,546	7,058	3,465,780	8,787,326
Vernon	7,922,560	8,932	7,860,344	15,782,904
Wardsboro	5,282,548	6,266	598,677	5,881,225
Westminster	11,291,449	8,370	5,752,006	17,043,455
Weston	4,171,889	7,463	1,294,032	5,465,921
Whitingham	6,143,136	6,494	1,652,043	7,795,179
Wilmington	19,283,722	7,212	10,958,423	30,242,145
Windham	2,573,934	6,263	145,355	2,719,289
Winhall	16,569,545	9,468	2,131,705	18,701,250
REGIONAL TOTAL	229,139,413	7,113	238,587,636	467,727,049

Data on electrical energy use comes from Efficiency Vermont, which provided the information in spreadsheet form via email in June 204. Electrical consumption data is for 2023.

Electrical Sector: Installed Generation Capacity

Town	Installed Generation Capacity of Renewable Technologies in the Windham Region (MW)			
	Solar	Wind	Biomass	Hydro
Athens	0.11	0	0	0
Brattleboro	11.09	0	1.89	0
Brookline	0.18	0	0	0
Dover	0.92	0	0	0
Dummerston	1.02	0	0.14	0
Grafton	0.51	0.00	0	0
Guilford	2.20	0	0	0
Halifax	0.22	0	0	0
Jamaica	0.68	0.01	0	2.41
Londonderry	1.48	0	0	0
Marlboro	0.33	0.00	0	0
Newfane	0.95	0	0	0
Putney	3.34	0	0	0
Readsboro	0.12	0	0	0
Rockingham	2.45	0.01	0	41.29
Searsburg	0.01	36.00	0	0
Somerset	0	0	0	0
Stratton	0.11	0	0	0
Townshend	0.88	0.01	0	0.96
Vernon	0.87	0	0	32.40
Wardsboro	0.11	0	0	0
Westminster	6.20	0	0.45	0
Weston	0.42	0	0	0
Whitingham	0.25	0.01	0	33.60
Wilmington	1.09	0.02	0	0
Windham	0.08	0	0	0
Winhall	4.61	0.00	0	0
REGIONAL TOTAL	40.2	36.1	2.5	110.7

Data on installed generation capacity was provided to WRC by PSD. Generation capacity data comes from ISO New England, which conducts a triannual survey of all utilities in New England and reports this information to Vermont's state agencies. The above data is from 2024.

Electrical Sector: Annual Electricity Production

Town	Annual Production of Renewable Technologies in the Windham Region (MWh)			
	Solar	Wind	Biomass	Hydro
Athens	150	0	0	0
Brattleboro	14,573	0	11,589	0
Brookline	240	0	0	0
Dover	1,203	0	0	0
Dummerston	1,345	0	871	0
Grafton	675	4	0	0
Guilford	2,889	0	0	0
Halifax	291	0	0	0
Jamaica	891	19	0	10,539
Londonderry	1,947	0	0	0
Marlboro	440	2	0	0
Newfane	1,245	0	0	0
Putney	4,387	0	0	0
Readsboro	154	0	0	0
Rockingham	3,217	17	0	180,828
Searsburg	18	70,956	0	0
Somerset	0	0	0	0
Stratton	140	0	0	0
Townshend	1,153	19	0	4,200
Vernon	1,142	0	0	141,912
Wardsboro	146	0	0	0
Westminster	8,147	0	2,759	0
Weston	553	0	0	0
Whitingham	322	13	0	147,168
Wilmington	1,434	44	0	0
Windham	104	0	0	0
Winhall	6,064	4	0	0
REGIONAL TOTAL	52,870	71,078	15,220	484,651

Estimates for annual electricity production were determined using generation capacity data provided to WRC by PSD. Generation capacity data comes from ISO New England, which conducts a triannual survey of all utilities in New England, and reports this information to Vermont's state agencies. Annual production was then determined by multiplying the installed capacity of generation facilities in the Region by the number hours in a year (8,760) and a capacity factor, which measures the efficiency of different generation technologies throughout time. Estimates are for 2024.

Thermal Sector: Residential Weatherization Targets

Town	Number of Residential Weatherization Projects by LEAP Target Year			
	Total Weatherization Projects (2023)	2025	2035	2050
Athens	2	41	89	143
Brattleboro	121	1,177	2,544	4,116
Brookline	1	43	93	150
Dover	79	127	273	442
Dummerston	12	170	368	595
Grafton	6	65	139	226
Guilford	24	230	496	803
Halifax	3	60	130	211
Jamaica	14	95	205	332
Londonderry	32	192	415	672
Marlboro	11	82	178	288
Newfane	23	165	356	577
Putney	30	196	423	684
Readsboro	21	76	165	267
Rockingham	24	494	1,068	1,728
Searsburg	1	14	30	49
Somerset	0	0	0	0
Stratton	1	22	48	78
Townshend	17	140	302	489
Vernon	6	219	474	767
Wardsboro	12	82	178	288
Westminster	12	277	599	968
Weston	8	64	138	223
Whitingham	15	112	242	391
Wilmington	25	223	482	780
Windham	19	46	100	161
Winhall	19	65	140	227
REGIONAL TOTAL	519	4,478	9,678	15,656

Targets for residential weatherizations were developed using the CAP Mitigation Scenario of the Vermont Pathways Model and assumptions informed by PSD's Analysis and Targets Tool. Regional targets were disaggregated to municipalities based on each town's share of residential thermal energy consumption. Targets are presented as the total number of weatherizations for each target year Data on the number of home weatherization projects were provided to WRC by EVT via email (June 2024). EVT tracks residential weatherization projects conducted through the Home Performance with ENERGY STAR® program up to 2023. This data does not capture weatherizations conducted outside of the ENERGY STAR® program.

Residential Cold Climate Heat Pump (CCHP) Targets

Town	Number of Households w/ Heat Pump Systems by LEAP Target Year			
	CCHP Installations (2023)[1]	2025	2035	2050
Athens	14	44	117	173
Brattleboro	419	1,251	3,364	4,958
Brookline	29	46	122	181
Dover	139	134	361	533
Dummerston	120	181	486	716
Grafton	61	69	184	272
Guilford	107	244	656	967
Halifax	34	64	172	254
Jamaica	49	101	272	400
Londonderry	197	204	549	809
Marlboro	54	87	235	346
Newfane	113	175	471	695
Putney	171	208	559	824
Readsboro	25	81	218	322
Rockingham	138	525	1,413	2,082
Searsburg	2	15	40	59
Somerset	0	0	0	0
Stratton	96	24	64	94
Townshend	109	149	399	589
Vernon	58	233	627	924
Wardsboro	24	87	235	346
Westminster	150	294	792	1,167
Weston	74	68	182	269
Whitingham	38	53	143	210
Wilmington	141	237	638	940
Windham	35	49	132	194
Winhall	217	69	186	274
REGIONAL TOTAL	2,614	4,760	12,796	18,858

Targets for residential CCHPs were developed using the CAP Mitigation Scenario of the Vermont Pathways Model and assumptions informed by PSD's Analysis and Targets Tool. Regional targets were disaggregated to municipalities based on each town's share of residential thermal energy consumption. Targets are presented as the total number of CCHPs by each target year. Data on CCHP project counts was provided by EVT (June 2024), and tracks the total number of residential CCHP installations as of 2023.

Commercial Cold Climate Heat Pump (CCHP) Target

Town	Number of Heat Pumps in Commercial Buildings by LEAP Target Year			
	CCHP Installations (2023)[2]	2025	2035	2050
Athens	2	1	3	4
Brattleboro	124	3,479	10,522	13,457
Brookline	6	32	98	125
Dover	12	396	1,198	1,533
Dummerston	2	189	572	732
Grafton	2	78	236	302
Guilford	2	88	266	340
Halifax	0	13	39	50
Jamaica	10	148	189	148
Londonderry	18	383	1,157	1,480
Marlboro	2	151	458	585
Newfane	2	280	846	1,082
Putney	16	505	1,526	1,952
Readsboro	1	57	172	220
Rockingham	10	724	2,189	2,799
Searsburg	0	4	12	16
Somerset	0	0	0	0
Stratton	2	132	400	512
Townshend	10	192	580	741
Vernon	5	167	504	645
Wardsboro	3	43	130	167
Westminster	12	280	847	1,083
Weston	12	95	287	367
Whitingham	2	90	271	347
Wilmington	26	433	1,308	1,673
Windham	0	56	169	217
Winhall	12	136	411	526
REGIONAL TOTAL		8,052	24,352	31,144

Targets for commercial CCHPs were developed using the CAP Mitigation Scenario of the Vermont Pathways Model and assumptions informed by PSD's Analysis and Targets Tool. Regional targets were disaggregated to municipalities based on each town's share of commercial thermal energy consumption. Targets are presented as the total number of CCHPs by each target year. Data on CCHP project counts was provided by EVT (June 2024), and tracks the total number of commercial CCHP installations as of 2023.

All-Electric Vehicle (AEV) Targets

Town	Number of AEVs by LEAP Target Year			
	Total Number of AEVs (2024)	2025	2035	2050
Athens	4	9	88	208
Brattleboro	131	176	1,815	4,275
Brookline	3	8	87	206
Dover	21	26	264	622
Dummerston	24	41	424	999
Grafton	7	13	130	306
Guilford	33	47	483	1,137
Halifax	3	11	110	259
Jamaica	8	18	188	444
Londonderry	30	40	412	970
Marlboro	25	15	151	356
Newfane	19	32	327	771
Putney	44	38	391	921
Readsboro	3	13	133	313
Rockingham	26	87	899	2,117
Searsburg	0	3	28	66
Somerset	0	0	0	0
Stratton	4	6	59	139
Townshend	9	26	270	636
Vernon	9	41	426	1,004
Wardsboro	12	17	180	425
Westminster	12	54	552	1,301
Weston	15	10	101	237
Whitingham	8	22	224	528
Wilmington	23	40	415	978
Windham	3	9	95	225
Winhall	20	14	149	351
REGIONAL TOTAL	496	816	8,401	19,794

Targets for transportation fuel-switching and AEVs were developed using the CAP Mitigation Scenario of the Vermont Pathways Model. Regional targets were disaggregated to municipalities based on each town's share of transportation energy consumption. Targets are presented as the total number of AEVs by each target year. Data on the total number of AEVs is from Drive Electric Vermont (2024).

Plug-In Hybrid Vehicle (PHEV) Targets

Town	Number of PHEVs by LEAP Target Year			
	Total Number of PHEVs (2024)	2025	2035	2050
Athens	1	2	1	0
Brattleboro	145	33	26	6
Brookline	2	2	1	0
Dover	12	5	4	1
Dummerston	30	8	6	1
Grafton	4	2	2	0
Guilford	30	9	7	2
Halifax	2	2	2	0
Jamaica	6	3	3	1
Londonderry	14	8	6	1
Marlboro	17	3	2	0
Newfane	20	6	5	1
Putney	51	7	6	1
Readsboro	4	2	2	0
Rockingham	25	17	13	3
Searsburg	1	1	0	0
Somerset	0	0	0	0
Stratton	3	1	1	0
Townshend	7	5	4	1
Vernon	11	8	6	1
Wardsboro	5	3	3	1
Westminster	9	10	8	2
Weston	7	2	1	0
Whitingham	4	4	3	1
Wilmington	15	8	6	1
Windham	1	2	1	0
Winhall	10	3	2	0
REGIONAL TOTAL	436	155	119	27

Targets for transportation fuel-switching and PHEVs were developed using the CAP Mitigation Scenario of the Vermont Pathways Model. Regional targets were disaggregated to municipalities based on each town's share of transportation energy consumption. Targets are presented as the total number of PHEVs by each target year. Data on the total number of PHEVs is from Drive Electric Vermont (2024).

Electrical Generation Targets (MWh)

Town	2025	2035	2050
Athens	1,290.5	1,911.0	2,493.2
Brattleboro	18,260.2	27,040.5	35,278.1
Brookline	1,384.0	2,049.5	2,673.8
Dover	6,108.7	9,046.0	11,801.8
Dummerston	3,567.3	5,282.6	6,891.9
Grafton	3,126.1	4,629.3	6,039.6
Guilford	4,622.7	6,845.4	8,930.8
Halifax	4,410.4	6,531.2	8,520.8
Jamaica	4,989.4	7,388.5	9,639.3
Londonderry	5,158.4	7,638.7	9,965.8
Marlboro	6,821.0	10,100.8	13,177.9
Newfane	4,315.6	6,390.7	8,337.5
Putney	4,677.4	6,926.5	9,036.6
Readsboro	4,528.4	6,705.8	8,748.7
Rockingham	7,925.9	11,737.0	15,312.5
Searsburg	2,136.9	3,164.5	4,128.5
Somerset	2,938.2	4,351.0	5,676.5
Stratton	5,889.8	8,721.8	11,378.9
Townshend	3,908.0	5,787.1	7,550.1
Vernon	3,508.6	5,195.7	6,778.6
Wardsboro	3,853.8	5,706.8	7,445.4
Westminster	6,039.3	8,943.3	11,667.8
Weston	3,794.1	5,618.4	7,330.0
Whitingham	6,214.1	9,202.1	12,005.4
Wilmington	8,039.7	11,905.5	15,532.4
Windham	2,973.1	4,402.7	5,743.9
Winhall	5,527.0	8,184.7	10,678.1
REGIONAL TOTAL	136,008	201,407	262,764

Targets for electrical generation were developed using PSD's Generation Scenarios Tool, which pulls data from the CAP Mitigation Scenario of the Vermont Pathways Model, the Census, and ISO New England, among other sources. Generation targets were disaggregated to municipalities based on an equal proportion of town land area and population. It should be noted that the Windham Region exceeds its 2025, 2035, and 2050 generation targets (see above table, Electrical Sector: Annual Electricity Production).

Electrical Capacity Generation Targets (MW)

Town	2025	2035	2050
Athens	0.9	1.4	1.8
Brattleboro	13.0	19.3	25.2
Brookline	1.0	1.5	1.9
Dover	4.5	6.6	8.6
Dummerston	2.6	3.8	5.0
Grafton	2.3	3.4	4.4
Guilford	3.3	4.9	6.5
Halifax	3.2	4.8	6.3
Jamaica	3.7	5.4	7.1
Londonderry	3.7	5.6	7.2
Marlboro	5.0	7.4	9.6
Newfane	3.1	4.6	6.1
Putney	3.4	5.0	6.5
Readsboro	3.3	4.9	6.4
Rockingham	5.7	8.4	11.0
Searsburg	1.6	2.3	3.1
Somerset	0.0	0.0	0.0
Stratton	4.4	6.5	8.4
Townshend	2.8	4.2	5.5
Vernon	2.5	3.7	4.8
Wardsboro	2.8	4.2	5.5
Westminster	4.4	6.4	8.4
Weston	2.8	4.1	5.4
Whitingham	4.6	6.8	8.8
Wilmington	5.9	8.7	11.4
Windham	2.2	3.2	4.2
Winhall	4.1	6.0	7.8
REGIONAL TOTAL	96.7	143.3	186.9

Targets for electrical generation were developed using PSD's Generation Scenarios Tool, which pulls data from the CAP Mitigation Scenario of the Vermont Pathways Model, the Census, and ISO New England, among other sources. Generation targets were disaggregated to municipalities based on an equal proportion of town land area and population. It should be noted that the Windham Region exceeds its 2025, 2035, and 2050 generation capacity targets (see above table, Electrical Sector: Installed Generation Capacity).

Residential Electrical Efficiency Targets (kWh)

Town	2025	2035	2050
Athens	17,925	102,862	189,756
Brattleboro	1,465,497	8,409,905	15,514,257
Brookline	25,716	147,575	272,240
Dover	426,716	2,448,756	4,517,367
Dummerston	110,620	634,806	1,171,065
Grafton	57,182	328,144	605,348
Guilford	103,489	593,880	1,095,566
Halifax	38,549	221,220	408,097
Jamaica	88,541	508,099	937,321
Londonderry	193,024	1,107,689	2,043,420
Marlboro	46,536	267,050	492,642
Newfane	90,748	520,768	960,692
Putney	358,122	2,055,120	3,791,203
Readsboro	37,442	214,862	396,369
Rockingham	343,699	1,972,354	3,638,520
Searsburg	11,350	65,131	120,151
Somerset	0	0	0
Stratton	266,862	1,531,414	2,825,092
Townshend	91,062	522,569	964,014
Vernon	163,556	938,585	1,731,464
Wardsboro	60,946	349,747	645,200
Westminster	176,619	1,013,548	1,869,752
Weston	56,643	325,050	599,639
Whitingham	80,781	463,567	855,170
Wilmington	313,396	1,798,453	3,317,715
Windham	28,180	161,712	298,320
Winhall	193,799	1,112,134	2,051,621
REGIONAL TOTAL	4,847,000	16,519,000	27,815,000

Targets for residential electrical efficiency were determined using data from PSD's 2022 EEU Market Potential Study. Regional targets were disaggregated to the municipal-level based on each town's share of residential electrical energy consumption. Targets are presented as the total amount of electrical energy to be saved (in kWh) by each target year.

Commercial Electrical Efficiency Targets (kWh)

Town	2025	2035	2050
Athens	32,229	161,869	145,963
Brattleboro	2,634,993	13,234,224	11,933,811
Brookline	46,238	232,231	209,411
Dover	767,245	3,853,478	3,474,830
Dummerston	198,898	998,961	900,802
Grafton	102,814	516,384	465,643
Guilford	186,075	934,557	842,726
Halifax	69,313	348,122	313,915
Jamaica	159,198	799,569	721,002
Londonderry	347,061	1,743,112	1,571,831
Marlboro	83,672	420,242	378,948
Newfane	163,167	819,505	738,980
Putney	643,910	3,234,034	2,916,253
Readsboro	67,321	338,118	304,894
Rockingham	617,978	3,103,790	2,798,807
Searsburg	20,407	102,493	92,422
Somerset	0	0	0
Stratton	479,823	2,409,906	2,173,105
Townshend	163,731	822,339	741,535
Vernon	294,078	1,477,001	1,331,869
Wardsboro	109,583	550,379	496,298
Westminster	317,565	1,594,967	1,438,243
Weston	101,845	511,514	461,252
Whitingham	145,245	729,491	657,810
Wilmington	563,492	2,830,131	2,552,039
Windham	50,668	254,477	229,472
Winhall	348,454	1,750,107	1,578,139
REGIONAL TOTAL	4,847,000	27,815,000	51,312,000

Targets for commercial electrical efficiency were determined using data from PSD's 2022 EEU Market Potential Study. Regional targets were disaggregated to the municipal-level based on each town's share of commercial electrical energy consumption. Targets are presented as the total amount of electrical energy to be saved (in kWh) by each target year.

Land & Rooftop Area Available for Solar

Town	Prime/Primary Acreage	Secondary Acreage	Prime & Secondary Acreage	Rooftop Area Available (sqm)
Athens	158.78	1,165.66	1,324.44	9,359
Brattleboro	1,509.49	3,089.78	4,599.27	658,972
Brookline	164.68	1,676.06	1,840.74	14,923
Dover	2,924.93	5,438.71	8,363.64	183,292
Dummerston	1,175.24	3,491.48	4,666.72	79,707
Grafton	521.55	3,242.16	3,763.71	41,663
Guilford	773.58	4,009.44	4,783.02	71,577
Halifax	3,014.07	5,209.87	8,223.94	36,604
Jamaica	2,113.99	8,953.48	11,067.47	45,761
Londonderry	4,026.43	8,867.60	12,894.03	109,498
Marlboro	4,005.29	5,361.32	9,366.61	42,421
Newfane	886.04	5,476.23	6,362.27	48,043
Putney	1,179.13	3,863.80	5,042.93	98,627
Readsboro	1,046.97	4,953.73	6,000.70	34,874
Rockingham	998.71	3,901.59	4,900.30	190,816
Searsburg	81.43	3,123.01	3,204.44	6,332
Somerset	93.08	7,876.07	7,969.15	501
Stratton	1,192.50	11,005.65	12,198.15	82,088
Townshend	509.56	4,025.52	4,535.08	52,871
Vernon	412.35	2,105.15	2,517.50	110,131
Wardsboro	1,711.84	4,314.00	6,025.84	33,309
Westminster	1,741.78	4,954.09	6,695.87	157,806
Weston	3,464.23	7,787.17	11,251.40	43,313
Whitingham	4,719.59	6,044.86	10,764.45	70,513
Wilmington	5,420.99	6,173.97	11,594.96	157,100
Windham	503.13	3,237.16	3,740.29	19,076
Winhall	1,467.57	7,622.72	9,090.29	108,827
REGIONAL TOTAL	45,816.93	136,970.28	182,787.21	2,508,004

The above acreage availability for ground mounted and rooftop solar generation was determined through the Act 174 mapping exercise using data layers created by the Vermont Center for Geographic Information (VCGI). WRC excluded highest priority and priority forest block mapped by the Vermont Agency of Natural Resources from the above analysis.

Land Available for Wind

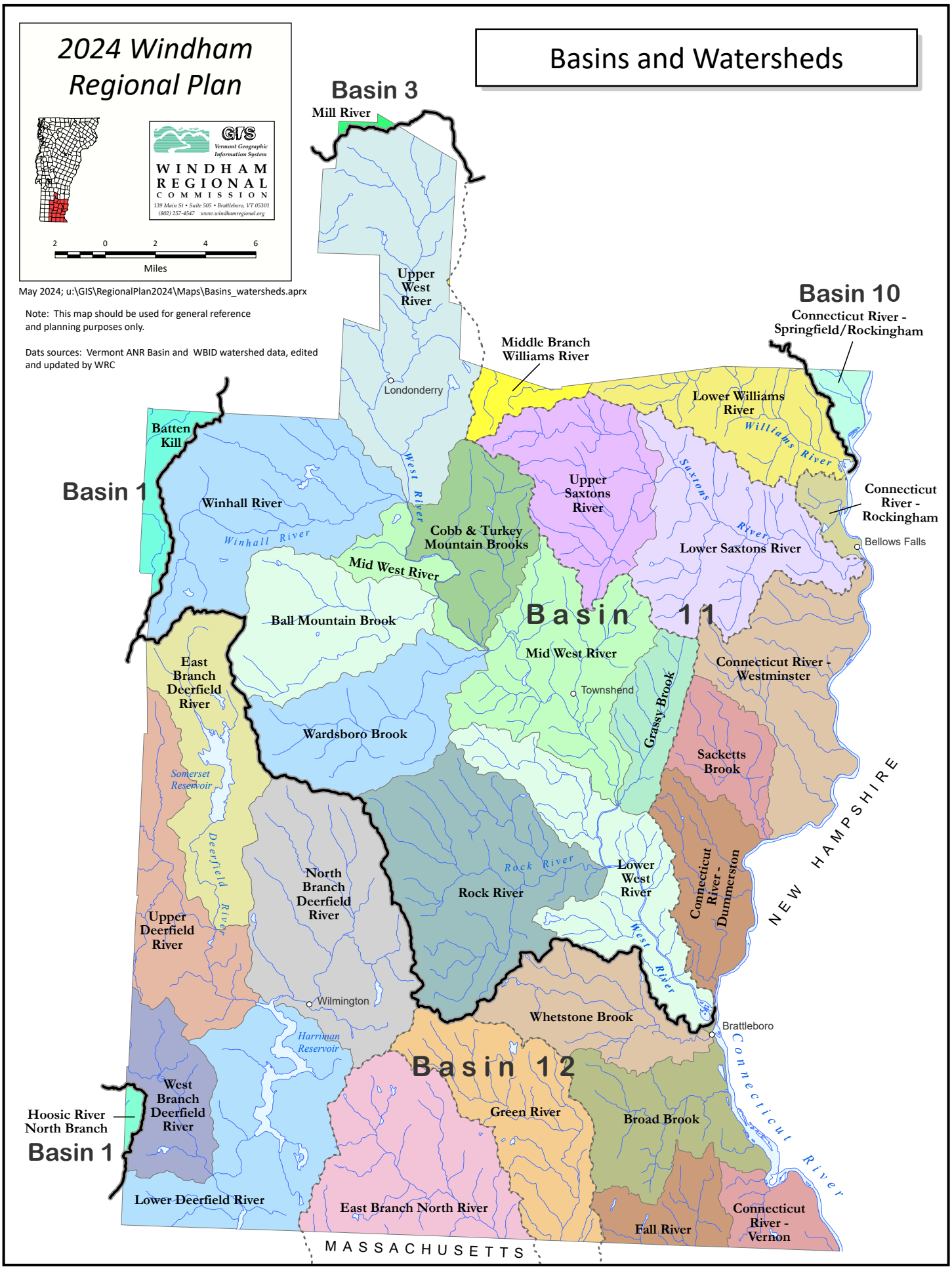
Town	Prime/Primary Acreage	Secondary Acreage	Prime & Secondary Acreage
Athens	143.89	3,519.25	3,663.14
Brattleboro	1,429.41	1,639.71	3,069.12
Brookline	44.35	2,240.90	2,285.25
Dover	5,048.78	10,169.39	15,218.17
Dummerston	394.87	1,200.30	1,595.17
Grafton	1,121.03	9,733.36	10,854.39
Guilford	423.39	5,652.34	6,075.73
Halifax	4,213.27	9,473.52	13,686.79
Jamaica	984.11	11,509.70	12,493.81
Londonderry	681.25	2,653.74	3,334.99
Marlboro	7,639.13	11,999.91	19,639.04
Newfane	459.15	6,402.17	6,861.32
Putney	134.24	1,452.10	1,586.34
Readsboro	3,319.65	14,003.52	17,323.17
Rockingham	352.82	2,308.49	2,661.31
Searsburg	313.62	9,383.91	9,697.53
Somerset	69.21	11,245.48	11,314.69
Stratton	2,610.83	19,880.19	22,491.02
Townshend	546.53	8,722.56	9,269.09
Vernon	5.79	329.40	335.19
Wardsboro	4,540.85	6,777.24	11,318.09
Westminster	2,105.95	3,097.60	5,203.55
Weston	1,287.50	6,678.13	7,965.63
Whitingham	7,931.07	9,794.47	17,725.54
Wilmington	9,578.07	10,910.82	20,488.89
Windham	1,135.40	10,548.01	11,683.41
Winhall	2,812.90	13,549.22	16,362.12
REGIONAL TOTAL	59,327.06	204,875.43	264,202.49

The above acreage availability for wind generation was determined through the Act 174 mapping exercise using data layers created by the Vermont Center for Geographic Information (VCGI). WRC excluded highest priority and priority forest block mapped by the Vermont Agency of Natural Resources from the above analysis.

Renewable Generation Potential

Town	Rooftop Solar (MWh)	Ground-Mounted Solar (MWh)	Wind (MWh)
Athens	1,316	51,608	288,802
Brattleboro	95,338	315,600	241,969
Brookline	2,071	63,754	180,169
Dover	27,052	599,528	1,199,801
Dummerston	11,239	269,497	125,763
Grafton	5,938	156,668	855,760
Guilford	10,035	214,867	479,011
Halifax	5,338	609,157	1,079,067
Jamaica	6,444	543,304	985,012
Londonderry	15,707	855,542	262,931
Marlboro	6,150	775,282	1,548,342
Newfane	6,698	265,462	540,946
Putney	13,966	278,289	125,067
Readsboro	5,121	280,452	1,365,759
Rockingham	27,015	249,483	209,818
Searsburg	958	81,769	764,553
Somerset	71	187,774	892,050
Stratton	12,321	436,892	1,773,192
Townshend	7,548	171,854	730,775
Vernon	15,713	113,831	26,426
Wardsboro	4,702	375,646	892,318
Westminster	22,592	394,582	410,248
Weston	6,255	739,539	628,010
Whitingham	10,320	907,575	1,397,482
Wilmington	23,048	1,025,608	1,615,344
Windham	2,728	153,533	921,120
Winhall	15,695	407,986	1,289,990
REGIONAL TOTAL	361,379	10,525,080	20,829,724

Generation potential was determined using data from the Act 174 mapping exercise. The Region's acreage availability for solar and wind was divided by a generic estimate of the amount of land required of each generation technology. For a full description of the methodological approach used to arrive at the above estimates, refer to Appendix B of the Energy Element of the 2025 WRP.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Miles
May 2024; u:\GIS\RegionalPlan2024\Maps\Basins_watersheds.aprx
Note: This map should be used for general reference and planning purposes only.
Dats sources: Vermont ANR Basin and WBID watershed data, edited and updated by WRC
Basins and Watersheds
Basin 3
Mill River
Upper West River
Londonderry
Middle Branch Williams River
Basin 10
Connecticut River - Springfield/Rockingham
Lower Williams River
Williams River
Saxtons River
Upper Saxtons River
Connecticut River - Rockingham
Bellows Falls
Lower Saxtons River
Batten Kill
Basin 1
Winhall River
West River
Cobb & Turkey Mountain Brooks
Mid West River
Ball Mountain Brook
Basin 11
Mid West River
Townshend
Grassy Brook
Connecticut River - Westminster
East Branch Deerfield River
Wardsboro Brook
Somerset Reservoir
Deerfield River
Sacketts Brook
NEW HAMPSHIRE
North Branch Deerfield River
Rock River
Lower West River
Connecticut River - Dummerston
Upper Deerfield River
Wilmington
Whetstone Brook
Brattleboro
Harriman Reservoir
Basin 12
West Branch Deerfield River
Hoosic River North Branch
Basin 1
Green River
Broad Brook
Connecticut River
Lower Deerfield River
East Branch North River
Fall River
Connecticut River - Vernon
MASSACHUSETTS

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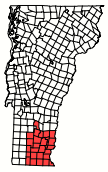

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May 2024; u:\GIS\RegionalPlan2024\Maps\EcologicalResources.aprx

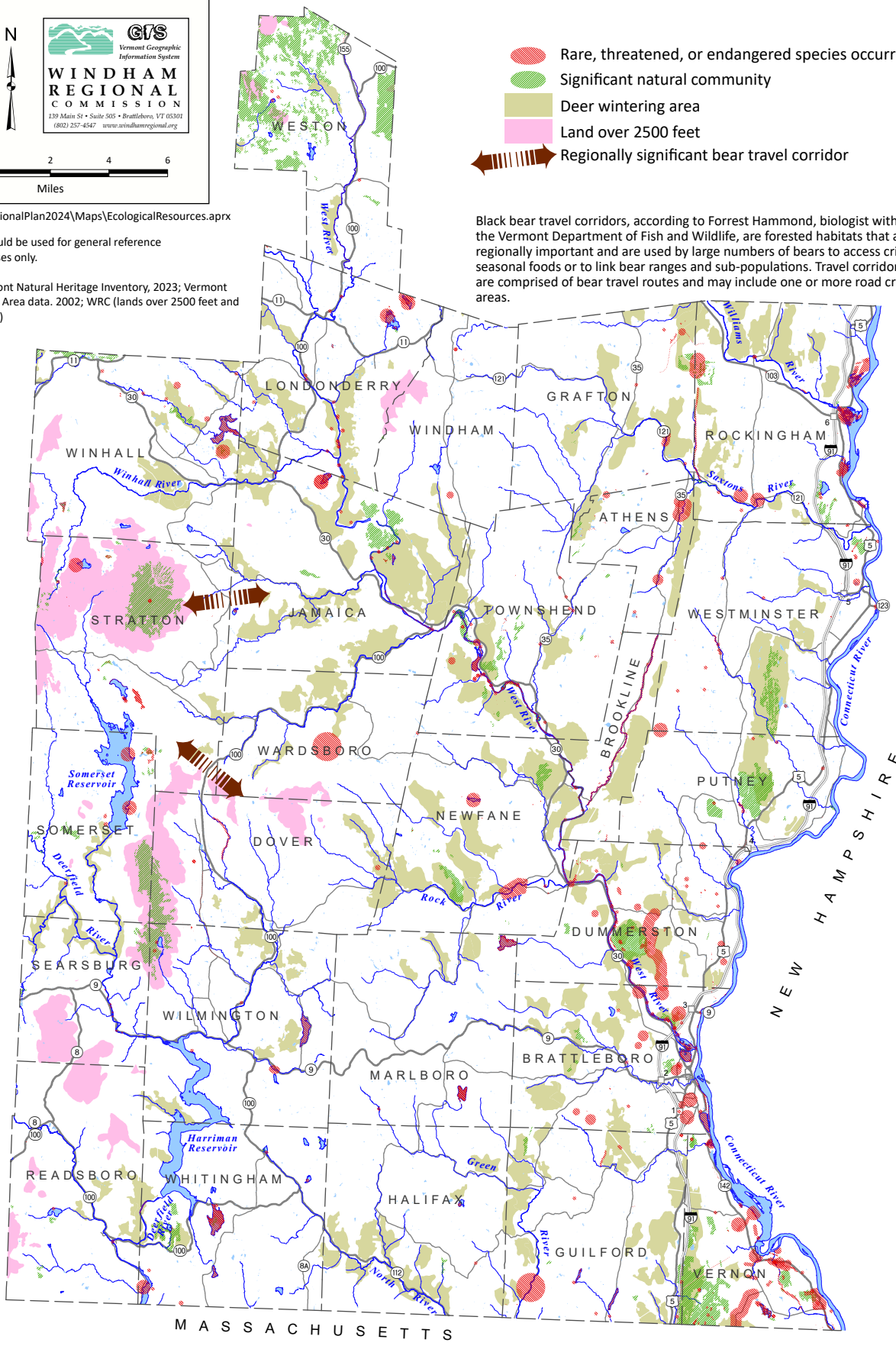
Note: This map should be used for general reference and planning purposes only.

Dats sources: Vermont Natural Heritage Inventory, 2023; Vermont ANR Deer Wintering Area data. 2002; WRC (lands over 2500 feet and bear travel corridors)

Ecological Resources

- Rare, threatened, or endangered species occurrence
- Significant natural community
- Deer wintering area
- Land over 2500 feet
- Regionally significant bear travel corridor

Black bear travel corridors, according to Forrest Hammond, biologist with the Vermont Department of Fish and Wildlife, are forested habitats that are regionally important and are used by large numbers of bears to access critical seasonal foods or to link bear ranges and sub-populations. Travel corridors are comprised of bear travel routes and may include one or more road crossing areas.



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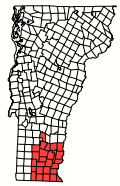

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August 2024; u:\GIS\RegionalPlan2024\CommunityResourcesMaps.aprx

Note: This map should be used for general reference and planning purposes only.

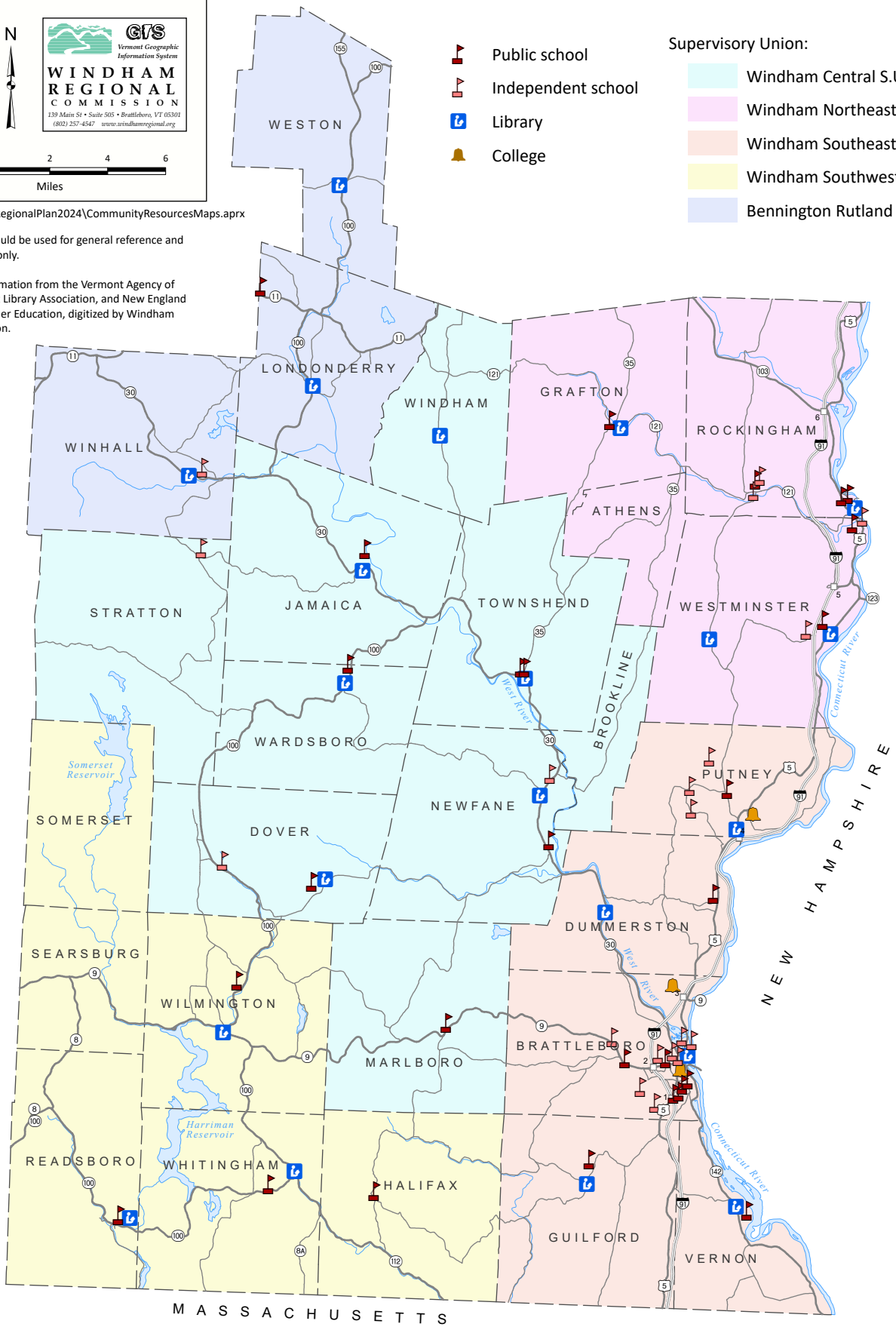
Data sources: information from the Vermont Agency of Education, Vermont Library Association, and New England Commission of Higher Education, digitized by Windham Regional Commission.

Educational Facilities

- Public school
- Independent school
- Library
- College

Supervisory Union:

- Windham Central S.U.
- Windham Northeast S.U.
- Windham Southeast S.U.
- Windham Southwest S.U.
- Bennington Rutland S.U.



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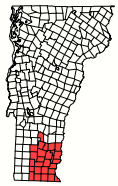

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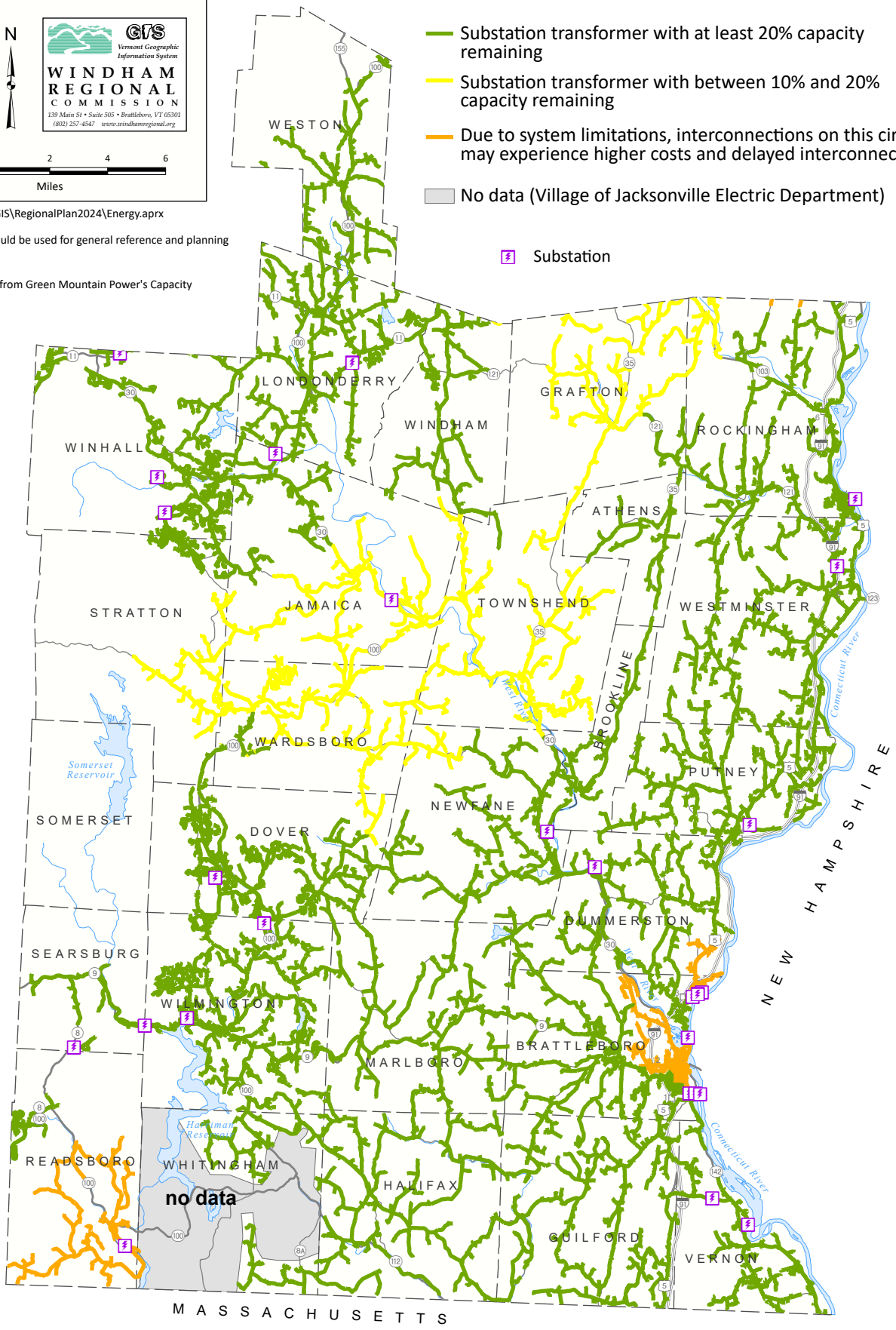
Note: This map should be used for general reference and planning purposes only.

Data sources: data from Green Mountain Power's Capacity Planning Map data

Distribution Circuit Capacity

- Substation transformer with at least 20% capacity remaining
- Substation transformer with between 10% and 20% capacity remaining
- Due to system limitations, interconnections on this circuit may experience higher costs and delayed interconnections
- No data (Village of Jacksonville Electric Department)

Substation



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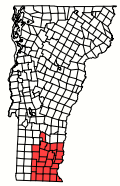

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September 2024; u:\GIS\RegionalPlan2024\Energy.aprx

Note: This map should be used for general reference and planning purposes only.

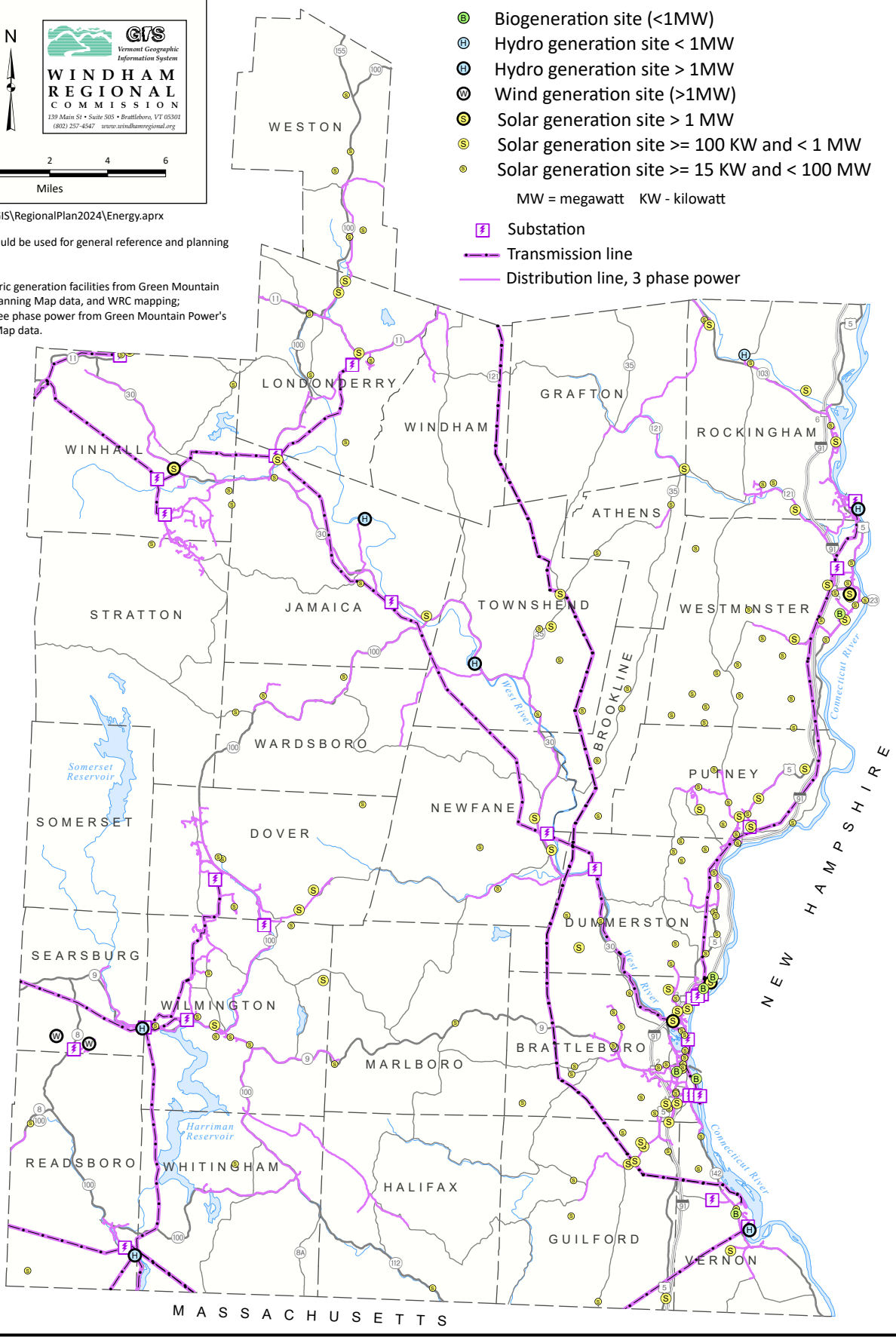
Data sources: electric generation facilities from Green Mountain Power's Capacity Planning Map data, and WRC mapping; substations and three phase power from Green Mountain Power's Capacity Planning Map data.

Generation Sites

- Biogeneration site (<1MW)
- Hydro generation site < 1MW
- Hydro generation site > 1MW
- Wind generation site (>1MW)
- Solar generation site > 1 MW
- Solar generation site >= 100 KW and < 1 MW
- Solar generation site >= 15 KW and < 100 MW

MW = megawatt KW - kilowatt

- Substation
- Transmission line
- Distribution line, 3 phase power



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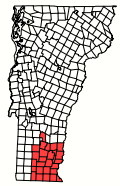

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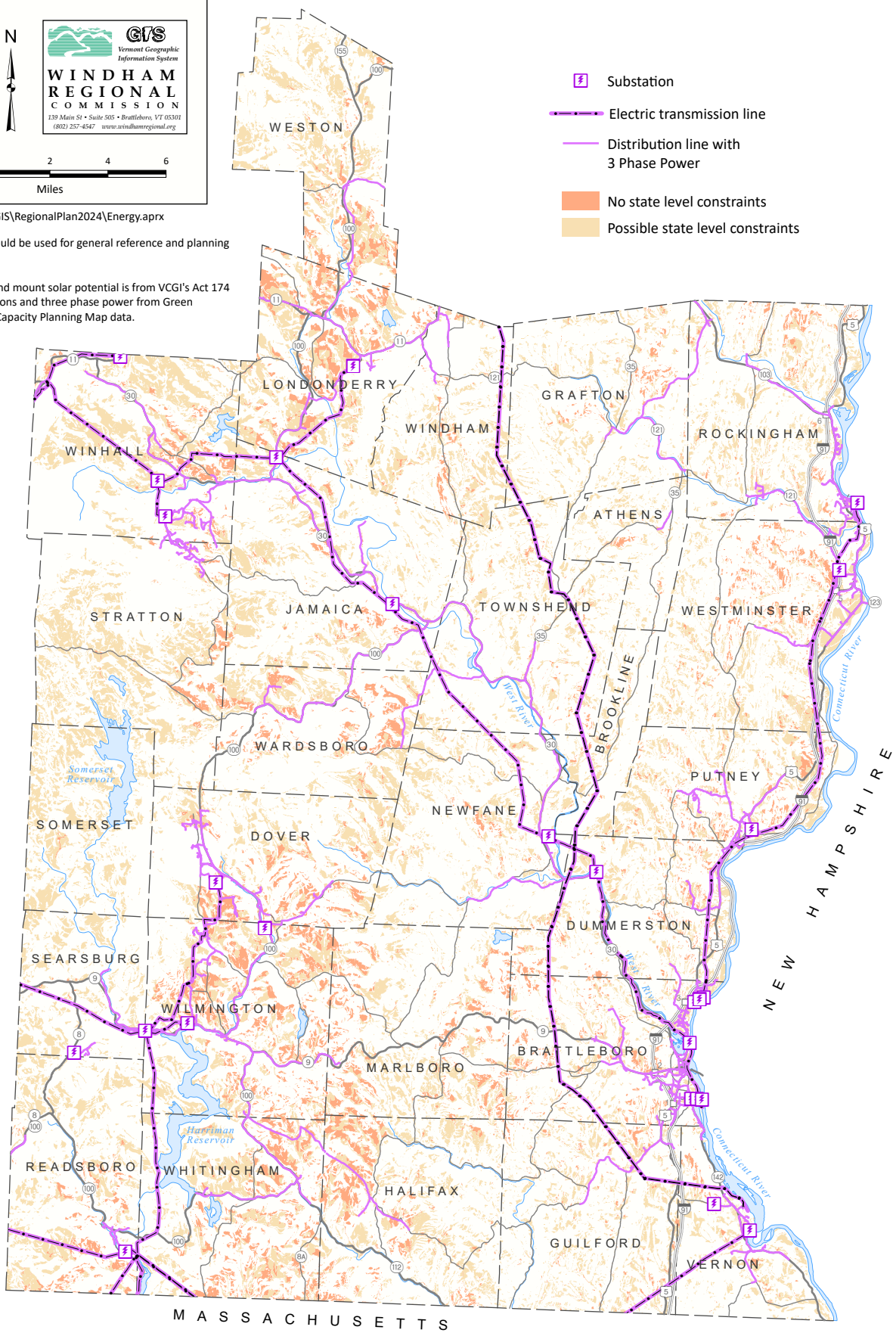
Data sources: ground mount solar potential is from VCGI's Act 174 data, 2022; substations and three phase power from Green Mountain Power's Capacity Planning Map data.

Ground Mount Solar Potential



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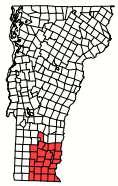

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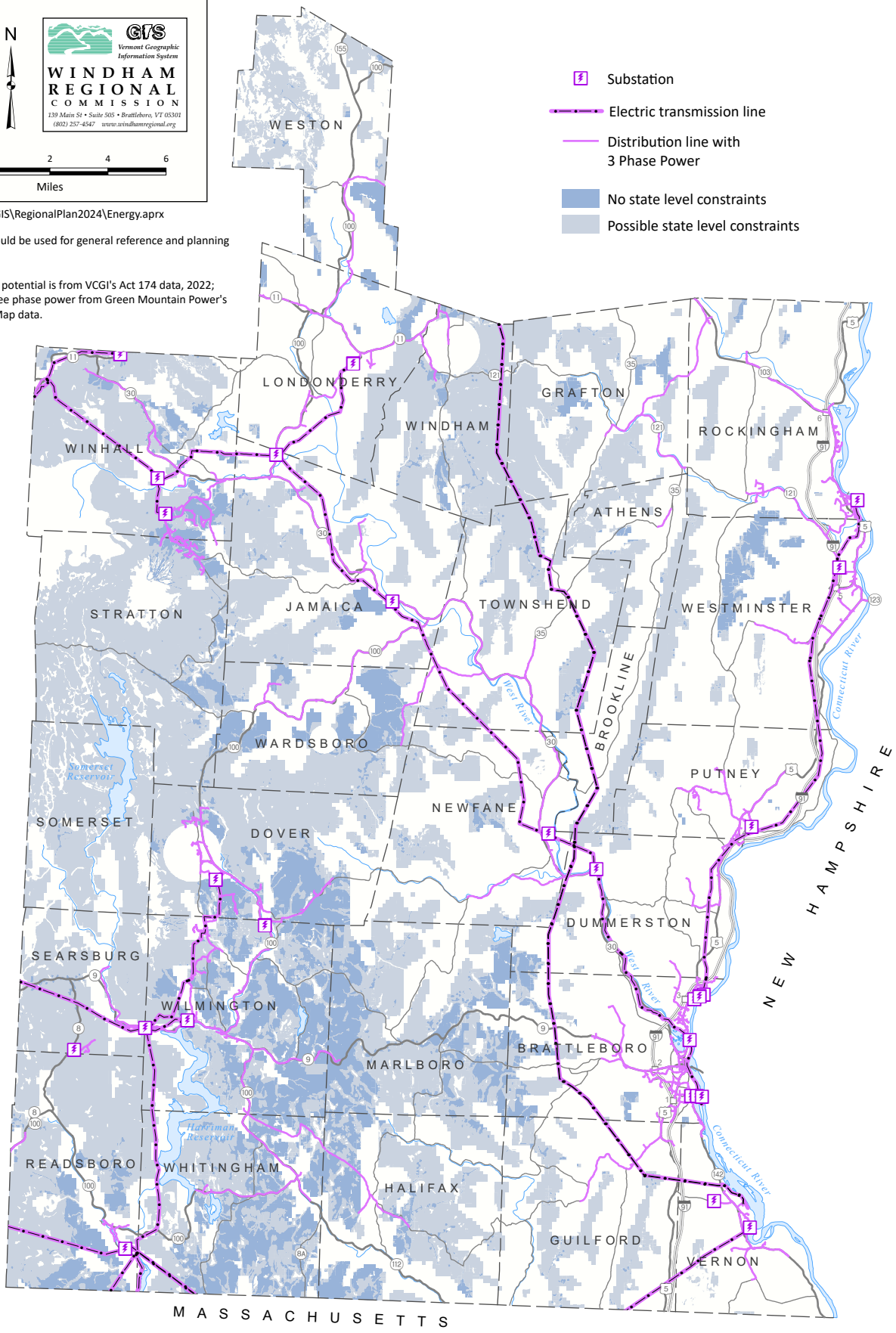
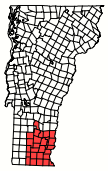
Note: This map should be used for general reference and planning purposes only.

Data sources: wind potential is from VCGI's Act 174 data, 2022; substations and three phase power from Green Mountain Power's Capacity Planning Map data.

Wind Potential



2024 Windham Regional Plan



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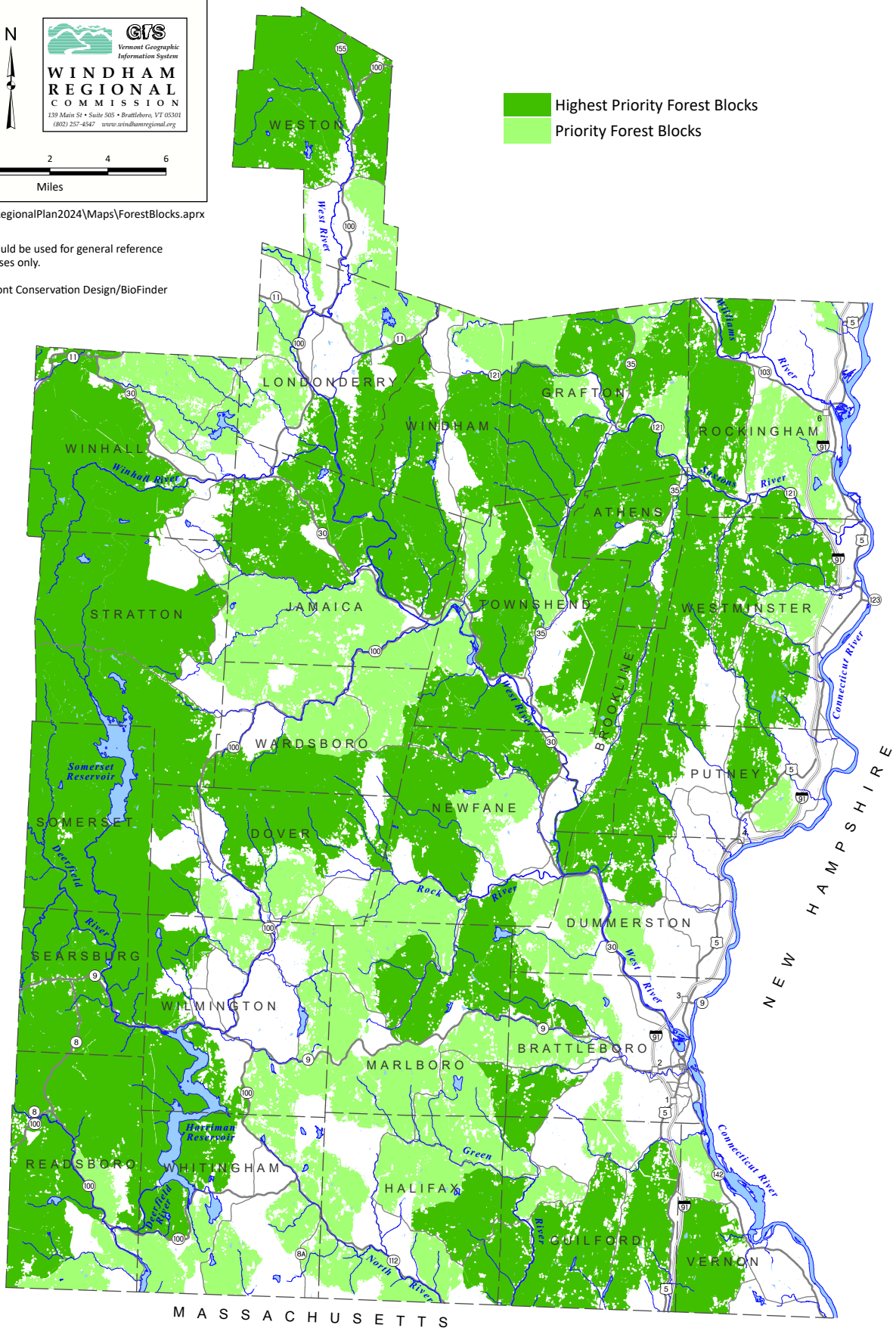
Note: This map should be used for general reference and planning purposes only.

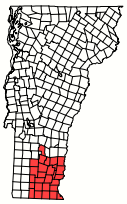
Data source: Vermont Conservation Design/BioFinder

Forest Blocks

Highest Priority Forest Blocks
Priority Forest Blocks



2024 Windham Regional Plan



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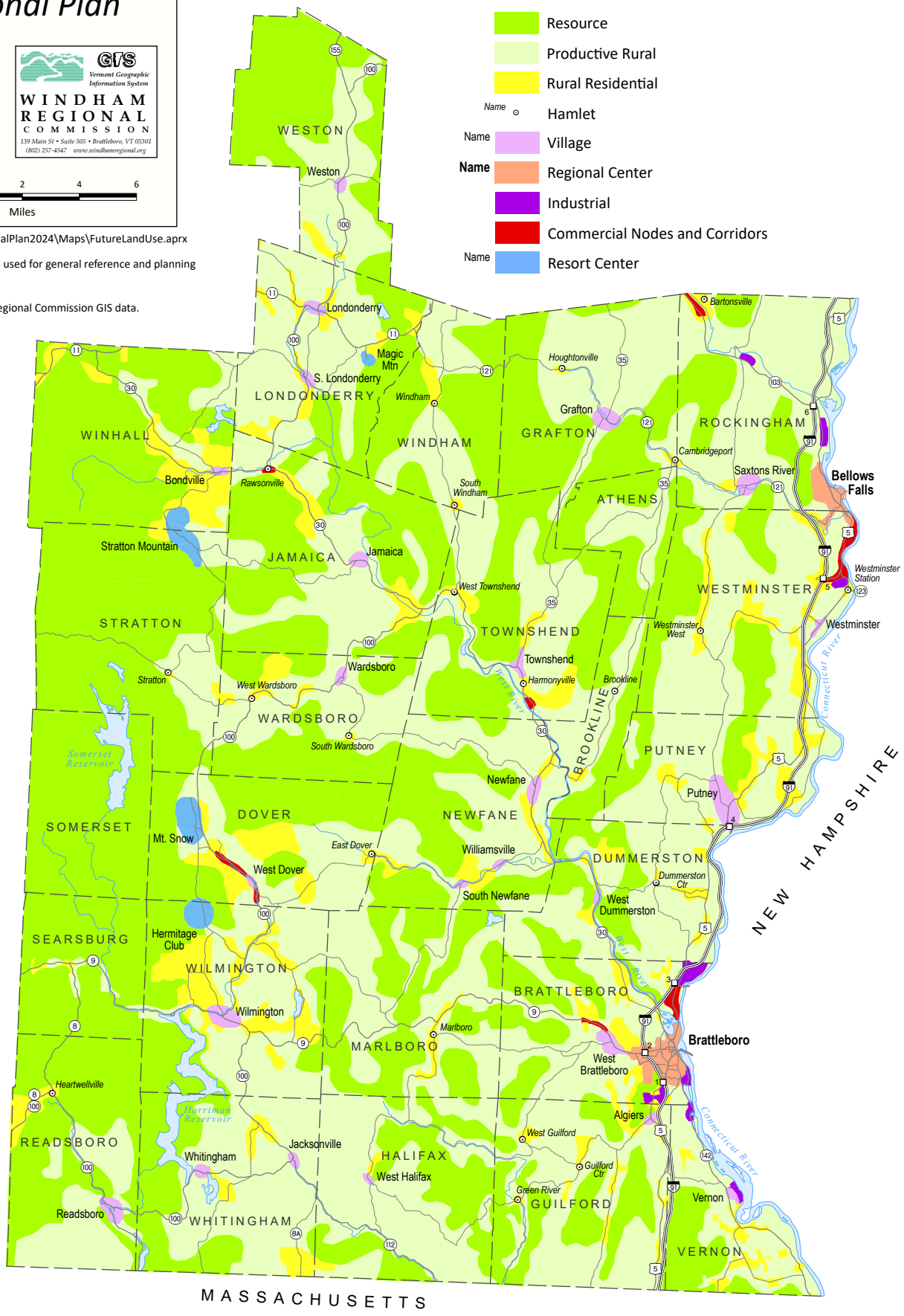
August 2024; u:\GIS\RegionalPlan2024\Maps\FutureLandUse.aprx

Note: This map should be used for general reference and planning purposes only.

Data source: Windham Regional Commission GIS data.

Proposed Land Use

- Resource
- Productive Rural
- Rural Residential
- Name — Hamlet
- Name — Village
- **Name** — Regional Center
- Industrial
- Commercial Nodes and Corridors
- Name — Resort Center



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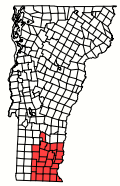

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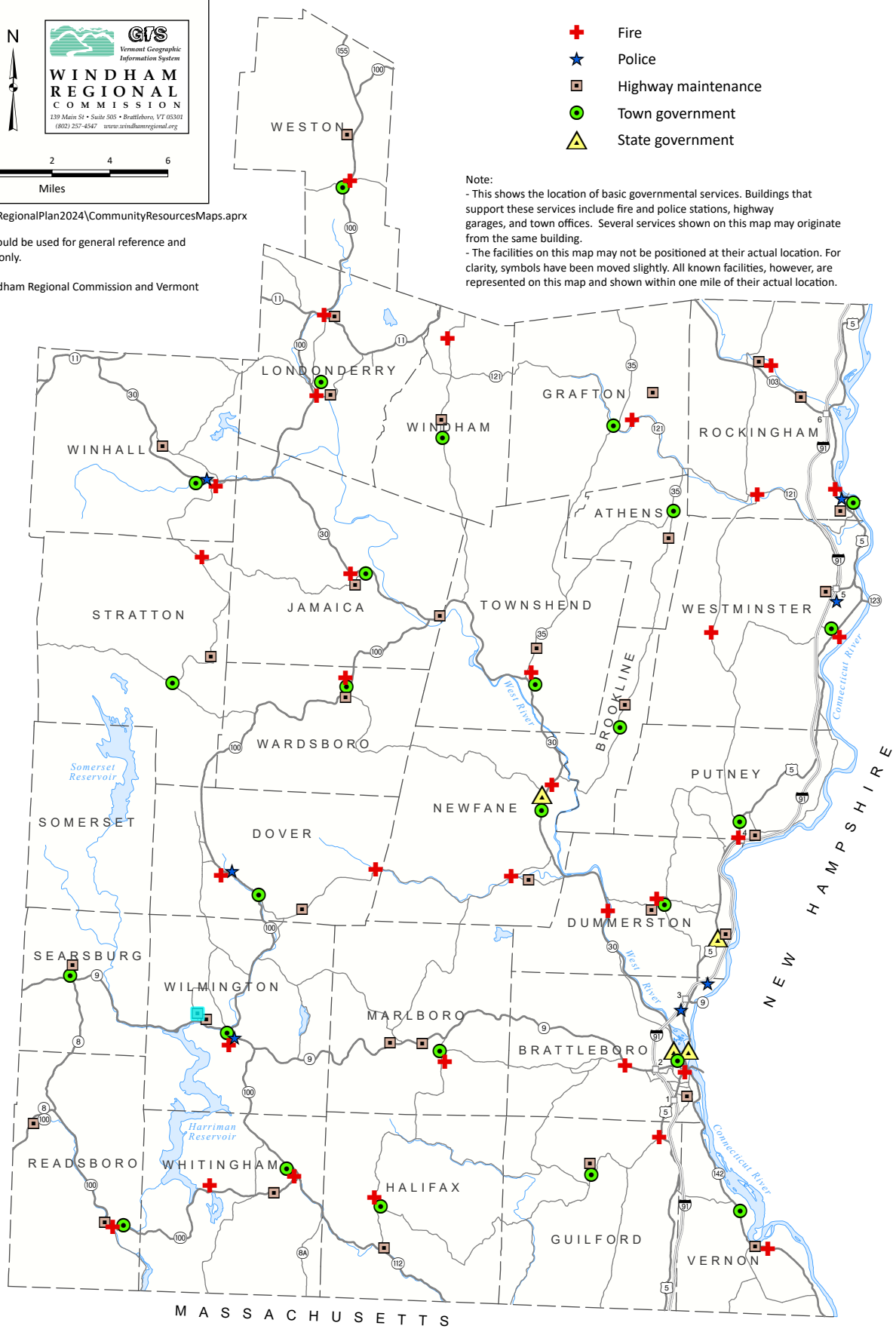
Note: This map should be used for general reference and planning purposes only.

Data sources: Windham Regional Commission and Vermont E911 data.

Governmental Services

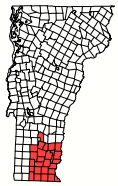
- Fire
- Police
- Highway maintenance
- Town government
- State government

Note:
- This shows the location of basic governmental services. Buildings that support these services include fire and police stations, highway garages, and town offices. Several services shown on this map may originate from the same building.
- The facilities on this map may not be positioned at their actual location. For clarity, symbols have been moved slightly. All known facilities, however, are represented on this map and shown within one mile of their actual location.



2024 Windham Regional Plan

Health and Social Service Facilities



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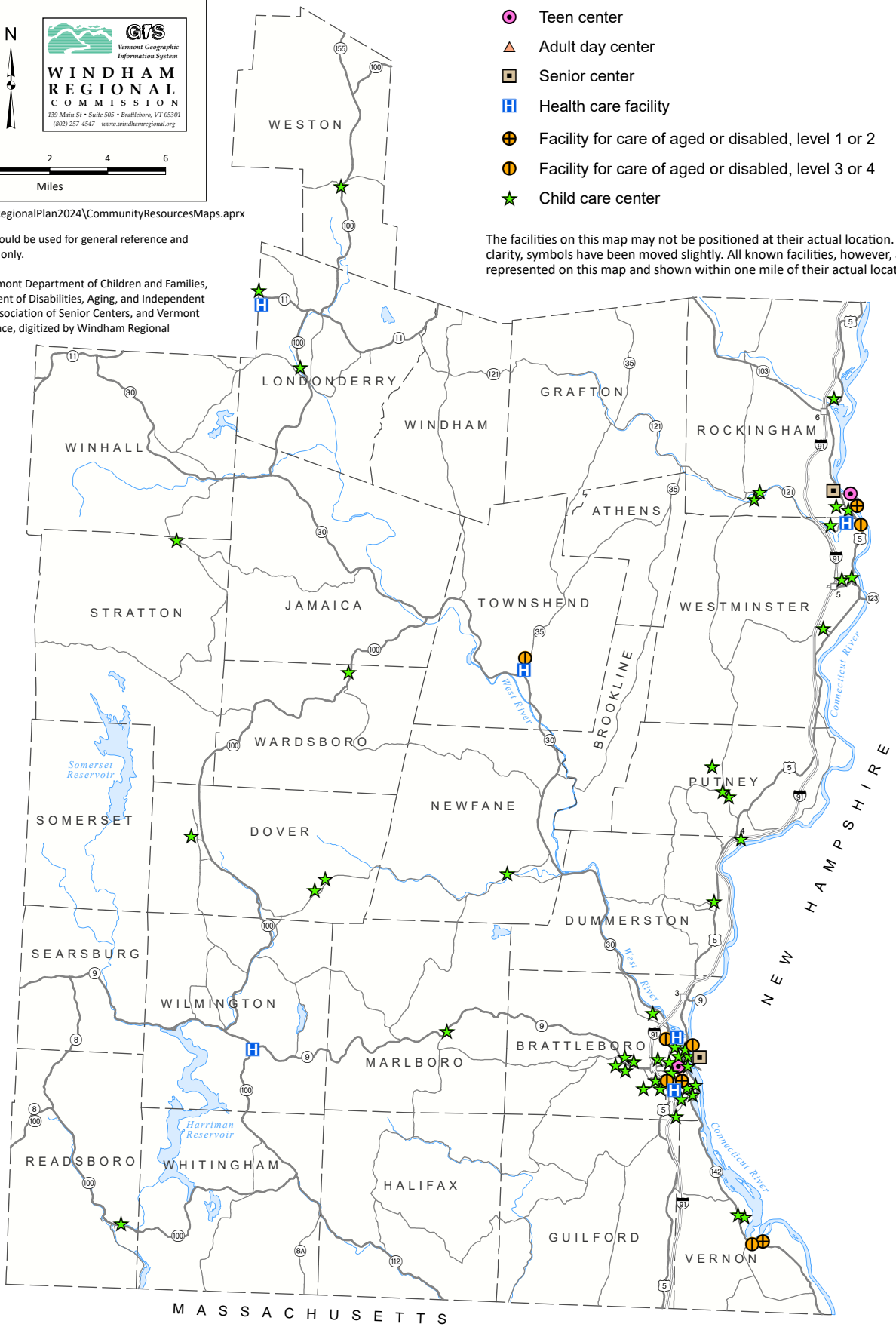
Note: This map should be used for general reference and planning purposes only.

Data sources: Vermont Department of Children and Families, Vermont Department of Disabilities, Aging, and Independent Living, Vermont Association of Senior Centers, and Vermont Youth Center Alliance, digitized by Windham Regional Commission.

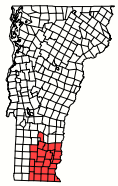
- Teen center
- Adult day center
- Senior center
- Health care facility
- Facility for care of aged or disabled, level 1 or 2
- Facility for care of aged or disabled, level 3 or 4
- Child care center

The facilities on this map may not be positioned at their actual location. For clarity, symbols have been moved slightly. All known facilities, however, are represented on this map and shown within one mile of their actual location.



2024 Windham Regional Plan

Historic Districts



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Miles

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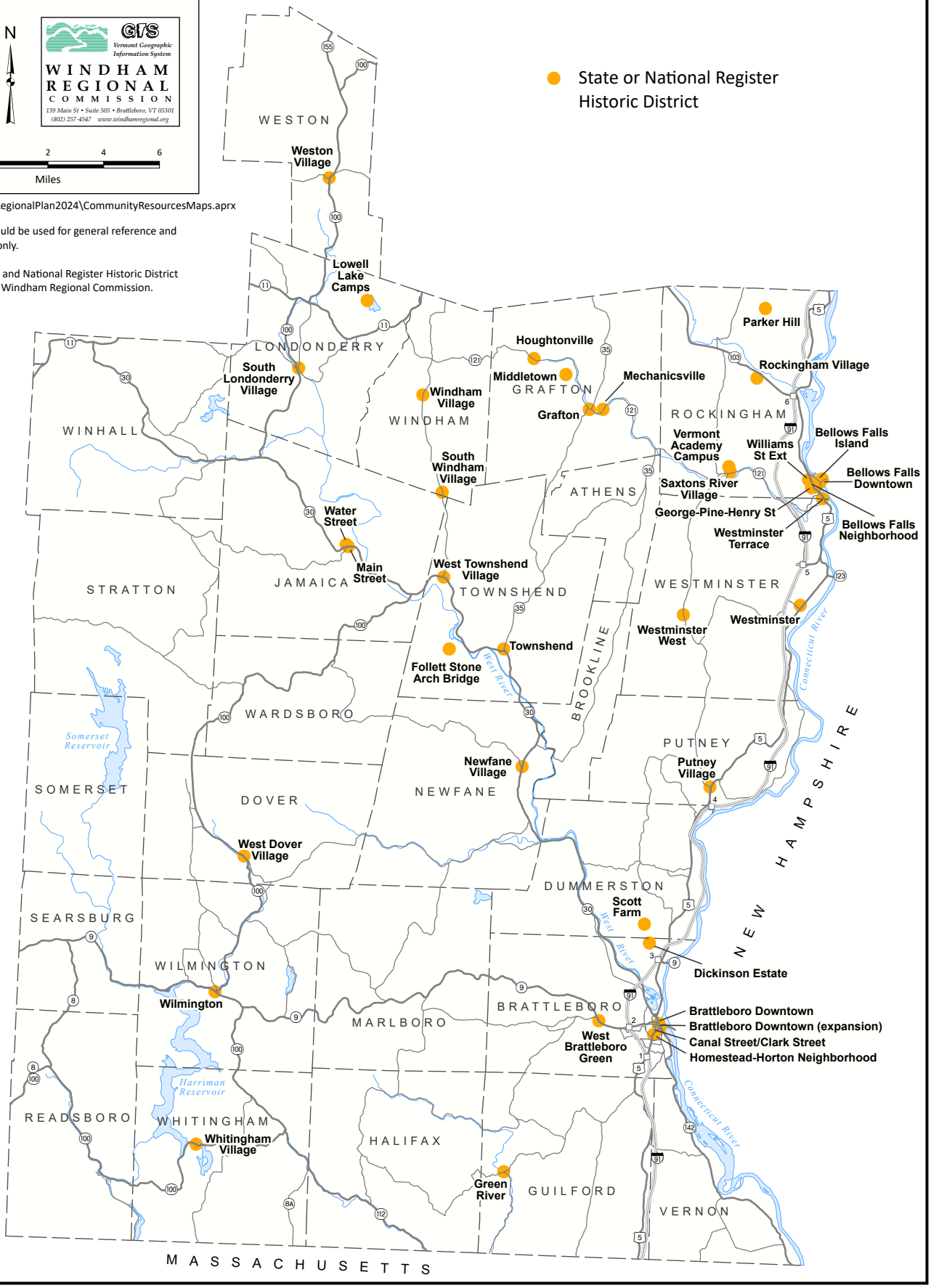
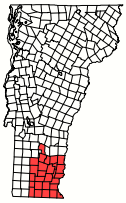
Note: This map should be used for general reference and planning purposes only.

Data sources: State and National Register Historic District listings, digitized by Windham Regional Commission.

● State or National Register Historic District



2024 Windham Regional Plan



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March 2024; u:\GIS\RegionalPlan2024\Maps\Agsoils.aprx

Note: This map should be used for general reference and planning purposes only. On-site investigation is required to verify the existence of these soil classes.

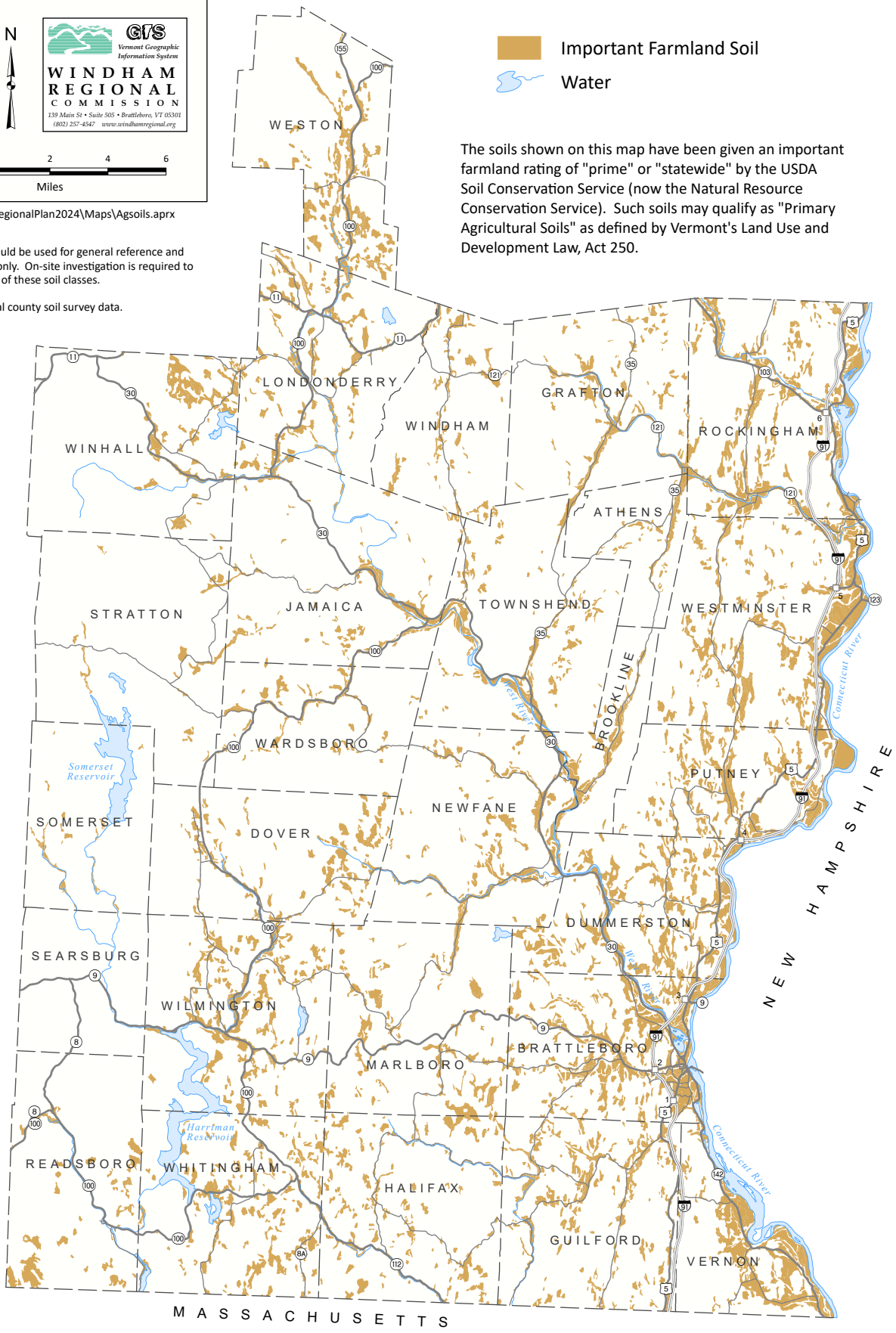
Data sources: digital county soil survey data.

Important Farmland Soils

Important Farmland Soil

Water

The soils shown on this map have been given an important farmland rating of "prime" or "statewide" by the USDA Soil Conservation Service (now the Natural Resource Conservation Service). Such soils may qualify as "Primary Agricultural Soils" as defined by Vermont's Land Use and Development Law, Act 250.



2024 Windham Regional Plan

Existing Land Use/Land Cover

N

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2 0 2 4 6

Miles

August 2024; u:\GIS\RegionalPlan2024\Maps\LandCov_8x11.aprx

Note: This map should be used for general reference and planning purposes only.

Data sources: National Land Cover Dataset, 2021; Vtrans road centerline data ,WRC land use point data.

- Regional center
- Village
- Hamlet
- Resort center

- Developed
- Developed open space
- Open/agriculture
- Barren
- Forest
- Water
- Wetland

WESTON
Weston
LONDONDERRY
Londonderry
S. Londonderry
Magic Mtn
WINHALL
Bondville
Rawsonville
Stratton Mountain
JAMAICA
Jamaica
STRATTON
Stratton
WARDSBORO
Wardsboro
West Wardsboro
South Wardsboro
Somerset Reservoir
SOMERSET
Mt. Snow
DOVER
West Dover
East Dover
SEARSBURG
Haystack
WILMINGTON
Wilmington
Heartwellville
Harriman Reservoir
READSBORO
Readsboro
Whitingham
Jacksonville
WHITINGHAM
HALIFAX
West Halifax
MARLBORO
Marlboro
BRATTLEBORO
Brattleboro
West Brattleboro
Algiers
GUILFORD
West Guilford
Guilford Ctr
Green River
Vernon
VERNON
DUMMERSTON
Dummerston Ctr
West Dummerston
South Newfane
Williamsville
NEWFANE
Newfane
PUTNEY
Putney
BROOKLINE
Brookline
TOWNSHEND
Townshend
Harmonyville
West Townshend
WINDHAM
Windham
South Windham
GRAFTON
Grafton
ATHENS
Houghtonville
Cambridgeport
Saxtons River
ROCKINGHAM
Bellows Falls
WESTMINSTER
Westminster
Westminster West
Westminster Station
Bartonsville
Connecticut River
West River
NEW HAMPSHIRE
MASSACHUSETTS

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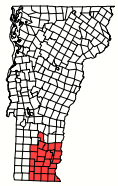

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2 0 2 4 6
Miles

August 2024; u:\GIS\RegionalPlan2024\Maps\PubCons.aprx

Note: This map should be used for general reference and planning purposes only.

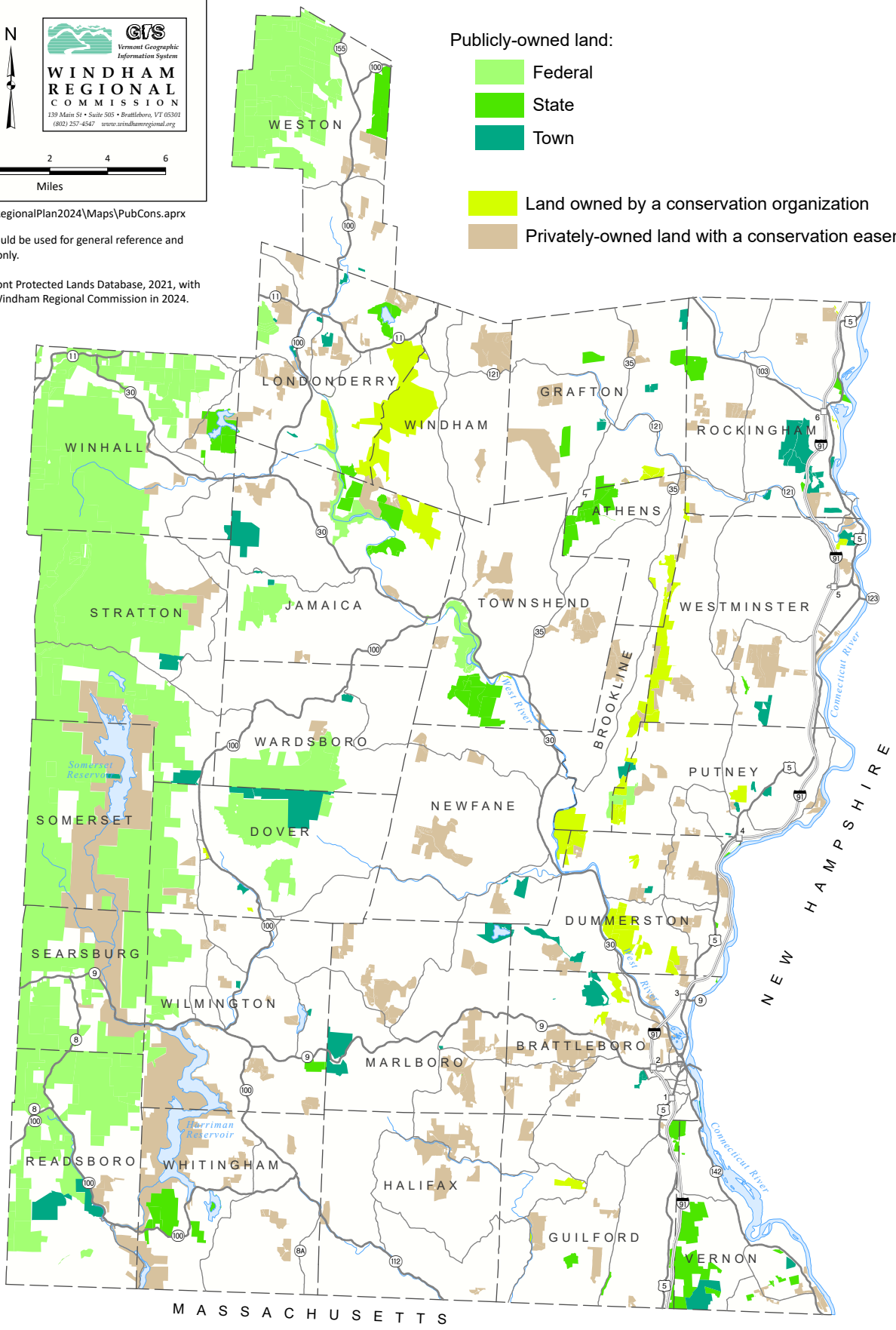
Data source; Vermont Protected Lands Database, 2021, with minor updates by Windham Regional Commission in 2024.

Public and Conserved Lands

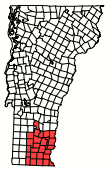
Publicly-owned land:

- Federal
- State
- Town

- Land owned by a conservation organization
- Privately-owned land with a conservation easement



2024 Windham Regional Plan



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2 0 2 4 6

Miles

May 2024; u:\GIS\RegionalPlan2024\Maps\\Development.aprx

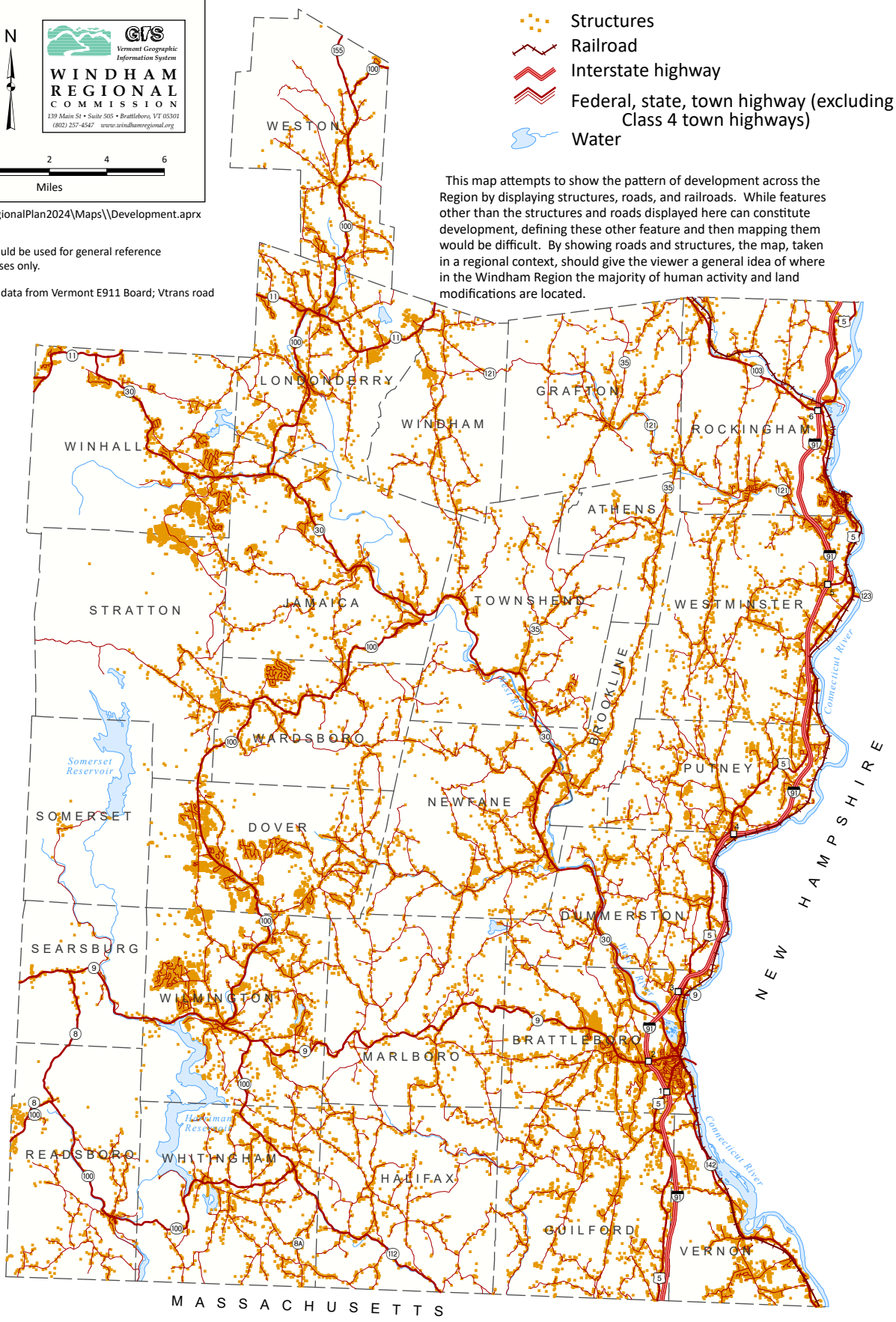
Note: This map should be used for general reference and planning purposes only.

Data sources: ESITE data from Vermont E911 Board; Vtrans road centerline data.

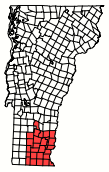
Regional Development Pattern

- Structures
- Railroad
- Interstate highway
- Federal, state, town highway (excluding Class 4 town highways)
- Water

This map attempts to show the pattern of development across the Region by displaying structures, roads, and railroads. While features other than the structures and roads displayed here can constitute development, defining these other feature and then mapping them would be difficult. By showing roads and structures, the map, taken in a regional context, should give the viewer a general idea of where in the Windham Region the majority of human activity and land modifications are located.



2024 Windham Regional Plan



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2 0 2 4 6
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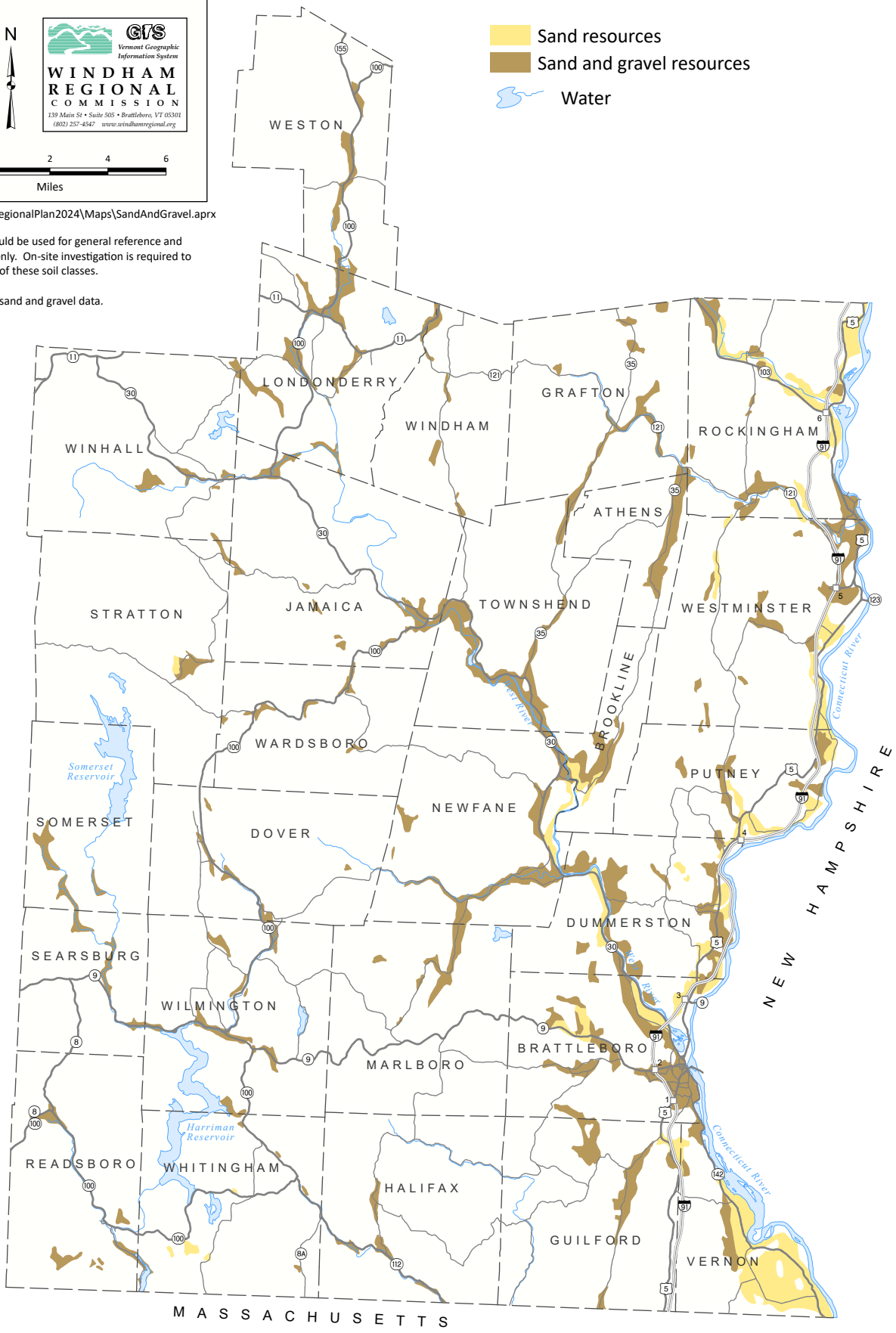
March 2024; u:\GIS\RegionalPlan2024\Maps\SandAndGravel.aprx

Note: This map should be used for general reference and planning purposes only. On-site investigation is required to verify the existence of these soil classes.

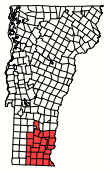
Data sources: VCGI sand and gravel data.

Sand and Gravel Resources

Sand resources
Sand and gravel resources
Water



2024 Windham Regional Plan



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2 0 2 4 6
Miles

March 2024; u:\GIS\RegionalPlan2024\Maps\Slopes.aprx

Note: This map should be used for general reference and planning purposes only.

Data source: USGS 1:24,000 Digital Elevation Model.

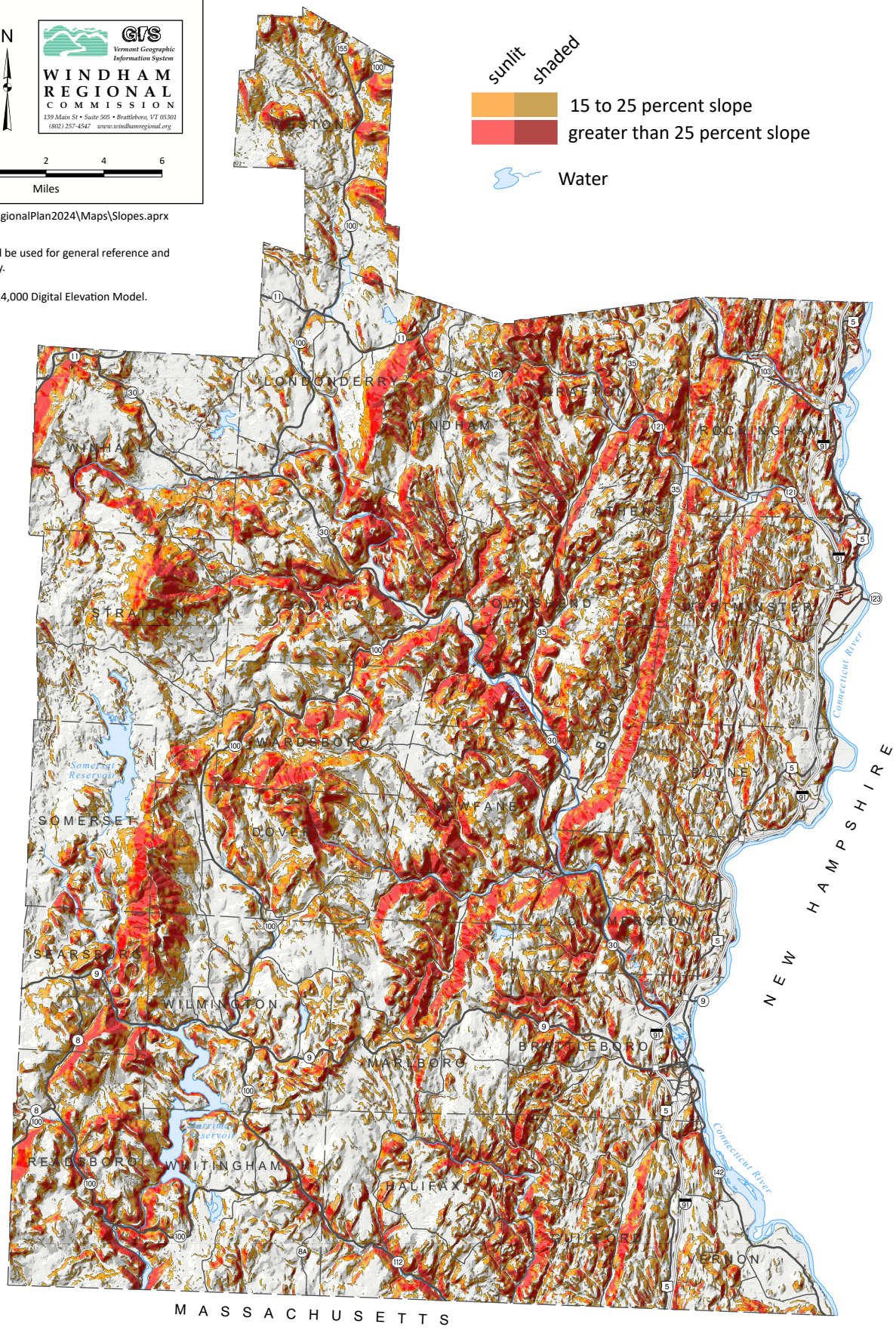
Steep Slopes

sunlit shaded

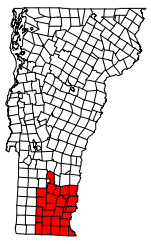
15 to 25 percent slope

greater than 25 percent slope

Water



Existing Transportation Network



This map displays the major features of the transportation network of the Windham Region. The proximity and connection between these features is represented, but the true locations are approximate. Features and locations outside the Region are not exactly located and simply shown to illustrate their connection to features within the region.

- Highway - higher traffic volume (Red = I-91)
- Highway - moderate traffic volume
- Highway - lower traffic volume
- Bus route - inter-city
- Bus route - fixed route
- Bus route - seasonal
- Bus service - in-town
- Rail service - freight
- Rail service - passenger
- Train Station
- Park and Ride Lot
- 6 Interstate exit, with number
- Ski resort
- Major/minor Town or Village

RUTLAND COUNTY (VT)

WINDSOR COUNTY (VT)

BENNINGTON COUNTY (VT)

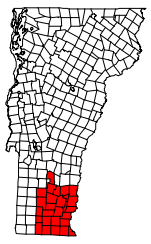
WINDHAM COUNTY (VT)

NEW HAMPSHIRE

MASSACHUSETTS

Ludlow
Okemo
Weston
Chester
White River Jct
Springfield
Claremont
Bartonsville
Bromley Mountain
Londonderry
South Londonderry
Magic Mountain
Manchester
Houghtonville
Windham
Grafton
Cambridgeport
Bellows Falls
Bondville
South Windham
Saxtons River
Stratton Mountain
Jamaica
West Townshend
Westminster Station
Westminster
Westminster West
Stratton
West Wardsboro
Wardsboro
Townshend
Harmonyville
Brookline
South Wardsboro
Newfane
Mount Snow
East Dover
Williamsville
Dummerston Center
Putney
West Dover
Hermitage
South Newfane
West Dummerston
Bennington
Wilmington
Marlboro
Brattleboro
Keene
West Brattleboro
Heartwellville
Algiers
West Guilford
Whitingham
Jacksonville
West Halifax
Guilford Center
Hinsdale
Readsboro
Green River
Vernon
North Adams
Greenfield
Palmer

Existing Transportation Network



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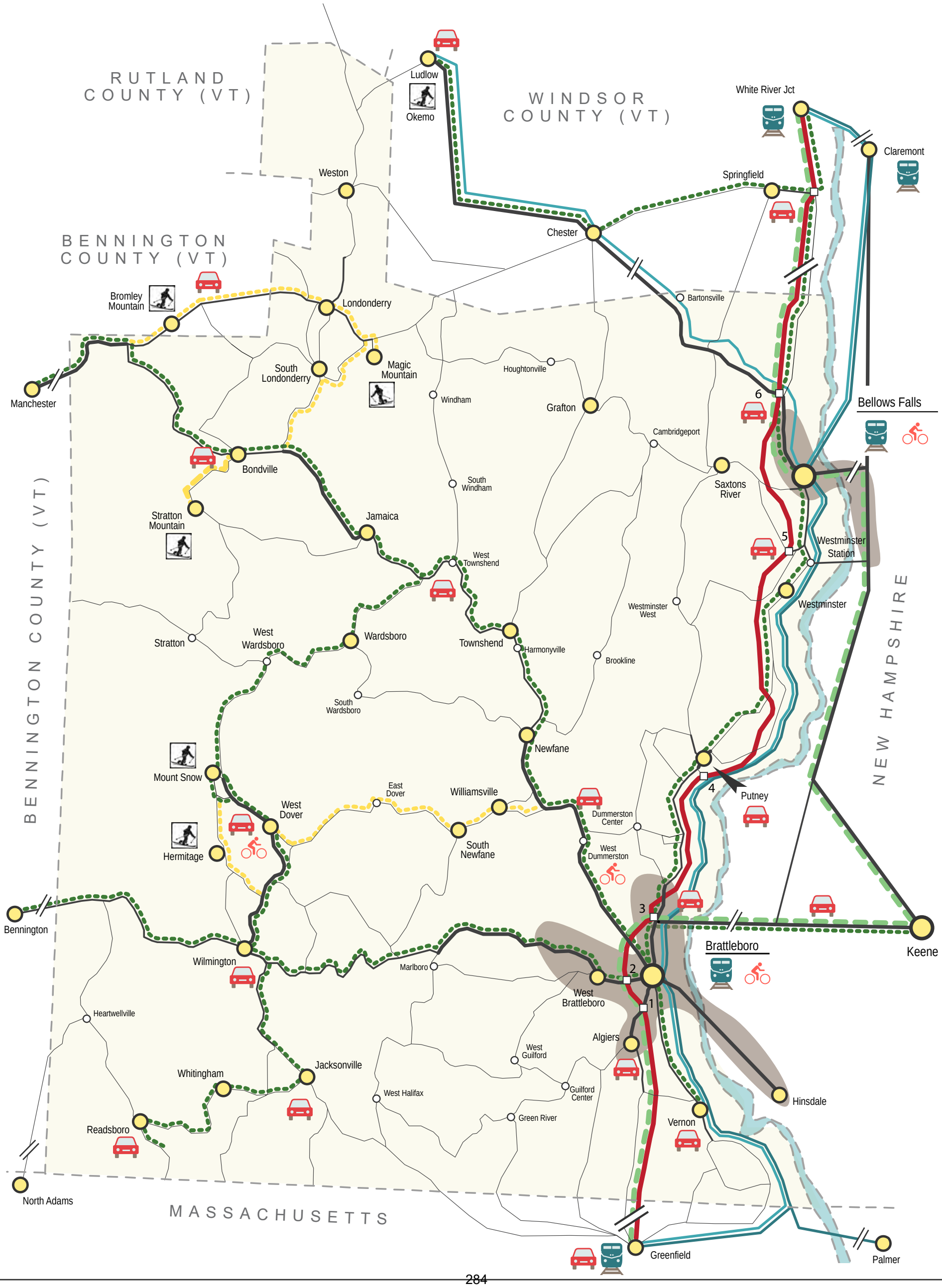
- Rail service - freight
- Rail service - passenger
- Train Station
- Park and Ride Lot
- Interstate exit, with number
- Bicycle facility improvements
- Ski resort
- Major/minor Town or Village



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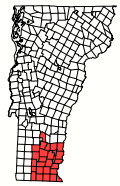

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July 2024; u:\GIS\RegionalPlan2024\CommunityResourcesMaps.aprx

Note: This map should be used for general reference and planning purposes only.

Data sources: electric generation facilities from Green Mountain Power's Capacity Planning Map data; source protection areas and water supplies from Agency of Natural Resources, transmission lines from VCGI, all other data digitized by WRC.

Utilities

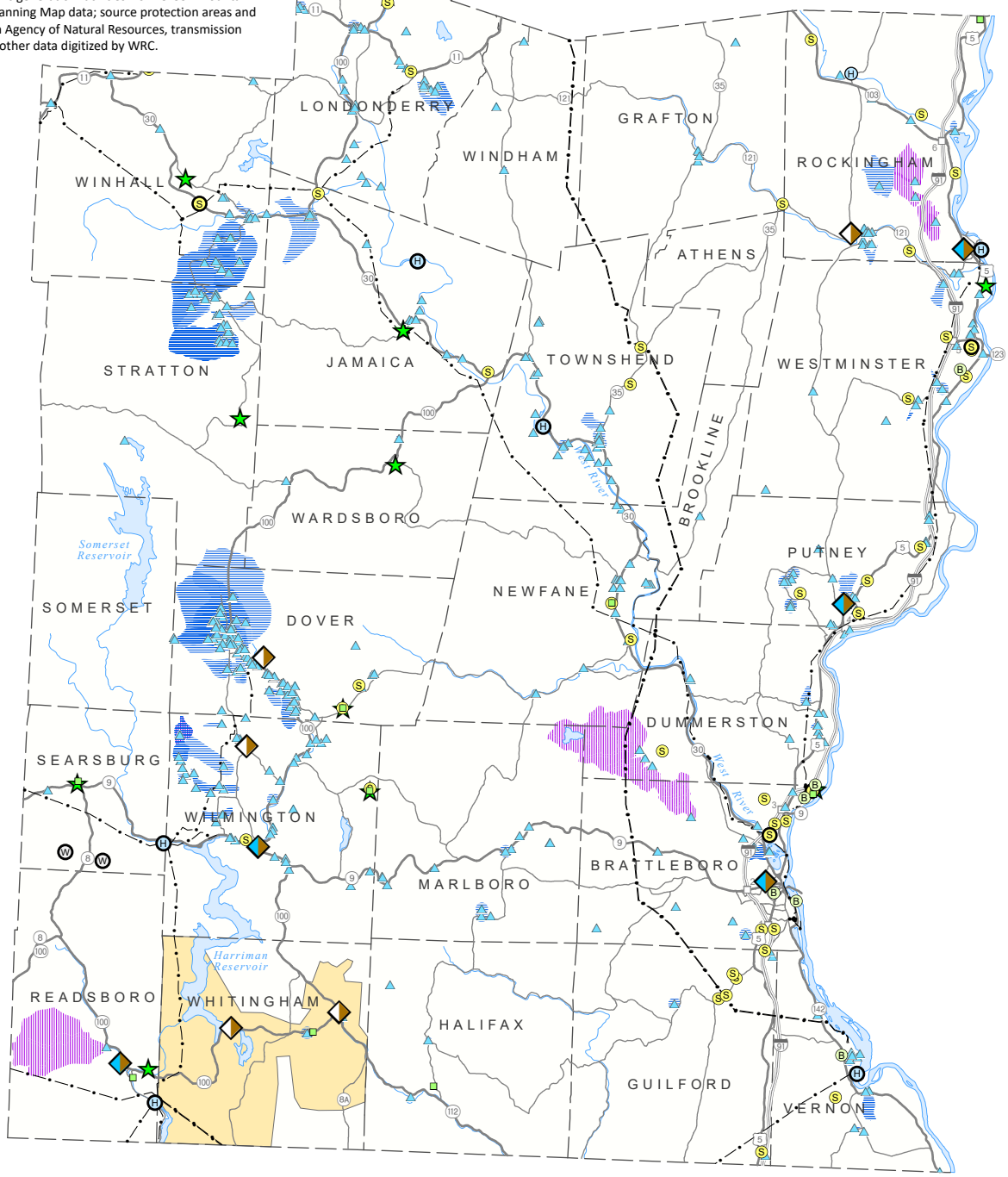
Electric utility franchise area:
- Village of Jacksonville Electric Dept
- Green Mountain Power

- Groundwater source protection area
- Surface water source protection area
- Public water supply source
  active and inactive

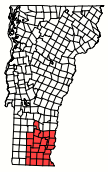
- Closed landfill
- Transfer station
- Electric transmission line

Electric generation facility:
- Solar
- Hydro
- Biogeneration
- Wind
- > 0.1 mW capacity
- > 1 mW capacity

- Municipal sewer system
- Municipal sewer and water system



2024 Windham Regional Plan



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July 2024; u:\GIS\RegionalPlan2024\Maps\WaterResources.aprx

Note: This map should be used for general reference and planning purposes only.

Data sources: Waste Management Zones and Outstanding Resource Waters mapped by WRC from state listings; Special Flood Hazard Areas from FEMA; wetland areas from WRC; River Corridors and Class A waters from Vt. ANR.

Water Resources

- Outstanding Resource Water
- Waste Management Zone
- Special Flood Hazard Area
- Areas dominated by wetlands
- Watershed of Class A(1) waters
- Watershed of Class A(2) waters
- Mapped River Corridor
- Water

Note:
-Waste management zones and Special Flood Hazard Areas have been enlarged slightly to improve visibility.